ADVANCED CAR LOCK SYSTEM

WITH

KEYLESS ENTRY FEATURE

ABSTRACT

Traditional lock systems using mechanical lock and key mechanism are being replaced by new advanced techniques of locking system. These techniques are an integration of mechanical and electronic devices and highly intelligent. One of the prominent features of these innovative lock systems is their simplicity and high efficiency.

Now a day's there is a huge boost to electronic developments in automobiles. One of the prominent features is the keyless entry to car but is this system good enough to secure our car from theft? Or sometimes if our key is lost someone else can take our car. In order to secure the car from theft we have found a new method.

In this project we have two sections. A scanning section which include a RFID module to scan the code on key. If the key matches user is directed to second stage. And the second section asks the user to enter the password by displaying it on the LCD. If the password matches with the predefined password, and then the engine gets ignited. For demonstration purpose we are using a dc motor instead of engine.

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Chapter 1

INTRODUCTION

1.1 Objective

The main objective of this project is to deter criminals from hijacking vehicle, thereby discouraging theft of the vehicle itself, its contents, or both by providing advanced security to the vehicle.

1.2 Introduction

Theft is one of the most common and oldest criminal behaviours. From the invention of the first lock and key to the introduction of RFID tags and biometric identification, anti-theft systems have evolved to match the introduction of new inventions to society and the resulting theft of them by others.

As vehicles become more sophisticated, vehicle security systems must be stronger than ever before. A modern vehicle utilizes remote keyless entry system as the main weaponry against vehicle theft. These systems prevent unauthorized access of the vehicle to a certain extent but are not a fool proof one. Due to the simple and poor nature of these security systems, auto theft incidents worldwide are on the rise.

This project involves a password based car lock system with an inbuilt keyless entry feature. Thus ease of access is enhanced together with adequate security. The owner should possess a lock system associated key to access the car. Upon detection of the key nearby, the system asks for the password. The password is a four digit key integrated into the system by its manufacturer as per the suggestion of the owner.

Once the right password is entered a “correct password” message is showed and the car is started. If the password is wrong, a “wrong password” message is showed. The enhancement of the ease of accessibility is done through the keyless entry feature and that of the security through the password based security.

Chapter 2

System Overview

2.1 Block Diagram

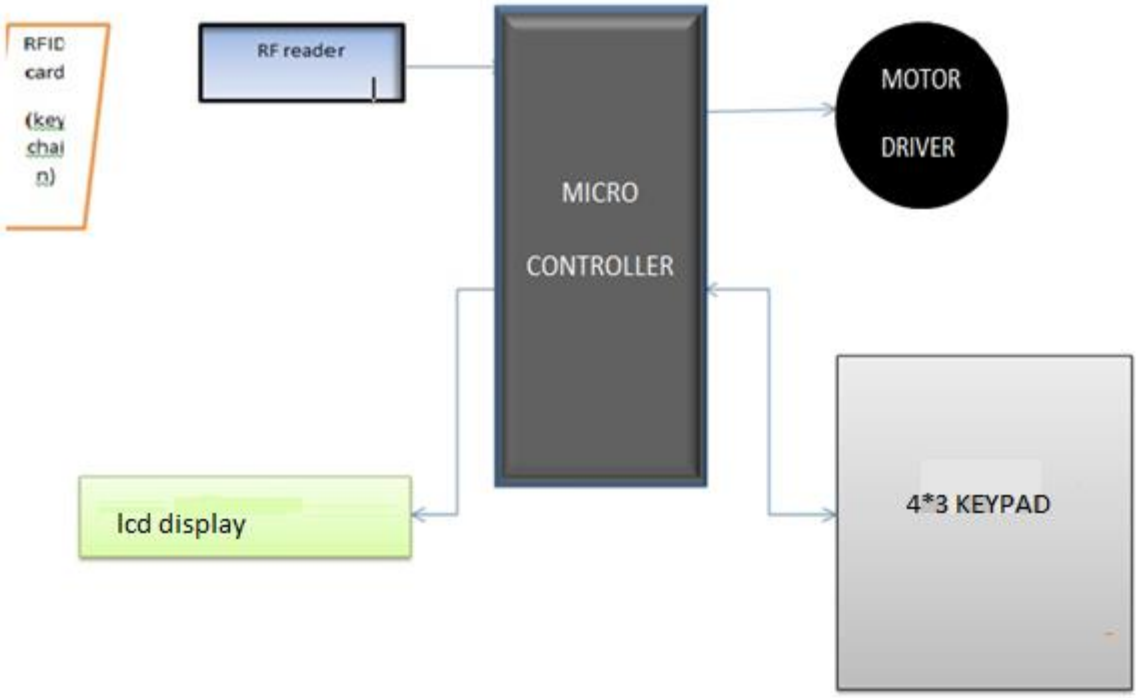


Figure 2.1: Block Diagram

2.2.1 Microcontroller

Microcontroller is the brain of the system. It is responsible for controlling and coordinating all the activities and functions. In this project microcontroller used is AT89C51.It receives input from RFID module and all other components and process all these signals accordingly.

2.2.2 DC Motor and Motor Driver

The motor section is used to demonstration purpose of igniting the engine. When the password entered matches motor rotates.

The motor driver IC used is L293D.It contains two pairs of inputs
ie, it can control 2 motors.L293D works on voltages of +5v and +12v.

2.2.3 Display Section

A 16x2 LCD display is used to display the working of the status of project at different stages.

2.2.4 RFID MODULE

A Radio Frequency Identification reader is a device used to gather information from a RFID tag which is used to track individual objects. Radio waves help to transfer the data from tag to reader. RFID technique uses digital data in RFID tag, made of integrated circuit containing tiny antenna for data transfer to RFID receiver.

2.2.5 Keypad

Keypad is used to enter the 4 digit password. When each key is pressed it is given to the microcontroller. Here we are using 4*3 keypad.

Chapter 3

Hardware Implementation

3.1 Circuit Diagram:

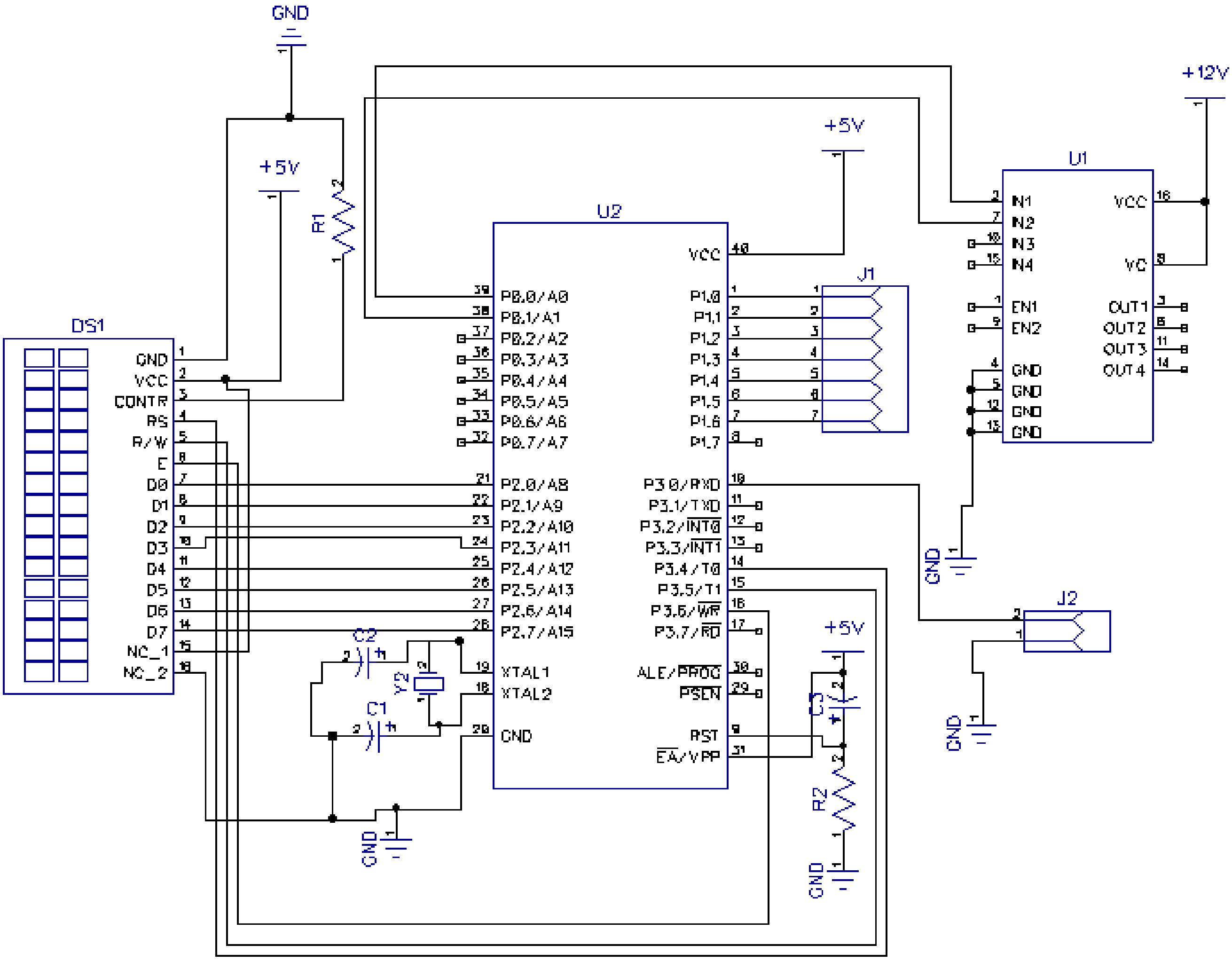


Fig 3.1 Circuit diagram

3.2 Hardware Description

3.2.1:AT89C51 MICROCONTROLLER

The main features of 8051 microcontroller are:

i. RAM – 128 Bytes (Data memory)

ii. ROM – 4Kbytes (ROM signify the on – chip program space)

iii. Serial Port – Using UART makes it simpler to interface for serial communication.

iv. Two 16 bit Timer/ Counter

v. Input/output Pins – 4 Ports of 8 bits each on a single chip.

vi. 6 Interrupt Sources

vii. 8 – bit ALU (Arithmetic Logic Unit)

viii. Harvard Memory Architecture – It has 16 bit Address bus (each of RAM and ROM) and 8 bit Data Bus.

ix. 8051 can execute 1 million one-cycle instructions per second with a clock frequency of 12MHz.

This microcontroller is also called as "System on a chip" because it has all the features on a single chip.

MEMORY ARCHITECTURE

The 4 discrete types of memory in 8051 are:

i. Internal RAM – This memory is located from address 0 to 0xff. The memory locations from 0x00 to 0x7F are accessed directly. The bytes from 0x20 to 0x2F are bit-addressable. Loading R0 and R1 the memory location from 0x80 to 0xFF can easily accessed.

ii. Special Function Registers (SFR) – Located from address 0x80 to 0xFF of the memory location. The same instructions used for lower half of internal RAM can be used to access SFR's. The SFR's are bit addressable too.

iii. Program Memory – This is read only memory which is located at address 0. With the help of 16 bit Special Function Register DPTR, this memory can also save the tables of constants.

iv. External Data Memory – Located at address 0. The Instruction MOVX (Move External) should be used to access the external data memory.

PIN DIAGRAM:

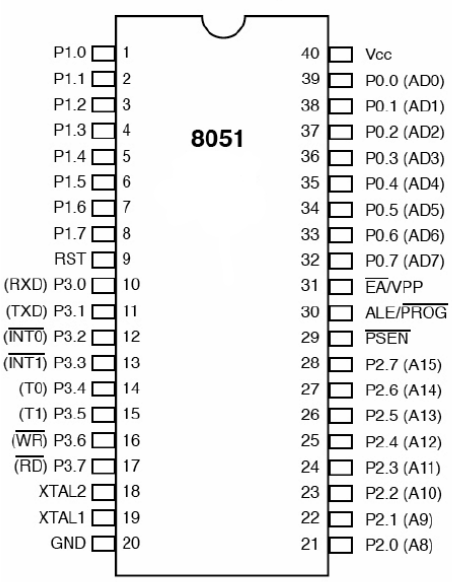


fig 3.2.1 pin diagram

3.2.2 16X2 LCD Display

A liquid crystal display (LCD) is a thin, at panel used for electronically displaying information such as text, images, and moving pictures. Among its major features are its lightweight construction, its portability, and its ability to be produced in much larger screen sizes than are practical for the construction of cathode ray tube (CRT) display technology. Its low electrical power consumption enables it to be used in battery-powered electronic equipment. It is an electronically-modulated optical device made up of any number of pixels filled with liquid crystals and arrayed in front of a light source (backlight) or reflector to produce images in colour or monochrome. The earliest discovery leading to the development of LCD technology, the discovery of liquid crystals, dates from 1888. The LCD has the distinct advantage of having the lower power requirement than the LED. It is typical in the order of microwatts for the display, as compared to the same order of milli watts for LEDs.

LCD is limited to a temperature range of about 0 to 60 C. Lifetime is an area of concern because LCDs can chemically degrade. The 8 bit data pins, D0 D7, are used to send information to the LCD or read the contents of the LCD's internal registers. To display letters and numbers, we send ASCII codes for the letters A- Z, a-z, and 0-9 to these pins while making RS = 1.There are also instruction command codes that can be send to the LCD to clear the display or force to cursor to the home position or blink the cursor.

Figure 3.2.2: Lcd

3.2.3 L293D

The L293D is a quadruple high current half-H driver. It is designed to provide bidirectional drive currents of up to 600mA at volt-ages from 4.5V to 36V.It is designed to drive inductive loads such as Relays, solenoids, dc and bipolar stepping motors etc. All inputs are TTL compatible. Drivers are enabled in pairs, with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN.When an enable input is high, the associated drivers are enabled, and their outputs are active and in phase with their inputs. When the enable input is low, these drivers are disabled, and their outputs are zero and in the high impedance state. With the proper data inputs, each pair of drivers forms a full-H (or bridge) reversible drive suitable for solenoid or motor applications.

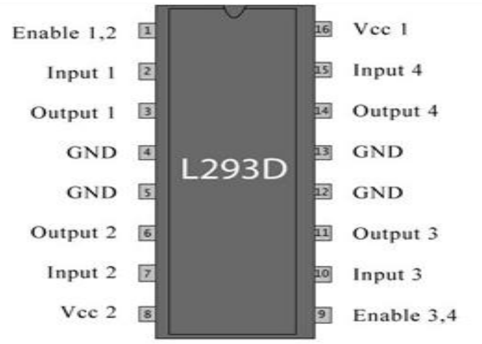


Fig 3.2.3 L293D

3.2.4 RFID MODULE

A radio frequency identification reader is a device used to gather information from a RFID tag which is used to track individual objects. Radio waves help to transfer data from tag to reader. Tags needn't be scanned directly or even LOS is not required. RFID tag must lie within the range of the reader. RFID technique uses digital data in RFID tag, made up of integrated circuit containing tiny antenna for data transceiver to RFID transceiver.

RFID tag consists of a tag chip and a tag antenna. Tag chip contains memory which stores the product's EPC (Electronic Product Code) which is the item's unique tracking address. It is a 96 bit string of data. Tag antenna collects the energy and channels it to turn on the chip. RFID reader uses an attached antenna to capture data from the RFID tag. It then passes the data to the microcontroller for processing. It is either fixed or portable. RFID reader communicates with the tag in its field and can perform tasks like filtering, writing, continuous inventorying etc.

Reader antenna converts electrical current into electromagnetic waves that are then radiated into space where they can be received by the tag antenna and converted back into electrical current. Reader control and application software connects RFID reader with applications they support. It sends control commands to reader and receives tag data from reader

Figure 3.2.4 RFID MODULE

3.2.5 KEYPAD

The keypad has a 3-columns and 4-rows matrix orientation as seen in figure 2. If a key is pushed then the circuit would be shorted for those specific key pins. The short circuit would always be between a row pin and a column pin. For this specific 96AB2-152-F keypad the rows 1-4 are represented by pins 1-4 and columns 1-3 are represented by pins 5-7. For example button 1 would be represented by pins 1 and 5, so if a voltage is applied to one of the pins and a voltammeter is connected to the other pin, when the button is pushed the voltammeter would read the input voltage.

Figure 3.2.5 KEYPAD

3.3 Circuit Operation

A 12V DC battery is fed to the input of the voltage regulator IC7805.The ripples in the resulting supply if any is filtered or smoothened by means of a 100uF/25V capacitor. This voltage is fed to regulator IC 7805, which provides a regulated 5V positive supply at its third pin. The regulated output is given as VCC to AT89C51, LCD display. And the 12V DC is directly given to RFID module and l293D .This is the power supply scheme used.

The RFID module will scan the key on the user. And the scanned code is transmitted to the micro controller’s (AT89C51) serial receiver pin. Microcontroller will check whether the scanned code matches the predefined code. if the scanned key is not the write one a message will be displayed on the lcd saying “key not recognized”. if the code matches the user is directed to the second stage of operation.

In the second stage the user is asked to “enter the password” by displaying on LCD. User can enter the 4 digit password through the keypad provided. And the password entered will be shown as ‘*’ on LCD. The microcontroller will check whether the password entered matches the predefined password. If the entered password is incorrect the user is asked to scan the key again. If the password entered is correct the microcontroller will send a logic high signal to the motor driver IC (l293D).Motor driver is directed to rotate the motor clockwise direction for 3s. The respective status of each operation is displayed on the LCD display by signals sent by the microcontroller the LCD at each stage.

Chapter 4

Software Implementation

4.1 Main Program

```
#include<reg51.h>
#include<string.h>
unsigned int data_out,command=0x80,temp;
sfr lcd_data_pin=0xA0;                    //p2 port
sbit rs=P3^4;                             // Register select pin
sbit rw=P3^5;                             // Read Write pin
sbit en=P3^6;                             // Enable pin
sbit m1=P0^0;
sbit m2=P0^1;
sbit r1=P1^0;
sbit r2=P1^1;
sbit r3=P1^2;
sbit r4=P1^3;
sbit c1=P1^4;
sbit c2=P1^5;
sbit c3=P1^6;
unsigned int b= 1;
unsigned char card_id[12];
unsigned char card[10]="pxppyueqvw";
unsigned char current_byte = 0;
int a;
char uid[]="8741";
char id[5];
void lcd_ini();
```

```
void lcd_string(char *);
void delay(int);
void lcd_command(char);
void lcd_data(char);
void check_id();
char scankey();
char check();
void engine_start();
void recieve() interrupt 4;


void main()
{
int n;
char key;
P2=0x00;
P1=0xff;
lcd_ini();
lcd_string("system is locked");
lcd_command(0xc0);
TMOD=0x20;                    //Enable Timer 1
TH1=0xFD;
SCON=0x50;
TR1=1;
EA=1;
ES=1;                         // Trigger Timer 1
lcd_ini();
lcd_command(0x81);            //Place cursor to second position of first line
lcd_string("Swipe Your Key Card");
delay(200);
```

```
while(b)
{
   while(current_byte!=12);
   display();
}
lcd_string("enter user id");
delay(100);
lcd_command(0x01);
lcd_command(0x02);
lcd_string("user_id");
lcd_command(0xc0);
n=0;
while(n<4)
{
key=check();
id[n]=key;
lcd_data('*');
delay(100);
n++;
}
lcd_command(0x01);
lcd_command(0x02);
if(strcmp(uid,id)==0)
{
lcd_string("id matched");
delay(200);
engine_start();


delay(600);
lcd_command(0x01);
lcd_command(0x02);
}
```

```
else
{
lcd_string("try again");

delay(200);
lcd_command(0x01);
lcd_command(0x02);
}
}
```

4.2 Delay Function

```
void delay(int count)                    //Function to provide delay of 1ms
{
    int i,j;
    for(i=0;i<count;i++)
    for(j=0;j<1275;j++);
}
```

4.3 Keypad Functions

```
char check()                    //Function to continuously check for keypad entry
{
char b='a';
while(b=='a')
{
b=scankey();
}
```

```
return b;
}


char scankey()                                  //Function to find keypad key pressed
{
c1=c2=c3=1;
r1=r2=r3=r4=0;
r1=0;r2=r3=r4=1;
if(c1==0)
{
delay(2);
return '1';
}
if(c2==0)
{
delay(2);
return '2';
}
if(c3==0)
{
delay(2);
return '3';
}
r2=0;r1=r3=r4=1;
if(c1==0)
{
delay(2);
return '4';
}
```

```
if(c2==0)
{
delay(2);
return '5';
}
if(c3==0)
{
delay(2);
return '6';
}
r3=0;r1=r2=r4=1;
if(c1==0)
{
delay(2);
return '7';
}
if(c2==0)
{
delay(2);
return '8';
}
if(c3==0)
{
delay(2);
return '9';
}
r4=0;r1=r2=r3=1;
if(c1==0)
{
delay(2);
return '*';
}
```

```
if(c2==0)
{
delay(2);
return '0';
}
if(c3==0)
{
delay(2);
return '#';
}
return 'a';
}
```

4.4 LCD Functions

```
void lcd_command(unsigned char comm)            //Lcd command funtion
{
    lcd_data_pin=comm;
    en=1;
    rs=0;
    rw=0;
    delay(1);
    en=0;
}
```

```
void lcd_data(unsigned char disp)                    //Lcd data function
{
    lcd_data_pin=disp;
    en=1;
    rs=1;
    rw=0;
    delay(1);
    en=0;
}


void lcd_ini()                                         //Function to inisialize the LCD
{
lcd_command(0x38);
delay(2);
lcd_command(0x01);
delay(2);
lcd_command(0x80);
delay(2);
lcd_command(0x0e);
delay(2);
}


void display()                                       // Function to check the unique id
{
        unsigned char count;
   lcd_command(0xC1);       //Place cursor to second position of second line
   a=1;
```

```
for(count=0;count<5;count++)
    {
        if(card_id[count]!=card[count])
        a=0;
    }
  if(a)
  {
        lcd_string("Card Recognised ");
        b= 0;
  }
  else
  lcd_string("wrong card      ");
  current_byte=0;
}


void lcd_string(char *p)                                   //Lcd string function
{
while(*p!='\0')
{
lcd_data(*p);
delay(10);
p++;
}
}
```

4.5 RFID Function

```
void recieve() interrupt 4                    // Function to recieve data serialy from RS232
{
        card_id[current_byte]=SBUF;
        RI=0;                                 // Reset the serial interrupt after recieving the byte
        current_byte++;
}
```

4.6 Engine Start Function

```
void engine_start()                    //Function to start the motor for 3 secounds
{
lcd_command(0x01);
lcd_command(0x02);
lcd_string("Starting Engine...");
m1=1;
m2=0;
delay(300);
m1=0;
}
```

Chapter 5

PCB Design

A printed circuit board, or PCB, is used to mechanically support and electrically connect electronic components using conductive path-ways, tracks or signal traces etched from copper sheets laminated onto a non-conductive substrate. The design of PCB is considered as the last step in electronics circuit design as well as the first step in production of PCBs. It forms a distant factor in the circuits performance and reliability. The designing of the PCB consists of designing of the layout followed by generation of the artwork. The board is typically coated with a solder mask that is green in colour. Other colours that are normally available are blue, black, white and red. Conducting layers are typically made of thin copper foil. Insulating layers dielectric is typically laminated together with epoxy resin prepreg.Well known prepreg materials used in the PCB industry are FR-2 (Phenolic cotton paper), FR-3 (Cotton paper and epoxy), FR-4 (Woven glass and epoxy), FR-5 (Woven glass and epoxy), FR-6 (Matte glass and polyester), G-10 (Woven glass and epoxy), CEM-1 (Cotton paper and epoxy), CEM-2 (Cotton paper and epoxy), CEM-3 (Non-woven glass and epoxy).

5.1 PCB Technology

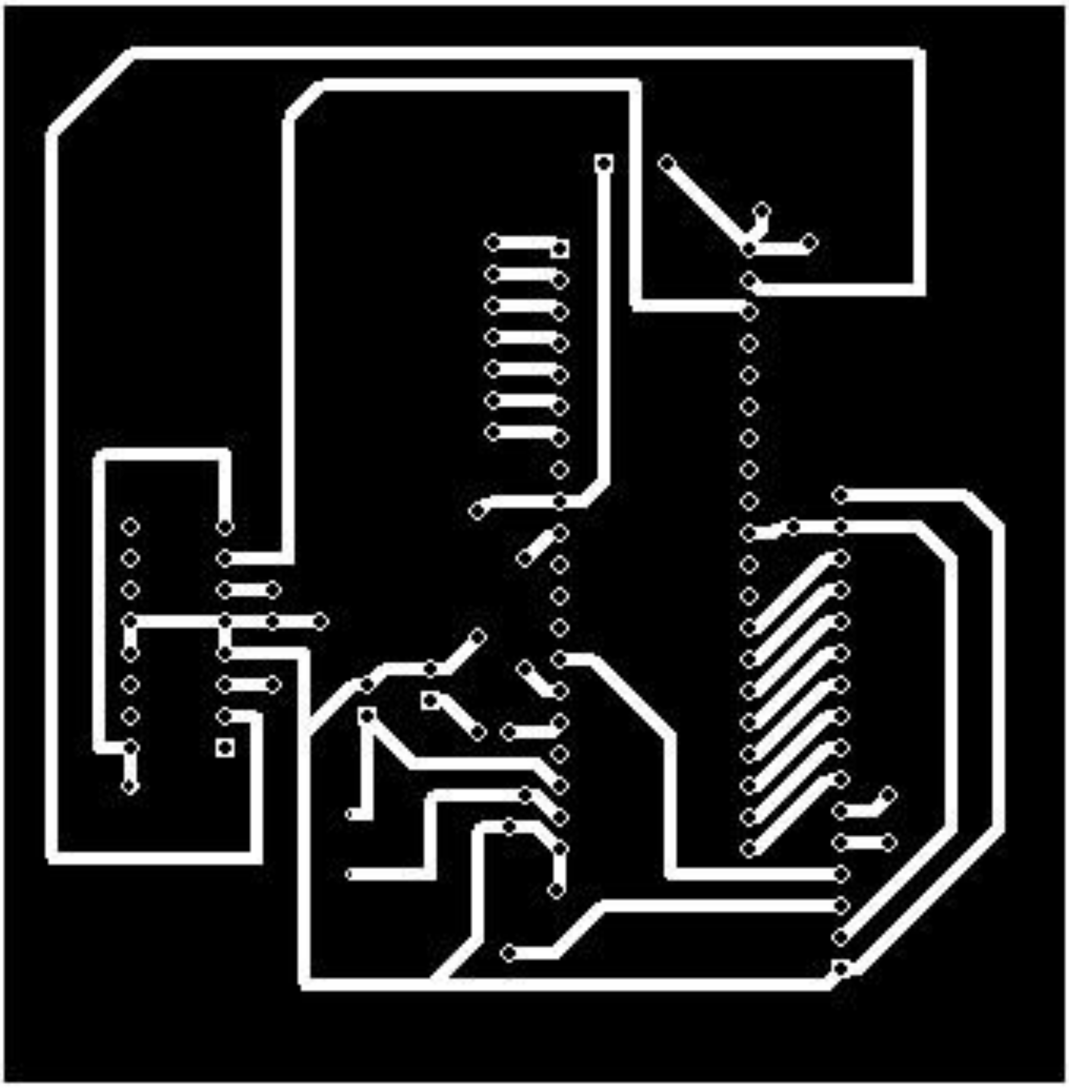
Block level descriptions of the various terms associated with the technology of PCBs are as follows:

- **COPPER CLAD LAMINATES** The board with copper on it is called "copper-clad laminate".
- **PATTERNING (ETCHING**) The vast majority of printed circuit boards are made by bonding a layer of copper over the entire substrate, sometimes on both sides, (creating a "blank PCB") then removing unwanted copper after applying a temporary mask (e.g., by etching), leaving only the desired copper traces.
- **LAMINATION** Some PCBs have trace layers inside the PCB and are called multilayer PCBs. These are formed by bonding together separately etched thin boards.
- **DRILLING** Holes through a PCB are typically drilled with small-diameter drill bits made of solid coated tungsten carbide. Coated tungsten carbide is recommended since many board materials are very abrasive and drilling must be high RPM and high feed to be cost effective. These holes are often filled with annular rings (hollow rivets) to create vias. Vias allow the electrical and thermal connection of conductors on opposite sides of the PCB.
- **SCREEN PRINTING** Line art and text may be printed onto the outer surfaces of a PCB by screen printing. Screen print is also known as the silk screen, or, in one sided PCBs, the red print.

- **PRINTED CIRCUIT ASSEMBLY** After the printed circuit board (PCB) is completed, electronic components must be attached to form a functional printed circuit assembly, or PCA (sometimes called a "printed circuit board assembly" PCBA).In through-hole construction, component leads are inserted in holes. In surface-mount construction, the components are placed on pads or lands on the outer surfaces of the PCB. In both kinds of construction, component leads are electrically and mechanically fixed to the board with a molten metal solder. Soldering techniques are used to attach components to a PCB.

- **TESTING** While the power is on, in-circuit tests, where physical measurements (i.e. voltage, frequency) can be done. More-over while the power is on, functional test, just checking if the PCB does what it had been designed to do can also be done.

5.2 PCB Layout



Chapter 6

Implementation and Circuit Testing

Implementation

The PCB circuit was designed and implemented. The key for keyless entry was implemented with the help of an RFID tag. The ignition of the system was demonstrated by turning on a 12V DC motor.

Circuit Testing

A “Key Recognised” message was displayed when the actual key was kept in proximity of the system. For all other keys a “Wrong Key” message was displayed. After recognising the key, the password was requested by the system. When the right password was entered a “Correct Password” message was displayed and the motor was turned ON for a specific time. When a wrong password was entered “Wrong Password” message was displayed.

Chapter 7

Applications and Future Enhancements

Application

The primary application of this project is in automobiles. The security of the vehicle is enhanced by the numeric pin code feature and the keyless entry feature enables easy access to the car without compromising security.

Future Enhancements

The same RFID card can be used to unlock different system such as the owner's house, his garage, and gate and so on, thereby giving easy access for the user as he doesn't have to carry many keys. Instead he can use one key for all the locks.

The 4 digit pin based password system can also be modified with finger scan for better protection and ease of access.

Chapter 8

Conclusion

The project ADVANCED CAR LOCK SYSTEM was successfully designed, implemented and tested .A model to secure the car from theft was setup. This project is efficient and simple and providing additional security to the user thereby deterring the criminals from hijacking the vehicle.

References

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