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VEHICLE ENGINE BLOCKING AND RECOVERING FROM THEFT CONTROL BY USING GSM TECHNOLOGY

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ABSTRACT

This paper deals with the design & development of an embedded system, which is being used to prevent /control the theftof a vehicle. The developed instrument is an embedded system based on GSM technology. The instrument is installed in the engine of the vehicle. An interfacing GSM modem is also connected to the microcontroller to send the message to the owner's mobile. The main objective of this instrument is to protect the vehicle from any unauthorized access, through entering a protected password and intimate the status of the same vehicle to the authorize person (owner) using Global System for Mobile (GSM) communication technology. This system deals with the concept of network security. The main concept in this design is introducing the mobile communications into the embedded system. The entire designed unit is on a single board.

1. INTRODUCTION

In these days, automobile thefts are increasing at an alarming rate all over the world. So to escape from these thieves most of the vehicle owners have started using the theft control systems. The commercially available anti-theft vehicular systems are very expensive. Here, we make an attempt to develop an instrument based on 8051 microcontroller and operated using GSM technology. The instrument is a simple and low cost vehicle theft control embedded system. The Global System for Mobile communications (GSM) is the most popular and accepted standard for mobile phones in theworld established in 1982 and it operates in 900 MHz frequency. Over billion people use GSM service across the world. The utility of the GSM standard makes international roaming very common between mobile phone operators, enabling subscribers to use their phones in many parts of the world. GSM differs significantly from its predecessors in both signaling and speech clarity, as its channels is digitized. It means that the GSM system is now considered as a third generation (3G) mobile communication system.

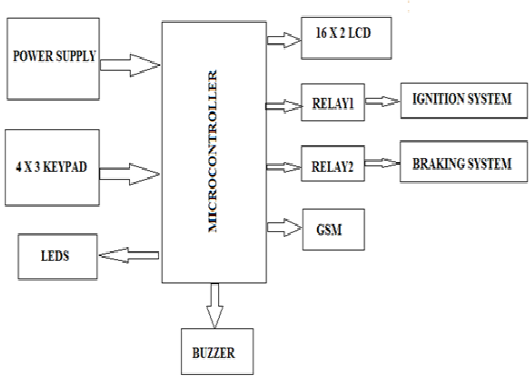
2. COMPONENTS, INTERFACINGS AND PROTOCOLS

1. PIC Microcontroller
2. DC Power supply unit
3.4x3 Matrix keypad
4.16x2 Liquid crystal display (LCD)
5. Relay and relay driver ULN2003
6.GSM Modem

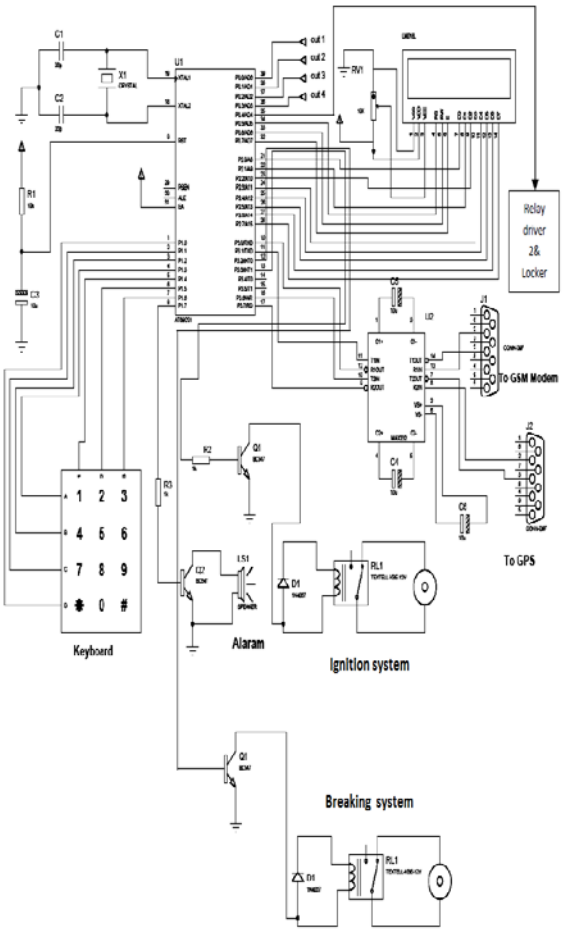
7.GSM Mobile
8.MAX232 line driver

9.24C02 E^2PROM
10. L293D motor driver & DC motor
11.Buzzer
12. DB9 connector

BLOCK DIAGRAM:



CIRCUIT DIAGRAM:



Microcontroller Unit:

PIC MICROCONTROLLER

PIC18F4550 is an 8-bit microcontroller of PIC18 family. PIC18F family is based on 16-bit instruction set architecture. PIC18F4550 consists of 32 KB flash memory, 2 KB SRAM and 256 Bytes EEPROM. This is a 40 pin PIC microcontroller consisting of 5 I/O ports (PORTA, PORTB, PORTC, PORTD and PORTE). PORTB and PORTD have 8 pins to receive/transmit 8-bit I/O data. The remaining ports have different numbers ofpinsforI/O data communications.PIC18F4550 can work on different internal and external clock sources. It can work on a varied range of frequency from 31 KHz to 48 MHz. PIC18F4550 has four in-built timers. There are various inbuilt peripherals like ADC, comparators etc in this controller.PIC18F4550 is an advanced microcontroller which is equipped with enhanced communication protocols like EUSART, SPI, I^2C, USB etc. Process Instrumentation Controller (PIC) is enhanced version of microcontrollers. It is an embedded controller.PIC microcontroller contains several families. They are classified as three categories.

1. Low End Family:

It has 33 instructions. For example, PIC 12XXX

2. Mid-Range Family:

It has 35 instructions. For example, PIC 16XXX

3. High End Family:

It has 77 instructions. For example, PIC 17XXX and PIC 18XXX.

In our project we use PIC16F877A Mid-range family as a microcontroller to control the dc voltage.

ARCHITECTURE

Two types of Architecture are followed.

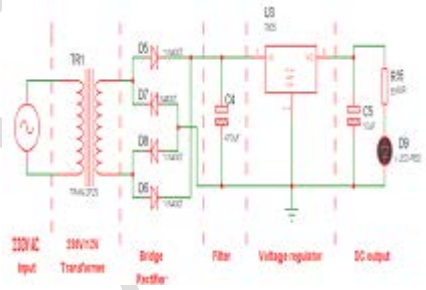
I. Van-Numen Architecture

The width of address and data bus is same.

II. Howard Architecture

The bus width of address and data may not be same. Pipelining is possible.

DC Power Supply Unit:



The DC power supply unit is divided into 4 elements as below.

1.230V /12V step down Transformer.

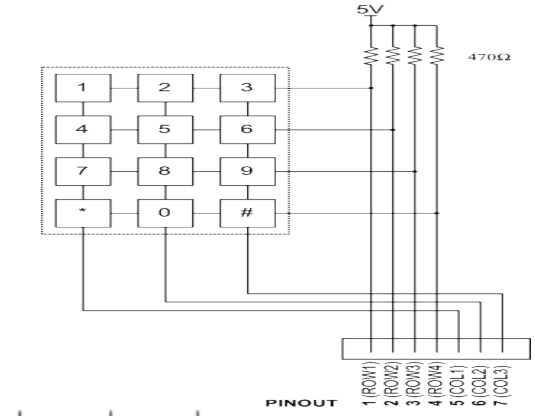
2. Bridge Rectifier with 4 x 1N4007 diodes.

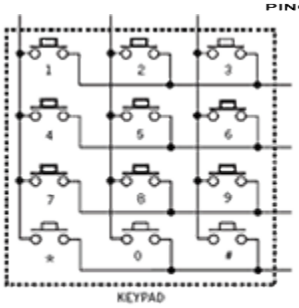
3. 470µF/35V Capacitor as a Filter.

4. 7805 Voltage Regulator IC.

4X3 Matrix Keypad:

Key pads and L CDs are the most widely used input/output devices. In this section, we first discuss keypad fundamentals, along with key press an d key detection mechanisms, and then it is shown how a keypad is interfaced to an 8051 µC. Keypads are organize d in a matrix of rows and columns. The CPU accesses both rows and columns through ports. When a key is pressed, the row and column are connected; otherwise there is no connection between them.





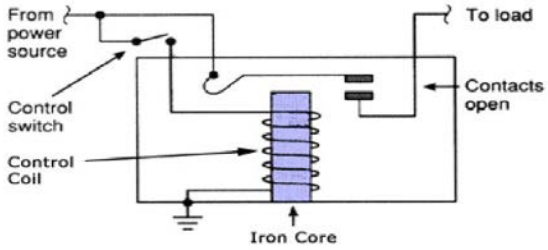
INTERNAL CIRCUIT

Liquid Crystal Display (LCD) unit:

A 16x2 character Line LCD module is a parallel port module. An 8051 program must interact with the outside world using input and output devices that communicate directly with a human being. One of the most common devices attached to an 8 051 µC is an LCD display. LCD requires 3 control lines as well as 8 I/O lines for the data bus. So this LCD will require a total of 11 data lines.

Relay:

The relay is an electromagnetic switch.when relay is activated,then it clodes the loop of ignition,hence start the engine.when relay is deactivated,it opens the loop ignition,hence stop theignition of the automobile.A dc fan is connected with relay replicating the automobile engine to verify the operation of the system.

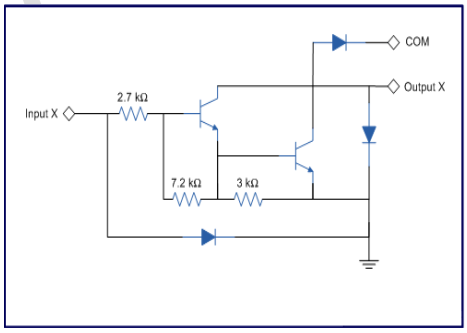


Relay driver ULN2003:

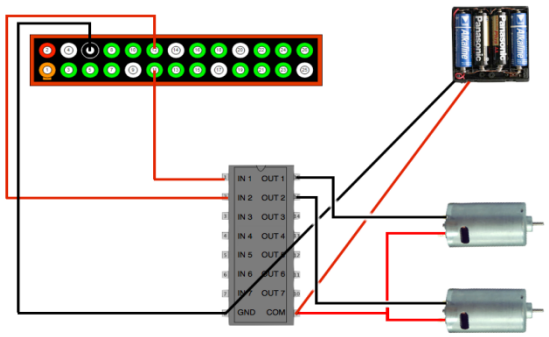
ULN2003 is a high voltage and high current Darlington array IC. It contains seven open collector darlington pairs with common emitters. A darlington pair is an arrangement of two bipolar transistors.

ULN2003 belongs to the family of ULN200X series of ICs. Different versions of this family interface to different logic families. ULN2003 is for 5V TTL, CMOS logic devices. These ICs are used when driving a wide range of loads and are used as relay drivers, display drivers, line drivers etc. ULN2003 is also commonly used while driving Stepper Motors. Refer Stepper Motor interfacing using ULN2003.

Each channel or darlington pair in ULN2003 is rated at 500mA and can withstand peak current of 600mA. The inputs and outputs are provided opposite to each other in the pin layout. Each driver also contains a suppression diode to dissipate voltage spikes while driving inductive loads.



INTERFACING MOTOR WITH ULN2003:



GSM Modem:
SIM900 :
GSM/GPRS Module:

The SIM900 is a complete Quad-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. Featuring an industry-standard interface, the SIM900 delivers GSM/GPRS 850/900/1800/1900MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption. With a tiny configuration of 24mm x 24mm x 3 mm, SIM900 can fit almost all the space requirements in your M2M application, especially for slim and compact demand of design.

- SIM900 is designed with a very powerful single-chip processor integrating AMR926EJ-S core
- Quad - band GSM/GPRS module with a size of 24mmx24mmx3mm
- SMT type suit for customer application
- An embedded Powerful TCP/IP protocol stack
- Based upon mature and field-proven platform, backed up by our support service, from definition to design and production

GSM MOBILE:

In our project we used a GSM mobile to receive the SMS sent by the instrument regarding the engine-on status. The mobile number must be programmed with the source code. So that the control unit can send the SMS and in the same time the authorized person received the same SM S to take care of his vehicle.

MAX232 line driver:

A MAX 232 chip is required to convert RS232 voltage levels to TTL levels, and vice versa. 8051 has one transmitter (TxD) and a receiver (RxD) for transferring and receiving serial data from the port 3 (P3.0 and P3. 1).They require a line driver to make them RS232 compatible. A line driver converts the R232's signals to TT L voltage levels that will be acceptable to 8051's TxDandRxD pins.

AT24C02 E^2PROM:

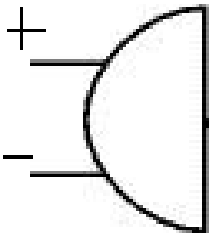
The AT24C02 is a 2 56 byte/ 2K-b it EEPROM, which used to retain the password eve n after power failure. The device is organized as a single block of 256 x 8-bit memory with a two-wired serial interface. The 24C02 supports a bi-directional two -wired bus and data transmission [I^2C] protocol. The bus has to be controlled by a master de vice (µC) which generates the serial clock(SCL),controls the bus access,and generates the START and STOP conditions,while the 24C02SC works as slave.

L293D MOTOR DRIVER IC & DC MOTOR:

The purpose of using 4 no. of 12V DC motors is to drive the hardware kit just like an auto mobile. Since, MCU can interpret the logic 1as 5v & 0 as 0v, so L293D motor driver IC is used to convert 5v logic to 12v logic to drive the motor efficiently with full RPM. Here used one IC to drive 2 motors. Accordingly there are used two ICs for our prototype model.

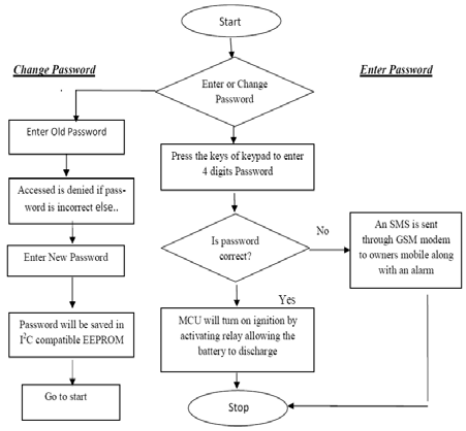
BUZZER:

A buzzer is an audio signaling device, which may be mechanical ,electro-mechanical or electronic. Typical use of buzzers / beepers includes alarmsandtimersetc.



3. WORKING OF THE MODULE

The embedded system installed in the engine of the vehicle along with the GSM modem. By entering a correct password(like: *abcd) the instrument allows to activate the 12V relay and then ignition of the engine will start. Hence start the vehicle.If anyone tries to enter the password randomly, then after three trials, the MCU will block the entry of further password. The n, the buzzer will turned o n to create a noise to pan ictheculprit, followed by sending a message **"Alert: Car IsUnder Threat"** through GSM modem to the owner'smobile for further action for prevention of his vehicle. According to the prototype model after entering correct password the Fan will move and at the same time, according to the instruction it will run forward for 10 sec and backward for10 sec like an automobile. Password can be changed by the following proper procedure. First enter #, then enter the old password, then new password. Now test, whether the new password is working or not. As per algorithm given below the new password will retain even after power failure. So it will work as usual.



4. CONCLUSION

This is a unique method of designing and assembling a low-cost, compact theft control system for an automobile. This instrument is an ultimate threat to vehicle thieves. By installing this instrument in the automobile engine it is very difficult to access by an unknown person, since it is based on GSM Technology. In future, there is no doubt, that all of the vehicles will be embedded with this unique kit. In addition to the above features we can also add extra features like thumb/face recognition to ascertain more security of the vehicle.

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