

Design and Implementation of Car Anti-Theft system using Microcontroller

A maximum security ensured design for car security

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Abstract— Security problem has been a matter of concern over the years not only in Bangladesh but also throughout the world. Car security is one of the most important issues of them. The main object of this project paper is to ensure the highest security for car or any kind of automobiles. With the invention of new and sophisticated way of stealing every now and then car security has been threatened immensely. This Anti-Theft system is designed with a target is to design a security system with which the owner do not have to bother about the new ways of stealing. The best solution is to control the start of the engine. And designing it with wireless system will increase the flexibility and enable a distant control.

Index Terms—Door Sensing, Transmitter, Receiver etc

1 INTRODUCTION

This research study is the result of the reflection of a universal problem. This study ensures higher rate of accuracy in the sector of securing the car with maximum security. There will be an automatic control over the starting of engine, door and horn but with a different level of manual instruction. So using this security arrangement the owner do not have to worry about the security of the car, just to see if any signal is coming in the circuit carried by him which is an indication that someone is trying to open the door. Dhaka Metropolitan Police (DMP) sources said over 1,000 motor vehicles were stolen in the last one year, means an average of approximately 3 vehicles per day. This is a dismaying condition. The increasing rate of car-theft has just caught the developers mind that how this situation can be handled. Firstly the developer thought about the available security systems in the country, but it is found that there are some problems with those. Moreover they are bit costly. So things are more problematic for the car owners. These were the incentives that motivated us to do something with car security system. There are many car security systems available in the market many projects also been done on this topic. Those systems have some alarming system after someone touches the car. There is a new GSM based security system introduced in Bangladesh very recently which sends a message in the cell phone of the owner of the car when the car is being handled by unauthorized person. But the security system has some significant features which differentiates the system with other typical systems. Firstly the other systems can't keep the engine off even if tried with the key where the system is capable of doing so. Secondly sending a back signal through GSM system is costly but it is not the case in the project.

2 OBJECTIVE

The main objective of the project is to ensure the car security at a very high level but with a low cost. To differentiate this work with other's work the manual instruction has been specified. Considering the different environment different modes will be arranged so that user does not have to bother. There will an important feature in this project that is when a thief is trying to open the door, there will a buzzer which will start making sound and a signal will also be sent in the circuit holding by the user.

3 CIRCUIT OPERATION

To ensure car high car security system there are four circuits developed. Transmitter and door sensing receiver circuit belongs to owner side. Receiver and door sensing transmitter circuit belongs to car side.

3.1 TRANSMITTER CIRCUIT

This circuit Belongs to owner side and it sends instructions. The components that are used in the transmitter circuit are:

- Resistance (10k)
- On-Off switch
- Contact switch(2 pin(5))
- LCD Display(16*2)[2]
- Capacitor
- Voltage regulator
- Rail
- Transmitter
- LCD display holder(16 pin)
- Male Female Connector(6 pin)

OPERATION

Remote/Transmitter circuit transmits the data by RF module Transmitter with the instruction of a microcontroller. An LCD display is used which will show the command or switch pressed. In this project microcontroller is programmed in such a way that when transmitter circuit is ON it will show "Provide Input" without any switch is pressed. With the pressing of switch 1 it will show "Auto" in the LCD display and transmitter will send the data to receiver circuit. When switch 2 is pressed transmitter circuit sends the data to receiver circuit to shut down the engine while in LCD display it shows "Engine off". When switch 3 is pressed, data is sent via transmitter to receiver and LCD display shows "Door&Engine". If switch 4 is pressed, LCD display shows "Identification". Switch 5 is kept for any additional feature to be added in future. It works with the same principle of the other 4 operation.[1]

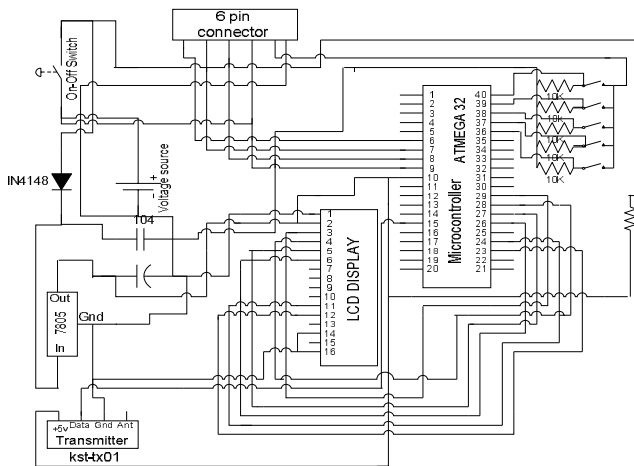


Figure: Transmitter Circuit

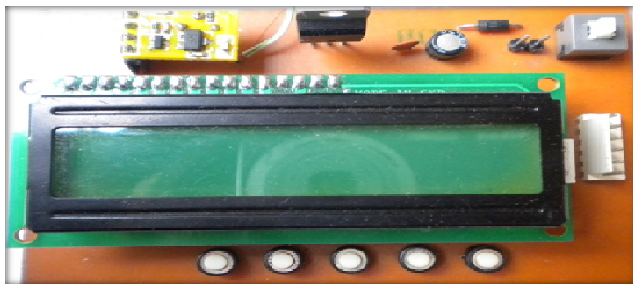


Figure: Transmitter Circuit(Display)

3.2 DOOR SENSING TRANSMITTER CIRCUIT

This circuit belongs to the car side and it transmits data to the owner side.

- Relay 12V(3)
- Crustal Diode(IN4148)(3)
- Resistance(470Ω(3) ,1k(3),10k(4))
- BJT(Bipolar Junction Transistor)(C1815)(3)
- Microcontroller (ATMEGA 8L)[3]

- LED(red)(3)
- Transmitter
- Voltage regulator(L7805CV)
- On-Off Switch(2)
- Rail((14*2))

OPERATION

Door sensing transmitter circuit is dependent on the receiver circuit. To make this circuit **ON** or **OFF** it is necessary to control the receiver circuit. This circuit is programmed in such a way that when door sensing option is **ON**, right then if the door is opened there is a current flow through this circuit and all three BJTs are **switched** at the same time. In the meantime, when door sensing transmitter circuit senses any current it will transmit the data to the door sensing receiver circuit. Due to the switching of the BJTs, relays will trip. Relays outputs are connected to the Engine and headlights, so when door sensing transmitter circuit sense that the door is opened it immediately trips and shuts down the engine and turn **ON** the headlights.[1]

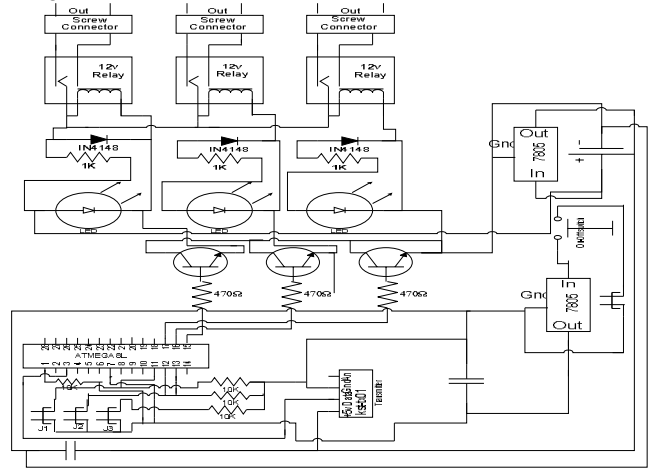


Figure: Door Sensing Transmitter

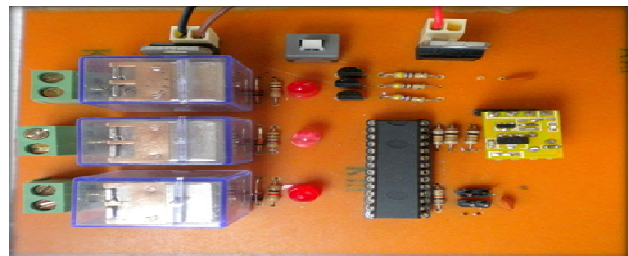


Figure: Door Sensing Transmitter

3.3 RECEIVER CIRCUIT

This circuit receives instructions which are sent from owner side and it belongs to car side.

- Relay 12V(5)

- Crustal Diode(IN4148)(5)
- Resistance(470Ω(5) ,1k(5),10k(1))
- BJT(Bipolar Junction Transistor)(C1815)
- Microcontroller (ATMEGA 32)
- LED(red)(5)
- Receiver
- Voltage regulator(L7805CV)
- On-Off Switch
- Rail(40 pin(20*2))

OPERATION

The main operation of this circuit is to receive the data from the remote circuit through RF (Radio frequency) based receiver module and then control the car security system with the help of a microcontroller by relay tripping mechanism. Receiver is always ready to receive the data when the circuit is on. After receiving, receiver passes the data to microcontroller. In receiver circuit, Microcontroller is programmed in such a way that when the data sent from microcontroller through transmitter is same. If the data is matched with the data which is sent from transmitter circuit then receiver microcontroller will accept the data and work as it was programmed. After receiving the data Microcontroller gives the voltage to the base of the BJTs. When the BJT gets a voltage which is higher than the 0.7V, it connects Emitter and collector. Collector is connected to the ground so there is a path for the current to flow which causes the BJT to switch and the relay to trip. In the car security system the developer programmed the microcontroller in such way that when **switch 1** is pressed in transmitter circuit, the receiver circuit receives data and microcontroller pass the data in three BJTs (For switch 1). The BJTs collector is connected to ground (-ve). Microcontroller gives the voltage to the base of those BJTs and due to switching of BJTs, 12V will pass through the corresponding relays to ground (-ve) and corresponding relays will trip. The outputs of those three relays are connected to the car's engine, door sensing circuit and head light . The connection is given in such a way that if **switch 1** is pressed, car's engine and head light will be disconnected from the car's control unit but door sensing circuit will be **ON**. Then if the door is opened anyhow, the circuit will sense and do its corresponding work. When **switch 2** is pressed in remote circuit, receiver circuit will receive the data and microcontroller sends pulse to the corresponding BJT which will cause the relay to trip. The output of the relay is connected to the engine so that it can be disconnected for preventing car stealing. If **switch 3** is pressed in remote circuit, the receiver circuit will receive and microcontroller will send pulse, as described before, to its corresponding relay. Here, two relays are controlled by **switch 3** and the outputs of the relays are connected to the door sensing circuit and the engine. **Swich4** is for identifying the car. When **switch 4 is** pressed, corresponding relay is tripped

as the same theory stated before. For identification an Alarm and light is used.[1]

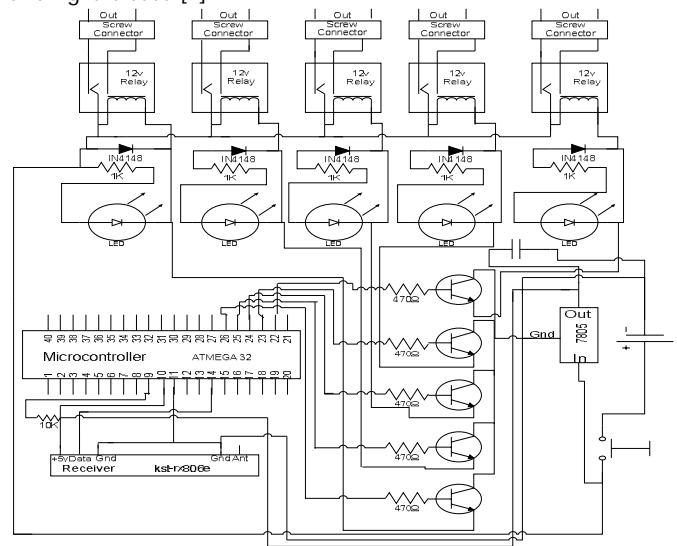


Figure 4.5: Diagram of Receiver circuit

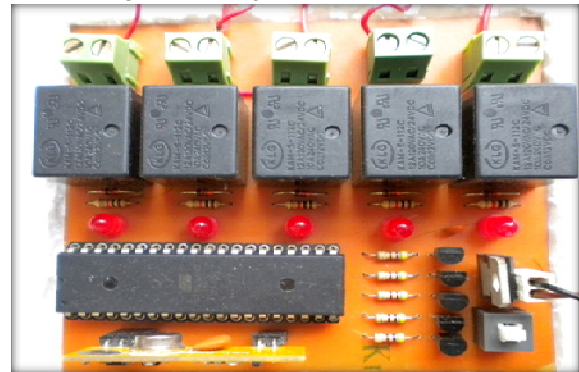


Figure 4.6: Picture of Receiver circuit

3.4 DOOR SENSING RECEIVER CIRCUIT

This circuit belongs to owner side and receives data when door is opened by unauthorized person.

- Relay 12V(2)
- Crustal Diode(IN4148)(2)
- Resistance(470Ω(2) ,1k(2),10k(1))
- BJT(Bipolar Junction Transistor)(C1815)(2)
- Microcontroller (ATMEGA 8L)
- LED(red)(2)
- Receiver
- Voltage regulator(L7805CV)
- On-Off Switch
- Rail(28 pin(14*2))
- Buzzer

OPERATION

Door sensing receiver circuit only works when any data is received from the door sensing transmitter circuit.

Microcontroller is programmed in such a way that, when door sensing transmitter circuit sensed that door is opened, door sensing receiver circuit will receive the data which is sent from the door sensing transmitter circuit and trip the relay by flowing current to BJTs as well as activating the buzzer.[1]

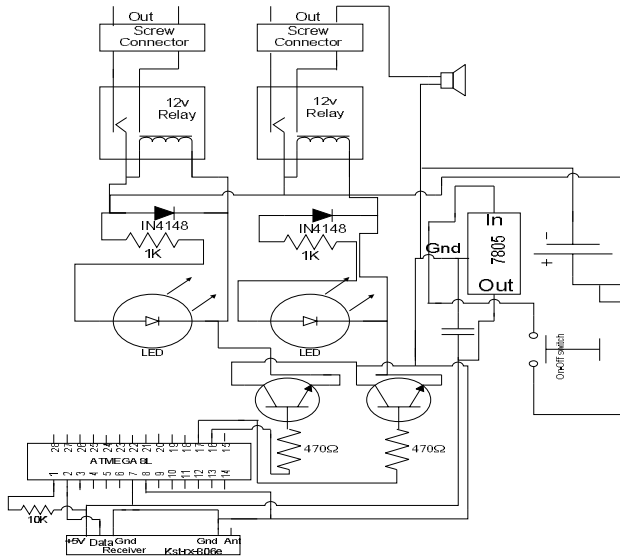


Figure 4.7: Diagram of Door Sensing Receiver circuit

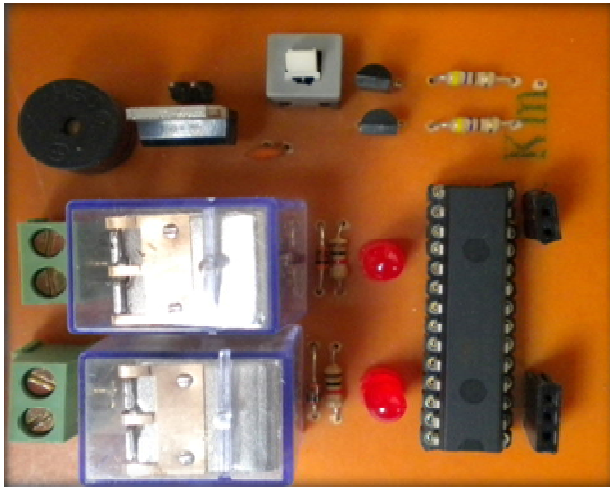


Figure 4.8: Picture of Door sensing Receiver Circuit

3.5 OVERALL CIRCUIT

Now let us summarize the whole circuit operation very shortly. The receiver circuit and the door sensing transmitter circuit will be connected in the car. And transmitter circuit and door sensing receiver circuit will be in the owner's hand. When the owner goes away for the car he/she will turn on the circuit so that the engine, door and light connection is off. If a thief tries to open the door, the door sensing transmitter circuit will be ON and send a signal in the door sensing receiver circuit

also start making sound with the buzzer. This will let the owner know that someone has opened the door and also the people who are around the car.

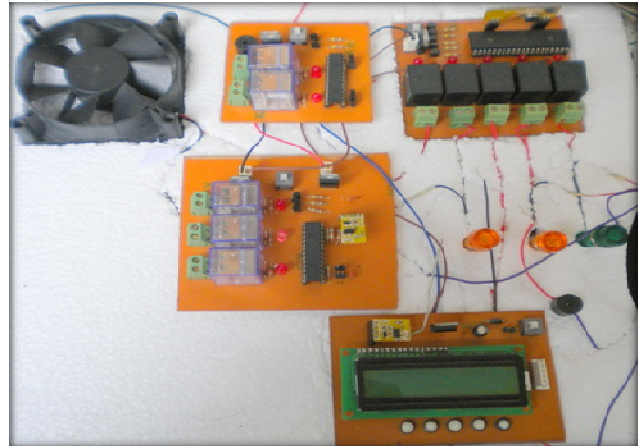


Figure 4.9: All the circuits

MODES OF OPERATION

There are four modes of operation in the project. These modes are specified for the different environment and different level of security

Auto Mode:

This mode is especially used for car highest security. In this mode emphasis given on the controlling of Engine, Head light & Door sensing part. When Auto mode is pressed in the transmitter side, received circuit will turn ON the engine, headlight and door sensing relays. Turning ON the engine relay will cut the engine connection as a result engine will turn off. Turning on the headlight relay will interrupt the headlight operation as a result headlight will turn off. When door sensing relay is turned ON it will turn on the door sensing receiver part and it will not work until anyone opens the door. When someone opens the door it means security is broken at that moment, door sensing part will be activated and it will turn on the alarm & light in the car and also send a signal to the owner holding the transmitter, door sensing part which turned ON the buzzer, on the transmitter door sensing part so that owner can identify someone is trying to steal his/her car.

Engine Mode:

In this mode, emphasis has been given on how to control the Engine. When Engine mode is pressed in the transmitter side, received circuit will turn ON the engine controlling relay. Turning ON the engine relay will cut the engine connection as a result without turning OFF the engine mode, no one can operate the engine.

Door & Engine:

In this mode both door sensing part and Engine part can be controlled by the owner. When Door & Engine mode is pressed in the transmitter side, receiver circuit turn ON the engine & door sensing controlling relays. Turning ON the engine, relay will cut the engine connection as a result no one can operate engine at this condition. Door sensing relay is turned ON means it will turn on the door sensing receiver part and it will not work until anyone open the door. When someone open the door it means security is broken and at that moment, door sensing part will be activated and an alarm & light in the car will be turned ON and also it will also send a signal to the owner holding transmitter door sensing part which will turned ON the buzzer on the transmitter door sensing part so that owner can identify someone is trying to stole his/her car.

Identification:

This option is to help the owner to find out his/her car in crowded place. When Identification mode is pressed in the transmitter side, receiver circuit will turn ON the "Identifying relay". The "Identifying relay" is connected with a buzzer & light .when this mode is active the relay will turn ON the buzzer and light as a result, owner can easily identify his /her car.

Extra mode: This mode can be used to add additional feature on the controlling system in the near future.

LIMITATIONS

Almost Every project comes out with some limitation or disadvantages. The project is not an exception of that. The circuit in the project has some constrains. Prefect execution of a wireless system depends on both the transmitter and the receiver. In the project the developer used the available transceiver set of frequency 434 MHz which can cover as long as 400 foot in free space but it is less in the case of obstacle in the way. So it cannot cover a long distance. Even if the developer try to increase length coverage with a higher frequency then there is a possibility of interfacing with the other wireless system's frequency. Besides, permission has to be taken from the legal authority for using higher frequency. The connection between the transceiver's antenna and microcontroller is given with a wire which has no insulator. This may result interference.

FUTURE PLAN

Transmitting and receiving are very sensitive so this has to be developed. As stated earlier it is a bit problematic to use higher frequency so the developer have to think other way round. The developer may try to use GPS technology. GPS is abbreviation of Global Positioning System. With this technology a driver can know his position in a city or country. This works with the help of satellite. If the developer can utilize GPS technology

then length coverage problem will be removed. The system has got 4 circuits in the entire design. Of them two are carried by the owner of the car and two are equipped with the car. It is not very suitable to carry two circuits. So the developer will try to merge the circuits. Modern technology is making everything very small. With the use of micro components shape and size of the circuits have vastly been reduced. The developer may try to foreshorten circuits by using micro components.

CONCLUSION

The technologies are upgrading day by day and all these are intended to make sure one thing that is making things easy and comfortable for human being. With the module the developer tried to ensure car security which is matter of big concern for every car owner.

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