CHAPTER THREE
ANTI-THEFT SYSTEM DESIGN

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3.1 Block diagram:

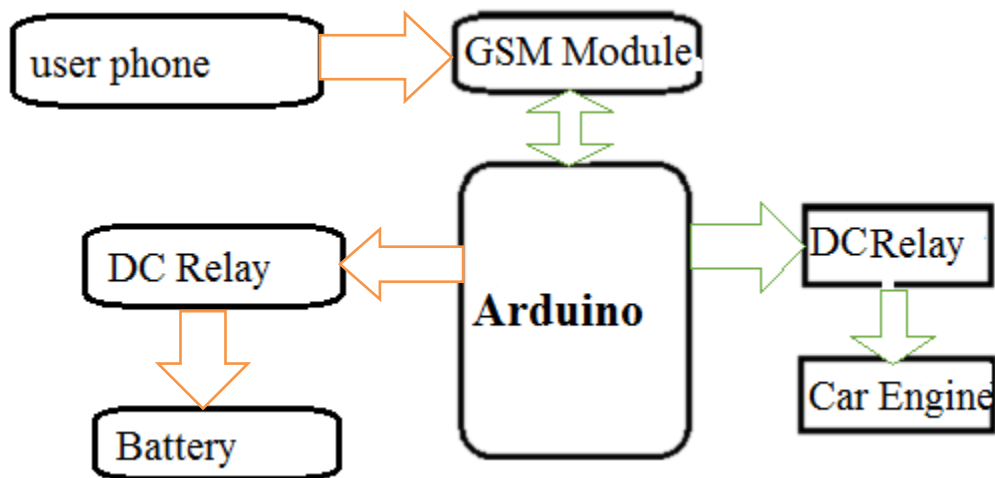The following figure shows the block diagram of Engine Lock and Control System:

Figure 3.1: Block diagram.

3.1.1 DC Relay:

Electromagnetic switch is used to control circuits and isolate the high voltage circuit from the low voltage circuit.

3.1.2 GSM module:

Module is used to establish communication between microcontrollers and GSM-GPRS systems. It receive SMS message from the user, and forward it to microcontroller and vice versa.

3.1.3 Car engine:

A machine designed to convert one form of energy into mechanical energy.

3.1.4 Microcontroller:

Is a small computer on a single integrated circuit contains processor core, memories and programmable input/output peripherals and designed for embedded application. The main controller to receive and transmit SMS from the GSM, and control in relays.

3.1.5 Battery:

Stores electrical energy and help the starting for the ignition process.

3.2 Basic system operation:

This system can do the following:

1. Enable the ignition system.
2. Disable the ignition system.
3. Starting the ignition system.

The following figure illustrate the positons of both relay1 and relay2 in the car ignition system:
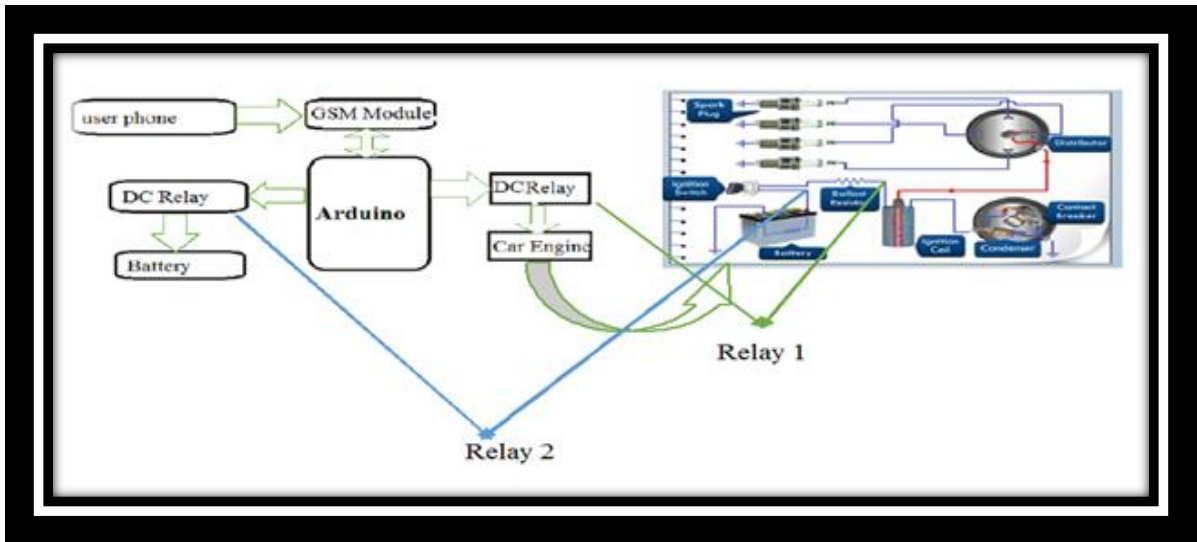
Figure 3.2: The position of the control system at car ignition system.

The first relay (Relay1) is located before the starter as shows in figure below, to control the circuit (enable, disable).
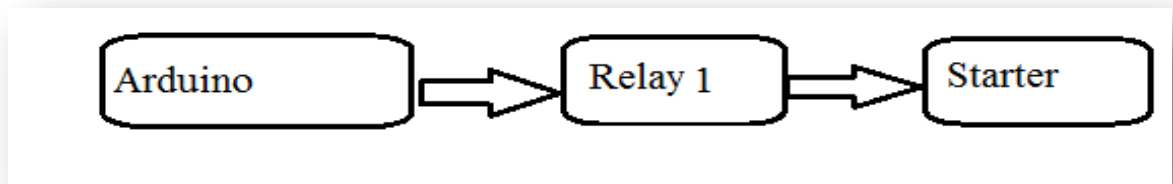

Figure 3.3:Relay1 position.

The second relay (Relay2) is connected in parallel with the car switch located between the ignition switch and the car battery to start the ignition process automatically.
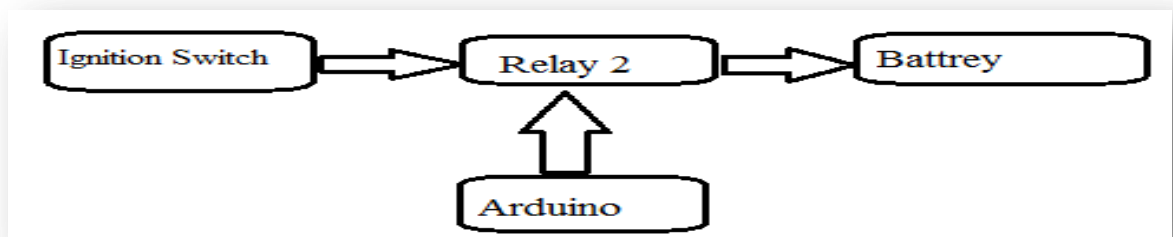

Figure 3.4:Relay2 position.

The user uses a cell phone to send SMS which contain password and instruction (enable, disable and starting), The GSM receives the massage and forward it to the microcontroller to verify the password and according to the instruction the relay 1 switch is either closed (enable) or opened (disable). If the instruction was to start the car, both relays will be closed.

If relay 1 switch was closed the ignition process could be started normally.

If the relay 1 switch was open the ignition will not start even If any user had the car key and this is the desired purpose of the project.

If the ignition process attempt successfully a feedback is send to the user inform of SMS via the rotation sensor connect to the car fan.

The table below shows all the status of relay1 (R1) and relay2 (R2) and the corresponding response of ignition system:

Table 3.1: relay1 and relay2 status.

System response	*R2*	*R1*
Disabling the ignition system.	OFF	OFF
Enabling the ignition system.	OFF	ON
Disabling the ignition system.	ON	OFF
Starting the ignition system.	ON	ON

Control word is send via SMS, this control word is consists of two parts in addition to two special characters the first one separate between password and instruction the second one in the end of SMS:

Password (4spaces)	*	Instruction (1space)	#

Figure 3.5: The control message.

- The Password field consists of four spaces, two characters followed by two numbers (qw12).

- The instruction field consist of one character as follows:

  ❖ e: enable the system.

  ❖ d: disable the system.

  ❖ s: start the system.

The full message could be: **qw12*d#**

The following table shows a various control messages and the equivalent response for each message:

Table 3.1: Control Messages and System Response.

Control Message	*The action*
qw12*e#	**Enable The Ignition System.**
qw12*d#	**Disable The Ignition System.**
qw12*s#	**Start The Ignition System.**
un12*e#	**Sends "wrong password".**
qw12*h#	**Sends "Error in the instruction".**
Ay32*p#	**Sends "wrong control word".**
Change qw12 df56	**Change password.**
" "	**No response.**

3.3 Scenarios:

The developed system will run through a variety scenarios, some of them are explained as following:

3.3.1 Scenario-1 (main scenario):

In case the user sends a correct password and correct instruction, three sub-scenarios could be happened:

If the user sends SMS with the following control word **qw12*e#**, this control word will enable the system which means the car will be ready for the ignition process by the using the car key.

If the user sends SMS with the following control word **qw12*d#**, this control word will disable the system which means the ignition process for the car won't happen even if any user had the car key.

If the user send SMS with the following control word **qw12*s#**, this control word will start the system which means the ignition process will happen remotely.

3.3.2 Scenario-2 (network failure):

In case the failure of the GSM network or the microcontroller, the system can go back to manual using.

3.3.3 Scenario-3 (wrong password):

In case the user sends wrong password .the microcontroller sends back message informing the user that he send invalid information. For example "ERORR".

3.3.4 Scenario-4 (password change):

If the user wants to change the old password, this can be done by entering a reserved word or special character and then the old password followed by the new password. For example "change qw12 cd34".