



# GSM Based Home Security System Using PLC

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**ABSTRACT:** In modern days security plays an important role in every aspect. Home security system has been a major issue where crime is increasing and everybody wants to take proper measure to prevent intrusion. In addition there is need to automate home so that user can take advantage of the technology advancement. The system can be set up and activated by mobile phone through text. The aim of this paper is to develop a wireless security system in the absence of home owner. In this paper we designed and implement the PLC based home security system based on GSM module. The automatic controlling process is done by PLC instead of embedded controller.

**KEYWORDS:** GSM, Home Security, Mobile Phone, Short Messaging Service (SMS), System Security.

## I. INTRODUCTION

Security is the degree of protection against damages, danger, loss and crime. Security is a form of protection structures and processes that provide or improve security as a condition. A security system provides a form of protection that ensures the safety and security of the assets and the threat but is not limited to the elimination of either the asset or the threat.

Anti-theft security system utilizes an embedded system design with Dual Tone Multi Frequency (DTMF) and a GSM to monitor and safeguard a car. It secures the car against theft. Upon activation, it automatically demobilizes the car by disconnecting the ignition key supply from the car battery. This now makes it impossible for anybody so starts the car, let alone moving with it. In an attempt of theft through the car doors or boot, the system sends text message to the car owner and at the same time starts up an alarm [1].

Home security has been a major issue where crime is increasing and everybody wants to take proper measures to prevent intrusion. In addition, there is need to automate home so that the user can take the advantage of technological advancement.

A PLC is an example of a hard real time system since output results must be produced in response to input conditions within a limited time, otherwise unintended operation will result. PLC reads the status of the external input devices, e.g. keypad, sensor, switch and pulses, and execute by the microprocessor logic, sequential, timing, counting and arithmetic operations according to the status of the input signals as well as the pre-written program stored in the PLC. The generated output signals are sent to output devices as the switch of a relay, electromagnetic valve, motor drive, control of a machine or operation of a procedure for the purpose of machine automation or processing procedure.

The peripheral devices (e.g. personal computer/handheld programming panel) can easily edit or modify the program and monitor the device and conduct on-site program maintenance and adjustment. The widely used language in designing a PLC program is the ladder diagram. With the development of the electronic technology and wider applications of PLC in the industry, for example in position control and the network function of PLC, the input/output signals of PLC include DI (digital input), AI (analog input), PI (pulse input), NI (numeric input), DO (digital output), AO (analog output), and PO (pulse output). Therefore, PLC will still stand important in the industrial automation field in the future. This project paper presents a model by using PLC that will provide security to their home, office or cabin etc via SMS using GSM technology.

## II. SYSTEM MODEL AND ASSUMPTIONS

The idea behind this project paper is to meet the upcoming challenges of the modern practical applications of wireless communication and to facilitate our successors with such splendid ideas. By this technique the disadvantage of using microcontroller is overcome by using PLC.

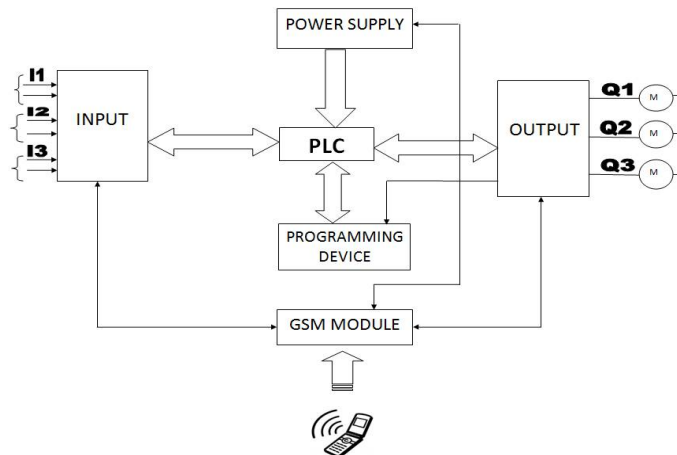


Figure 1. Block diagram of System Model

Here two types of locks are used which is primary and secondary lock for security purpose. The first sensor is placed before the entry of the main door. The second sensor I2 is placed away from the main door. The third sensor I3 is placed in front of the room where the personal locker is present. In case of breakage an information will be sent to the owner and the required process can be done by selecting the appropriate option which is displayed in the mobile phone. This is generally initiated by the inception of an idea or a concept, which not only aims at developing a product (Hardware or Software), but also the in-depth study of the earlier existing products in the same category and their deficiencies.

The system model as shown in Figure 1 requires the *WPLSOFT PLC* software and hardware main components such as:

- i. Programmable Logic Controller (PLC)
- ii. Switched Mode Power Supply (SMPS) 0-25VDC
- iii. Relay
- iv. IR Sensor -3
- v. Motor
- vi. GSM module
- vii. RS 232
- viii. SIM ( Short Messaging Service )
- ix. Mobile Phone

#### **Programmable Logic Controller (DELTA PLC):**

In this paper, we have used a Delta DVP 14SS2 PLC which is one of the several models available from the plethora of PLCs offered by DELTA. Delta DVP-SS2 series PLCs. DVP-SS2 series PLCs include one 12-point PLC, and two 14-point PLCs. A DVP-SS2 series PLC provides various instructions and the size of the program memory in it is 8k steps. It is able to connect to all DVP-S series extension modules, including digital I/O (max. 480 I/O points) and analog modules (for A/D, D/A conversion and temperature measurement). 4 groups of high-speed (10 kHz) pulse output satisfy all kinds of applications. DVP-SS2 is small in size, and can be installed easily. Users do not have to install any batteries in DVP-SS2 series PLCs. The PLC programs and the latched data are stored in the flash memories. This instruction sheet only provides introductory information on electrical specifications, general specifications, installation and wiring. For detailed information on programming and instructions, please refer to “DVP-SS2 Operation Manual: Programming”. For information about optional peripherals, please see individual product instruction sheet enclosed with DVP-SS2.

#### **PLC SPECIFICATIONS:**

MPU points: 14(8DI+6DO) ; Max I/O points: 494(14+480) ; Program capacity: 8k steps ; COM port: Built-in RS-232 & RS-485 ports, compatible with Modbus ASCII/RTU protocol. It can be master or slave. High Speed Pulse Output



Supports 4 points (Y0 ~ Y3) of independent high-speed (max. 10kHz) pulse output Supports PID Auto-tuning: DVP-SS2 saves parameters automatically after the PID auto temperature tuning is completed.

#### **GSM MODEM:**

GSM (Global system for mobile communication) is a cellular network. GSM network operate in four different frequency ranges. Most GSM network operates in 900 MHz or 1800 MHz bands. The transmission power in the handset is limited to a maximum of 2 watts GSM 850/900/300 and 1 watt in 1800/1900. The longest distance the GSM specification supports in practical use is 35Km (22 mi). In this paper we use SIM300 based GSM modem to receive and send short message to user and system

#### **IR SENSOR:**

An infrared sensor is an electronic instrument which is used to sense certain characteristics of its surroundings by either emitting or detecting infrared radiation. Infrared sensors are also capable of measuring the heat being emitted by an object and detecting motion.

### **III. PROGRAMMING THROUGH LADDER DIAGRAM**

The most common method used for programming PLCs is based on the ladder diagrams. Writing a program is then equivalent or resembles to drawing a switching circuit. The ladder diagram consists of two vertical lines on either side representing the power rails which are positive and neutral. Circuits are connected in the rungs of the ladder which are horizontal, between these two rails. Ladder logic was originally a written method to document the design and construction of relay racks as used in manufacturing and process control. Each device in the relay rack would be represented by a symbol on the ladder diagram with connections between those devices shown. In addition, other items external to the relay rack such as pumps, heaters, and so forth would also be shown on the ladder diagram.

Although the diagrams themselves have been used since the days when logic could only be implemented using switches and electromechanical relays, the term 'ladder logic' was only latterly adopted with the advent of solid state programmable logic. Ladder logic acts as a programming language that represents a program in the form of graphical diagram based on the circuit diagrams of relay logic hardware and used in industrial control applications. The name Ladder Logic is appropriate as it resembles a ladder with two vertical rails on either side with a series of horizontally connected rungs between them. The system in the ladder diagram form will be programmed into the PLC. Once the programs have been downloaded into PLC, it can be monitored in the Diagram Workspace during execution. The WPLSoft provide the easy user interface to download the program, to upload the program, and to go back at online mode to see program desirable state.

Logic sequence of the program is scheduled as:

- i. When the main door of a home is closed the security system will get activated.
- ii. When the interrupt is made in the first sensor(I1 input), immediately the IR sensor send the signal to the GSM.
- iii. The GSM module will send the text to the owner.
- iv. When the interruption is made in the second sensor(I2 input) the secondary door will get closed automatically.
- v. The closing of the door is done by driving the motor which is connected to the PLC.
- vi. The opening of the secondary door will be done only if the text message is received to the PLC by the owner.

Program flow is shown in Figure.2 as flow chart.

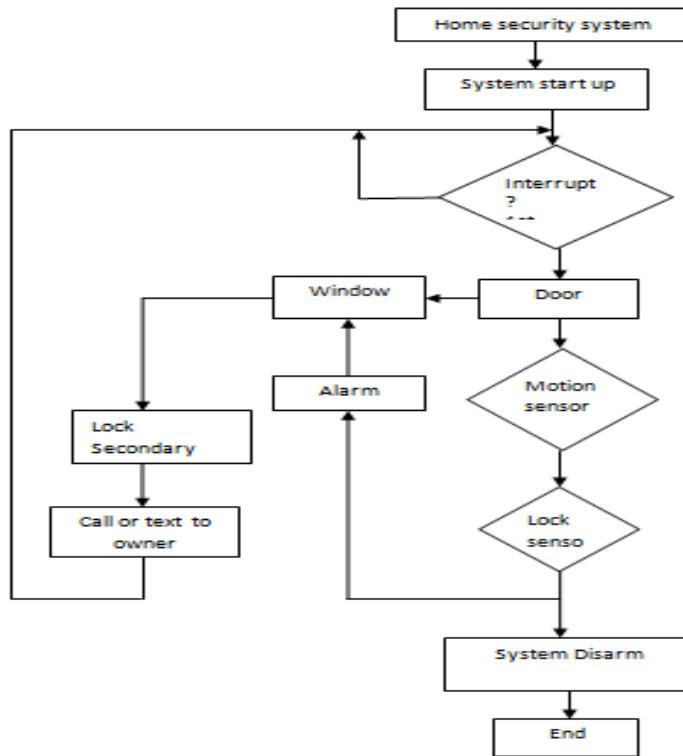
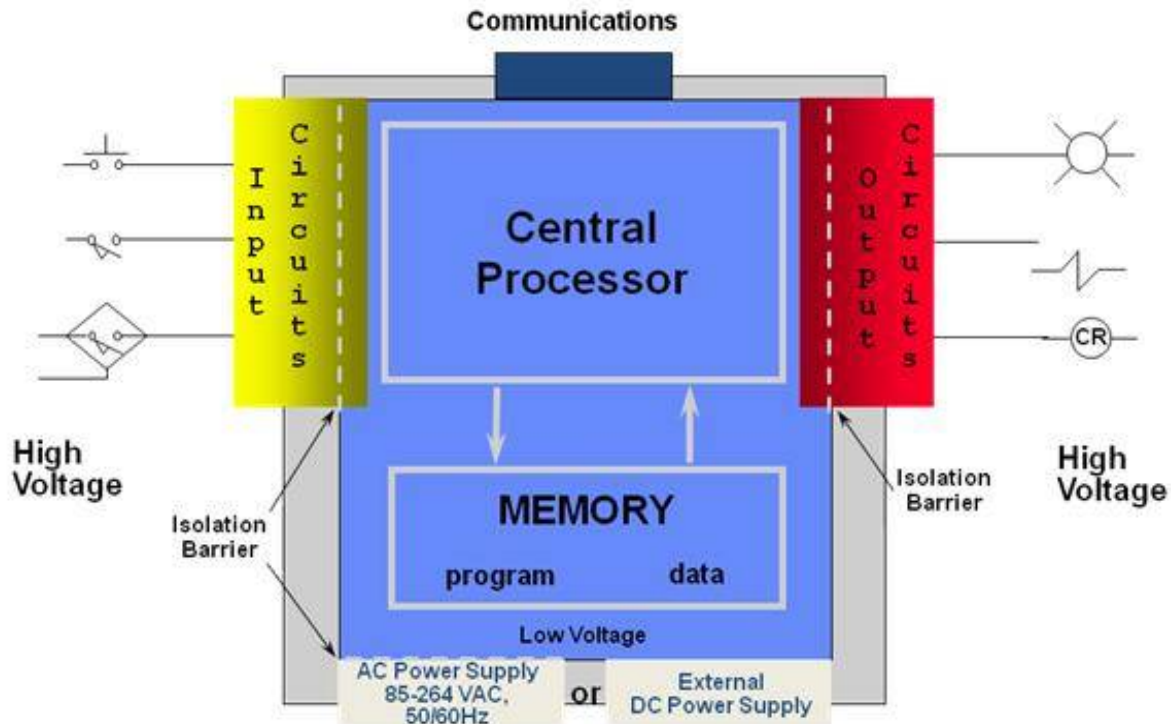


Figure.2 Logic Sequence

#### IV. RESULT AND DISCUSSION

The GSM based home security system has been designed for the users that they can get alerts anywhere through the GSM technology thus making the system location independent. A flexible way to control and explore the services of the mobile which keeps the house, fully secured. The communication of home is only through the SMS which has been tested with the mobile networks and is working on any mobilenetwork. A simple application of the above described system is a home security system. This system enables the far end user through SMS facility to monitor the state of home door and detect any illegal intrusion. A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. The applications of SMS/GSM Based security system are quite diverse. There are many real life situations that require control of different devices remotely and to provide security. There will be instances where a wired connection between a remote appliance/device and the control unit might not be feasible due to structural problems. In such cases a wireless connection is a better option. Basic idea of our paper is to provide GSM Based security even if the owner is away from the restricted areas. For this wireless mode of transmission using GSM is adopted.

The input/output (I/O) system is physically connected to the field devices that are encountered in the machine or that are used in the control of a process. These field devices may be discrete or analog input/output devices, such as limit switches, pressure transducers, push buttons, motor starters, solenoids, etc. The I/O interfaces provide the connection between the CPU and the information providers (inputs) and controllable devices (outputs). During its operation, the CPU completes three processes:



1. It reads, or accepts, the input data from the field devices via the input interfaces,
2. It executes, or performs, the control program stored in the memory system, and
3. It writes, or updates, the output devices via the output interfaces.

In this project paper, the sensors which are placed can be categorized as normal Level for the 1st sensor, medium Level for the second sensor and critical level for the third sensor. When the 1st sensor is activated the second sensor and third sensor will also get activated. If there is any disturbance across these three sensors a text will be sent to the owner through the GSM module. A reply text can be sent to lock the secondary Door which is placed in horizontal or vertical position. The Secondary Lock is attached to the main door and to the windows present in the home after a text is sent by the user the lock gets activated where the thief can be locked inside the home. The Program is done by the ladder logic sequence.

## V. CONCLUSION

The extensive capabilities of this security system are what make it so interesting. From the convenience of a simple cell phone, a user is able to control and monitor. This makes it possible for users to rest assured that their belongings are secure and electrical appliances were not left running when they left the house to just list a few of the many uses of this system. The end product will have a simplistic design making it easy for users to interact with. This will be essential because of the wide range of technical knowledge that homeowners have. As a result of this paper, the controlling of the system can be done by sending text to the GSM irrelevant of their presence near or far.

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