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ELECTRONICS COMMUNICATION STREAM

PROJECT REPORT

ON

LOCKER SECURITY SYSTEM USING RFID AND GSM TECHNOLOGY

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Abbreviations

- RFID — Radio frequency identification
- GSM — Global system for mobile communication
- LCD — Liquid crystal display
- SMS — Short message service
- SIM — subscriber identity module
- KHZ — Kilo hertz
- MHZ — Mega hertz
- GHZ — Giga hertz
- GPRS — general packet radio service
- RF — Radio frequency
- CEPT — European conference of posts & telecommunication
- ETSI — European telecommunication standards institute
- DCS — Digital cellular system
- ME — Mobile equipment
- MS — Mobile station
- VLR — Visitor location register
- MSC — Mobile switching center
- HLR — Home location register
- BTS — Base transceiver station
- BSC — Base station controller
- EIR — Equipment identity register
- AUC — Authentication center
- PSTN — Public switch telephone network
- ISDN — Integrated service digital network
- CSPDN — Circuit switched public data network
- PSPDN — packet switched public data network

- BSS Base station sub-system
- NSSs Network station sub-system
- NMS Network management system
- AT Atmel
- MCU Microcontroller unit
- IC Integrated circuit
- TTL Transistor transistor logic

V

- CMOS Complementary metal oxide silicon
- PEROM programmable and erasable read only memory
- RAM Random access memory
- V voltage
- Dc Direct current
- EGSM European Global system for mobile communication
- PCS personal computer service
- CRT Cathode ray tube
- D Diode
- C Capacitor
- LED Light emitting diode
- mA milli ampere
- Pf Pico farad
- kΩ Kilo ohm
- UART Universal asynchronous receiver transmitter
- P port
- RS Register select
- CPU Central processing unit

ABSTRACT

The main goal of this project is to design a locker security system using RFID and GSM technology which can be organized in bank, secured offices and homes. In this system only authenticated person can recover money from locker. We can implement a locker security system based on RFID (Radio –frequency identification) and GSM technology containing door locking system using RFID and GSM technology which can activate, authenticate and validate the user and unlock the door. The main advantage of using passive RFID and GSM is more secured than other systems .This system consists of microcontroller, RFID reader, GSM modem, keyboard and LCD. The RFID reader reads the id number from passive tag and sends to the microcontroller where it checks whether it is of valid person or not (from stored data in memory of microcontroller) .If the id number is valid then microcontroller sends the SMS request to the authenticated person's mobile through GSM, for getting original password to open the bank locker. when the person sends the password to the microcontroller, it will verify the passwords entered by the keyboard (by person present in front of locker) and received from authenticated person's mobile phone .If these two passwords are matched then locker will be opened otherwise it will remain in locked position .This system is more secured than other systems because two passwords are required for verification and the valid person can type password from his mobile and keypad of locker which should be same as that of stored (initially during account opening). This system can also create a log containing check-in and check-out of each user along with basic information of user.

1. INTRODUCTION

1.1 Background

Some people will try to steal the property which may endanger the safety of money in the bank, house and office. To overcome the security threat, most people will install bunch of locks or alarm system. There are many types of alarm system available in the market which utilizes different types of sensors. The sensor can detect different types of changes and process giving corresponding alert. In this paper we have implemented safety of the money in the bank locker, house, office (treasury) by using RFID and GSM technology which will provide more security than other systems. RFID based access –control system allows only authorized persons to open the locker with GSM technology. Basically an RFID system consists of an antenna or coil, a transceiver (with decoder) and a transponder (RF tag) electronically programmed with unique information .There are many different type of RFID systems in the market. These are categorized on the basis of their frequency ranges. Some of the most commonly used RFID kits are low frequency (30-500 kHz), mid frequency (900 kHz-1500MHz) and high frequency (2.4-2.5GHz). The passive tags are lighter and less expensive than the active tags. GSM is a globally accepted standard for digital cellular communication and is a common European mobile telephone standard for a mobile cellular radio system operating at 900 MHz in the current work GSM module is used .The SIM 300 GSM module is used. The SIM 300 GSM module is a Tri-band GSM/GPRS solution in a compact plug in module featuring an industry –standard interface .It delivers voice, data and fax in a small form factor with low power consumption. In this paper we have designed a locker security system based on RFID and GSM technology .In this system only authentic person can recover money from locker with two password protection method. In this present age, safety has become an essential issue for most of the people especially in the rural and urban areas.

1.2 OBJECTIVES

General objective:

- To implement a locker security system based on RFID and GSM technology which is more secured than other system because of using two passwords for verification.

Specific objective:

- To design a low and low in power consumption locker security system.
- To build locker security system with compact in size and standalone system.

1.3 SCOPE OF THE PROJECT

This project is:

- Not planned to a develop security system based on camera for visual identification of the person
- Only by comparing two passwords to validate the user to provide more security system and alarm will turn on whenever door is forced to open.
- In the proposed method, one does need to remember the password as every time a user tries to access one's locker, a randomly generated password is not made available to them.

1.4 STATEMENT OF THE PROBLEM

There are many reasons and problems which motivate us to seek for solutions and suggestions. Those problems that initiate us to develop this project are:

- The security of money and jewelry in bank, office and home is more difficult because of fraudulent behavior
- Keeping the security of compound and house is not protecting us from the thief.
- Knowing the security of money from the distance is the most attractive.
- Controlling antisocial crimes in bank is difficult.
- Wireless tag is less in cost

2. LITERAURE REVIEW

2.1 Radio frequency identification (RFID)

Radio Frequency Identification (RFID) technology is a non-contact, automatic identification technology that uses radio signals to identify, track, sort and detect a variety of objects including people, vehicles, goods and assets without the need for direct contact (as found in magnetic stripe technology) or line of sight contact (as found in bar code technology). RFID technology can track the movements of objects through a network of radio-enabled scanning devices over a distance of several meters.

2.1.1 HOW RFID WORKS?

An RFID reader emits a low-level radio frequency magnetic field that energizes the tag. The tag responds to the reader's query and announces its presence via radio waves, transmitting its unique identification data. This data is decoded by the reader and passed to the local application system via middleware. The middleware acts as an interface between the reader and the RFID application system. The system will then search and match the identity code with the information stored in the microcontroller.

2.1.2 The element of an RFID

Systems that make use of RFID technology are typically composed of two key elements.

1. An RFID tag, or transponder, that carries object-identifying data.
2. An RFID tag reader, or transceiver, that reads and writes tag data.



FIG 1: element of RFID system

1, RFID TAGS: The tag is the basic building block of RFID. Each tag consists of an antenna and a small silicon chip that contains a radio receiver, a radio modulator for sending a response back to the reader, control logic, some amount of memory, and a power system. The power system can be completely powered by the incoming RF signal, in which case the tag is known as a ***passive tag.*** Alternatively, the tag's power system can have a battery, in which case the tag is known as an ***active tags***

This project is concentrate on the Passive tags, on the other hand, can be much smaller and cheaper than active ones because they don't have batteries. Another advantage is their longer shelf life: Whereas an active tag's batteries may lost only a few years, a passive tag could in principle be read many decades after the chip was manufactured.



Fig 2: RFID tag in different format

RFID tags can interfere with each other when multiple tags are present in a reader's field, the reader may be unable to decipher the signals from the tags. For many applications, such as raising the gate in a parking lot, this is not a problem. The systems are optimized so that only one tag is within range at a time. However, for other applications, reading multiple tags at once is essential. For these applications, the tags need to support either an anti-collision protocol or, more commonly, a singulation protocol. A singulation protocol allows a reader to determine that multiple tags are visible and to iterate through the tags, getting them to take turns responding so that each may be read without interference from the others.

2, RFID READER: The RFID reader sends a pulse of radio energy to the tag and listens for the tag's response. The tag detects this energy and sends back a response that contains the tag's serial number and possibly other information as well. In simple RFID systems, the reader's pulse of energy functioned as an on-off switch; in more sophisticated systems, the reader's RF signal can contain commands to the tag, instructions to read or write memory that the tag contains, and even password. FID readers are usually on, continually transmitting radio energy and awaiting any tags that enter their field of operation.



Fig 3. RFID reader

2.1.3 Coupling

While it is possible to build RFID systems such that both the tag and reader contain a radio transmitter and a radio receiver, this method of operation is ideal only for active systems attempting to communicate over the longest distances. Because placing and powering a transmitter on the tag is an expensive proposition, passive tag systems are usually chosen for applications that are extremely sensitive to the cost of the tag. Either the passive tag will have some form of energy storage, for example a capacitor, to provide power when the reader stops transmitting and starts receiving or the reader must always transmit, meaning the tag has to reply on a different frequency.

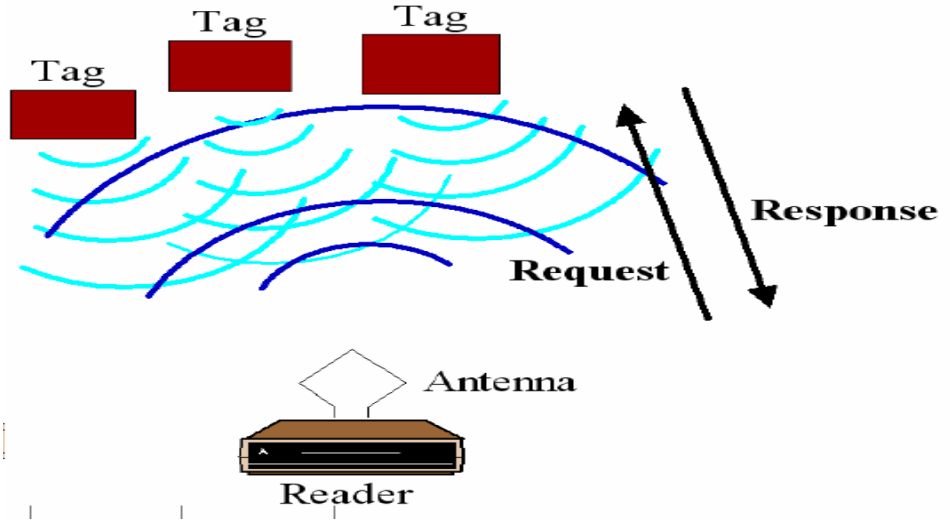


Fig 4 coupling RFID tag and RFID reader

In the near field, a tag couples with a reader via electromagnetic inductance. The antennas of both the reader and the tag are formed as coils, using many turns of small gauge wire. The current in the reader's coil creates a magnetic field. This field, in turn, induces a current in the coil of the tag. The reader communicates with the tag by modulating a carrier wave, which it does by varying the amplitude, phase, or frequency of the carrier, depending on the design of the RFID system in question. This modulation can be directly detected as current changes in the coil of the tag.

2.1.4 Reading range of passive RFID

Passive systems operate under far more limiting circumstances. To be read, a passive RFID tag must be provided with sufficient power to both run the electronics and generate a return signal that the reader can detect. Thus, the read range of a passive system depends on

- P_r: The reader transmitter power.
- S_r: The reader receiver sensitivity
- G_r: The reader antenna gain.
- G_t: The tag antenna gain.
- P_t: The tag's power requirement
- ε_t: The tag modulator efficiency

The power available to the tag, Pt, is given by the formula:

$$\mathbf{P_t} = Pr \times Gr \times Gt \times \frac{\lambda^2}{(4\pi d)^2}$$

Where $\boldsymbol{\lambda}$ is the wavelength of the radio waves used by the system.

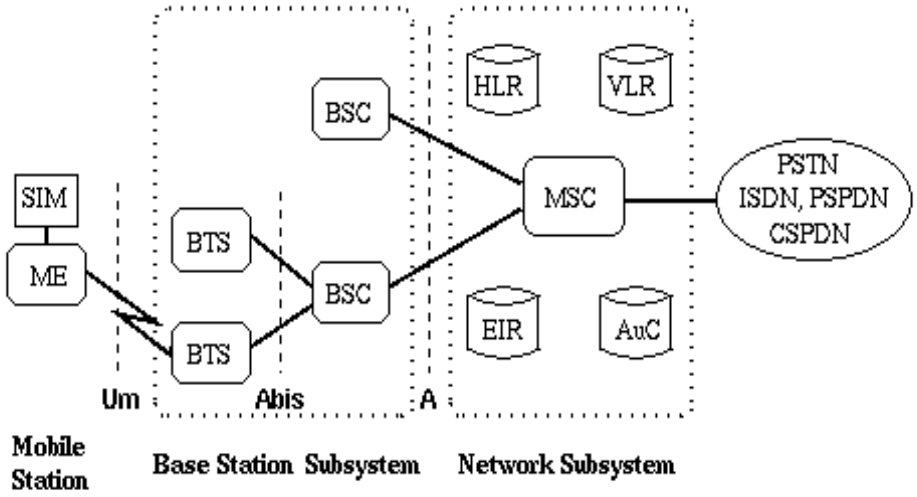
2.2 GLOBAL SYSTEM FOR MOBILE COMMUNICATION (GSM)

The European TDMA digital cellular system GSM was developed by CEPT during the 1980s, and this work was continued by ETSI. The acronym GSM came originally from the standardization working team, but GSM is presently understood to mean Global System for Mobile Communications. Two other cellular networks are based on GSM technology: the European DCS-1800, which operates in the 1.8-GHz band, and the American GSM-1900, which operates in the 1.9-GHz band. Our discussion in this section is valid for all of these networks. In GSM, unlike in analog mobile networks, subscription and mobile equipment are separated. Subscriber data are stored and handled by a subscriber-identity module (SIM), which is a smart card belonging to a subscriber. With this card the subscriber can use any mobile telephone equipment just if it were his or her own. The radio equipment is called mobile equipment (ME) and we can say that the mobile station consists of two parts, ME and SIM; that is: MS = SIM + ME.

2.2.1 GSM Network

A GSM network is composed of several functional entities, whose functions and interfaces are specified. The GSM network can be divided into three broad parts. The Mobile Station is carried by the subscriber. The Base Station Sub-system controls the radio link with the

Mobile Station. The Network Sub-system, the main part of which is the Mobile services Switching Center (MSC), performs the switching of calls between the mobile users, and between mobile and fixed network users. The MSC also handles the mobility management operations. Not shown is the Operations and Maintenance Center, which oversees the proper operation and setup of the network. The Mobile Station and the Base Station Sub-system communicate across the Um interface, also known as the air interface or radio link. The Base Station Subsystem communicates with the Mobile services Switching Center across the A interface.



SIM Subscriber Identity Module | BSC Base Station Controller | MSC Mobile services Switching Center
ME Mobile Equipment | HLR Home Location Register | EIR Equipment Identity Register
BTS Base Transceiver Station | VLR Visitor Location Register | AuC Authentication Center

Fig 5: general architecture of GSM

Block 1: Mobile Station:

* ***Mobile Equipment (ME)*****:** such as hand portable and vehicle mounted unit.

* ***Subscriber Identity Module (SIM)*****:** which contains the entire customer related information (identification, secret key for authentication, etc.). The SIM is a small smart card, which contains both programming and information. One of the advantages of the GSM architecture is that the SIM may be moved from one Mobile Station to another. This makes upgrades very simple for the GSM telephone user.

Block 2: Base Station Subsystem (BSS): All radio-related functions are performed in the BSS, which consists of *base Station controllers (BSCs)* and the *base transceiver stations (BTSs)*.

* ***Base Transceiver Station (BTS):*** The Base Transceiver Station (BTS) contains the equipment for transmitting and receiving of radio signals (transceivers), antennas, and equipment for encrypting and decrypting communications with the Base Station Controller (BSC). A group of BTSs are controlled by a BSC. A BTS is controlled by a parent BSC via the Base Station Control

Function (BCF). The BCF is implemented as a discrete unit or even incorporated in a TRX in compact base stations. The BCF provides an Operations and Maintenance (O&M) connection to the Network Management System (NMS), and manages operational states of each TRX, as well as software handling and alarm collection.

* ***Base Station Controller (BSC):*** The BSC controls multiple BTSs and manages radio channel setup, and handovers. The BSC is the connection between the Mobile Station and Mobile Switching Center. The Base Station Controller (BSC) provides, classically, the intelligence behind the BTSs. Typically a BSC has 10s or even 100s of BTSs under its control. The BSC handles allocation of radio channels, receives measurements from the mobile phones and controls handovers from BTS to BTS. A key function of the BSC is to act as a concentrator where many different low capacity connections to BTSs become reduced to a smaller number of connections towards the Mobile Switching Center (MSC) (with a high level of utilization). Overall, this means that networks are often structured to have many BSCs distributed into regions near their BTSs which are then connected to large centralized MSC

Block 3: Network Switching Subsystem (NSS): Network Switching Subsystem is the component of a GSM system that carries out switching functions and manages the communications between mobile phones and the Public Switched Telephone Network. It is owned and deployed by mobile phone operators and allows mobile phones to communicate with each other and telephones in the wider telecommunications network. The architecture closely resembles a telephone exchange, but there are additional functions which are needed because the phones are not fixed in one location.

* ***Mobile Switching Centre (MSC):*** The Mobile Switching Centre or MSC is a sophisticated telephone exchange, which provides circuit-switched calling, mobility management, and GSM services to the mobile phones roaming within the area that it serves. This means voice, data and fax services, as well as SMS and call divert. In the GSM mobile phone system, in contrast with earlier analogue services, fax and data information is sent directly digitally encoded to the MSC. Only at the MSC is this re-coded into an "analogue" signal. There are various different names for MSCs in different context, which reflects their complex role in the network; all of these terms though could refer to the same MSC, but doing different things at different times. A Gateway MSC is the MSC that determines which visited MSC the subscriber who is being called is currently located. It also interfaces with the Public Switched Telephone Network. All mobile to mobile calls and PSTN to mobile calls are routed through a GMSC. The term is only valid in the context of one call since any MSC may provide both the gateway function and the Visited MSC function. The VLR associated with this MSC will have the subscriber's data in it. The target MSC is the MSC toward which a Handover should take place.

2.2.2 WORKING PRINCIPLES OF GSM

The GSM module is connected with the controller. As the controller is keep on monitoring the doors and locker key, when the door get opened, the microcontroller sends the command “AT” to initiate the module. Now the module sends an SMS as “Theft Occurred” to the already fed mobile number. Thus the information is passed from the module to the Authorized person. Whenever it receives the correct password from the mobile, it will inform the microcontroller to open the door

3. METHODOLOGY

3.1 BLOCK DIAGRAM

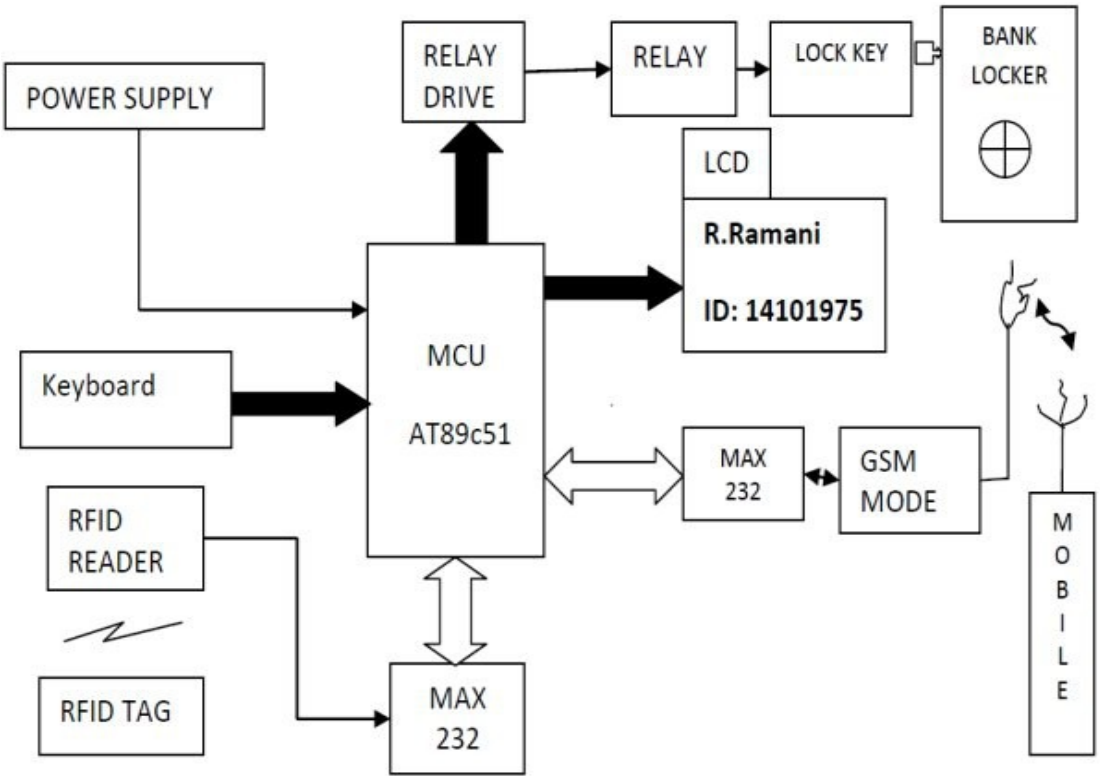


Figure .5 block diagram of locker security using RFID and GSM

The block diagram of locker system based on RFID and the GSM technology is shown in the figure1. It comprises power supply section, keyboard, RFID Reader, AT89C51 microcontroller, MAX232 driver, relay driver and GSM modem, LCD. The GSM board has a valid SIM card with sufficient recharge amount to make outgoing calls. The circuit is powered by regulated +5v dc.

The RFID reader reads the data from the tag and send to the microcontroller, if the card is valid then microcontroller display the account holder name and number. Then the account holder need to enter the password, if the password is valid then microcontroller sends the SMS to account holder’s mobile number. Then account holder sends the password to the microcontroller through mobile phone using GSM. The microcontroller compares the password entered by

keyboard with received password through mobile phone. If these passwords are matched the microcontroller provides necessary control signal to open the locker. This method is simple and more secured than other systems.

3.2 OPERATION

1. RFID Tag: An RFID tag is a microchip combined with an antenna in a compact package. The packaging is structured to allow the RFID tag to be attached to an object to be tracked. The tags antenna picks up signals from an RFID reader or scanner and then returns the signal, usually with some additional data (like a unique serial number or other customized information). The tag used in the proposed method is a passive tag. A passive tag is an RFID tag that does not contain a battery. The power is supplied by the reader. When radio waves from the reader are encountered by a passive RFID tag, the coiled antenna within the tag forms a magnetic field. The tag draws power from it, energizing the circuits in the tag. The tag then sends the information encoded in the tags memory.

2. RFID Reader: An RFID reader is a device that is used to interrogate an RFID Tag. The reader has an antenna that emits radio waves. The reader has two main functions: the first is to transmit a carrier signal, and the second is to receive a response from any tags in proximity of the reader.

Basically an RFID system consists of three components - an antenna or coil, a transceiver with decoder and a transponder (RF Tag) electronically programmed with unique information. The tags antenna picks up signals from an RFID reader or scanner and then returns the signal , usually with some additional data (like a unique serial number or other customized information) A passive tag is an RFID tag that does not contain a battery .The power is supplied by the reader. When radio waves from the reader are encountered by a passive RFID tag, the coiled antenna within the tag forms a magnetic field. The tag draws power from it, energizing the circuits in the tag. The tag then sends the information encoded in the tags memory. The RX and TX pins of RFID reader connected to TX and RX pins of AT 89c51 microcontroller respectively. Then the reader senses the data from the tag and transmits the sensed data to microcontroller via serial port.

3. MAX 232: The MAX232 IC is used to convert the TTL/CMOS logic levels to RS232 logic levels during serial communication of microcontrollers with PC. The controller operates at TTL logic level (0-5V) whereas the serial communication in PC works on RS232 standards (-25 V to + 25V). This makes it difficult to establish a direct link between them to communicate with each other. MAX232 is a dual driver/receiver that includes a capacitive voltage generator to supply RS232

voltage levels from a single 5V supply. Each receiver converts RS232 inputs to 5V TTL/CMOS levels.

4. Microcontroller AT89C5: Microcontrollers as the name suggests are small controllers. They are like single chip computers that are often embedded into other systems to function as processing/controlling unit. AT89C51 is an 8-bit microcontroller and belongs to Atmel's 8051 family. AT89C51 has 4KB of Flash programmable and erasable read only memory (PEROM) and 128 bytes of RAM. It can be erased and program to a maximum of 1000 times. In this project microcontroller used to store data and integrate the system.

5. GSM modem: The GSM Modem is specialized types of modem which accept a SIM card operate on a subscriber mobile number over a network, just like a cellular phone. Basically it is a cell phone without display. Modem SIM 300 is a Tri-band GSM/GPRS engine that works on EGSM 900MHz, DCS1800MHz and PCS1900 MHz frequencies GSM. Modem is RS-232 –logic level compatible i.e. it takes -3v to -15v as logic high and +3v to +15 as logic low.

6. LIQUID CRYSTAL DISPLAY (LCD): A liquid crystal display (LCD) is a thin, flat panel used for electronically displaying information such as text, images, and moving pictures. Its uses include monitors for computers, televisions, instrument panels, and other devices ranging from aircraft cockpit displays, to every-day consumer devices such as video players, gaming devices, calculators, and telephones. 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 color or monochrome.

7. Power supply: A linear power supply is the oldest and simplest type of power supply. In these power supplies, electrical isolation can only be provided by bulky line frequency transformers. The ac source can be rectified with a bridge rectifier to get an uncontrolled dc, and then a dc-to-dc converter can be used to get a Controlled dc output. The power supply section is the important for any electronics circuits.

To derive the power supply, the 230V, 50Hz AC mains is stepped down by transformer X1 to deliver a secondary output of 12V, 500 mA. The transformer output is rectified by a full-wave rectifier comprising diodes D1 through D4, filtered by capacitor C1 and regulated by ICs 7812 (IC2) and 7805 (IC3). Capacitor C2 bypasses the ripples present in the regulated supply. LED1 acts as the power indicator and R1 limits the current through LED1.The power supply section is shown in the figure.

8. Relay: A relay is an electrically operated switch. Most of the relays use an electromagnet to operate a switching mechanism mechanically. Relays are used where it is necessary to control a circuit by a low-power signal with complete electrical isolation between control and controlled circuits or where several circuits must be controlled by one signal.

3.3 Circuit Diagram

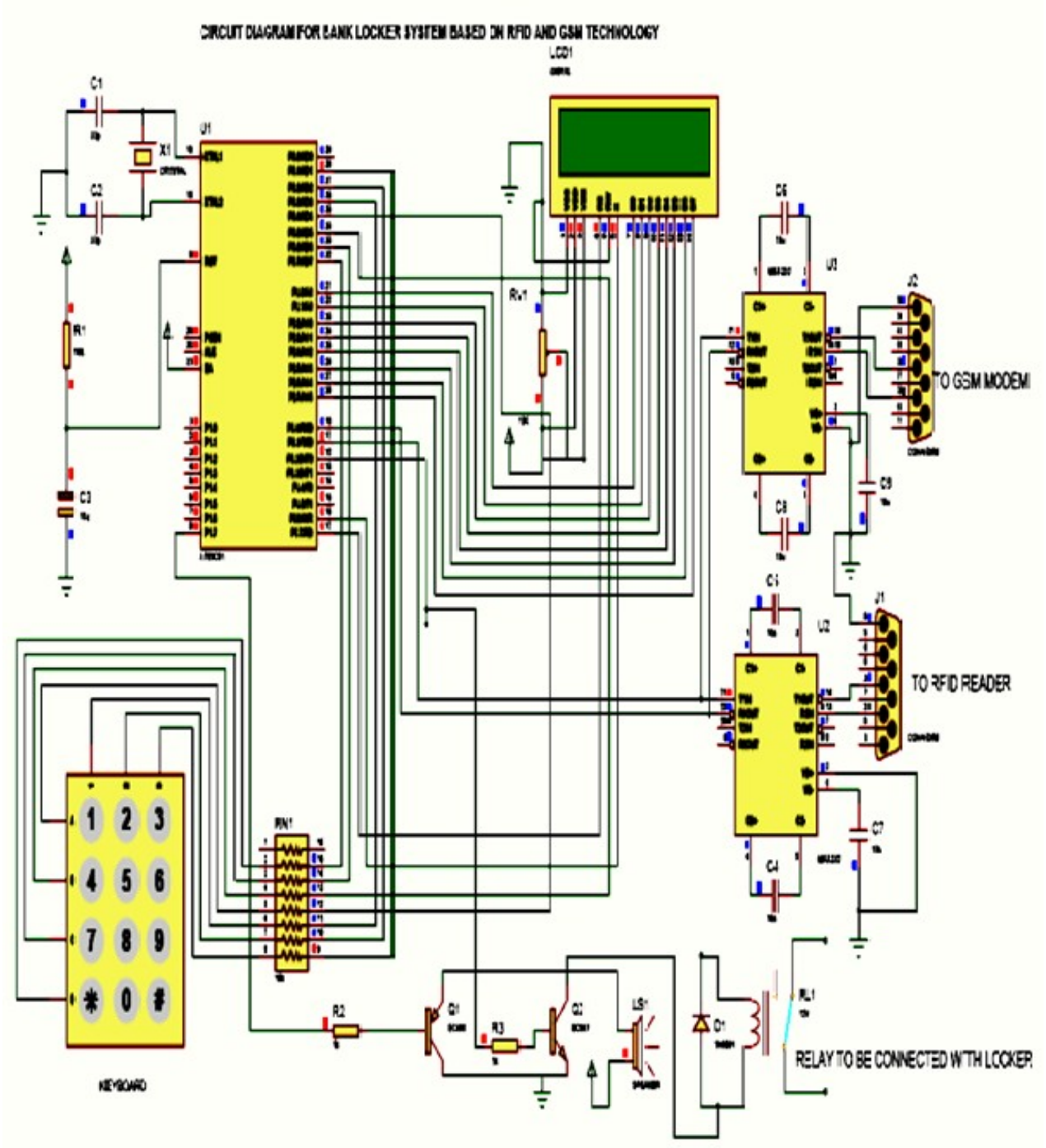


Figure 5: circuit diagram of locker security system

Components

Components specification & quantity

LED	1
LCD	1

Relay		2
Speaker		1
Max 232	DIL 16	2
Resistor	10kΩ	4
Keyboard		1
Capacitor	33pf	8
“	10pf	1
Transistor		2
GSM module		1
RFID module		1
Microcontroller	AT89c51	1

3.4 component description

3.4.1 Capacitor: A capacitor is an electrical/electronic device that can store energy in the electric field between a pair of conductors (called "plates"). The process of storing energy in the capacitor is known as "charging", and involves electric charges of equal magnitude, but opposite polarity, building up on each plate. Capacitors are often used in electric and electronic circuits as energy-storage devices. They can also be used to differentiate between high-frequency and low-frequency signals. This property makes them useful in electronic filters. Practical capacitors have series resistance, internal leakage of charge, series inductance and other non-ideal properties not found in a theoretical, ideal, capacitor.

3.4.2 Resistor: A resistor is a two terminal electronic component that opposes an electric current by producing a voltage drop between its terminals in its terminals in proportion to the current, that is in accordance with Ohm's law: V=IR. Resistors are used as part of electrical networks and electronic circuits.

3.4.3 Microcontroller: In 40 pin AT89C51, there are four ports designated as P_1, P_2, P_3 and P_0. All these ports are 8-bit bi-directional ports, i.e., they can be used as both input and output ports. Except P_0 which needs external pull-ups, rest of the ports have internal pull-ups. When 1s are written to these port pins, they are pulled high by the internal pull-ups and can be used as inputs. These ports are also bit addressable and so their bits can also be accessed individually.

Port P_0 and P_2 are also used to provide low byte and high byte addresses, respectively, when connected to an external memory. Port 3 has multiplexed pins for special functions like serial communication, hardware interrupts, timer inputs and read/write operation from external memory. AT89C51 has an inbuilt UART for serial communication. It can be programmed to operate at different baud rates. Including two timers & hardware interrupts, it has a total of six interrupts.

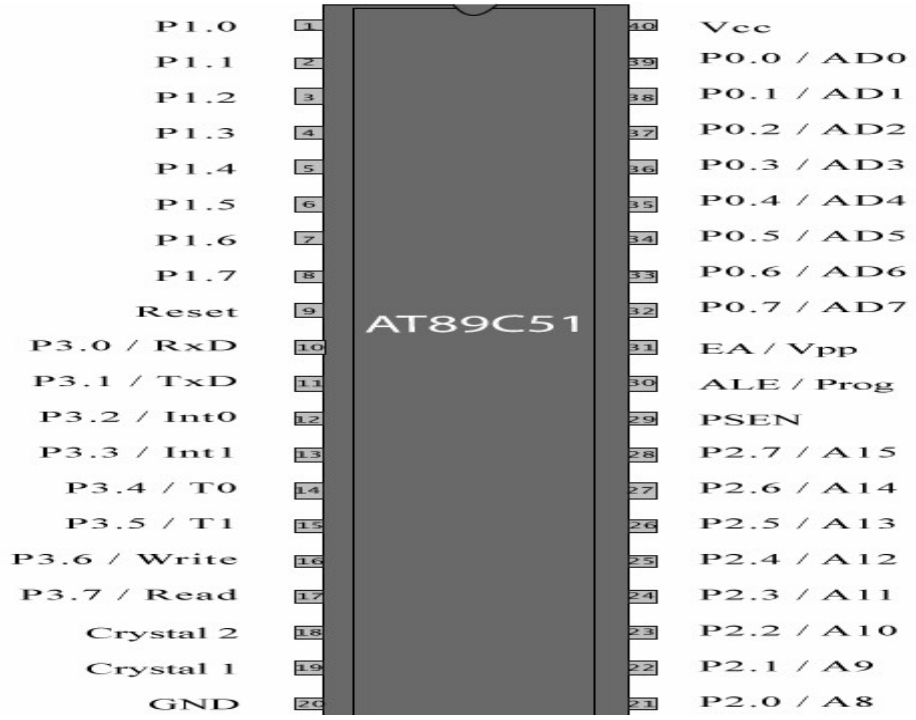


Figure 6: Pin diagram of AT89C51

3.4.4 OSCILLATOR CHACTERSTICS: XTAL1 and XTAL2 are the input and output, respectively, of an inverting amplifier which can be configured for use as an on-chip oscillator, as shown in Figure. Either a quartz crystal or ceramic resonator may be used. To drive the device from an external clock source, XTAL2 should be left unconnected while XTAL1 is driven.

There are no requirements on the duty cycle of the external clock signal, since the input to the internal clocking circuitry is through a divide-by-two flip-flop, but minimum and maximum voltage high and low time specifications must be observed.

3.4.5 MAX 232: It is a dual driver/receiver that includes a capacitive voltage generator to supply RS232 voltage levels from a single 5V supply. Each receiver converts RS232 inputs to 5V TTL/CMOS levels. These receivers (R1 & R2) can accept ±30V inputs. The drivers (T1 & T2), also called transmitters, convert the TTL/CMOS input level into RS232 level. The transmitters take input from controller's serial transmission pin and send the output to RS232's receiver. The receivers, on the other hand, take input from transmission pin of RS232 serial port and give serial output to microcontroller's receiver pin. MAX232 needs four external capacitors whose value ranges from 1ìF to 22ìF.

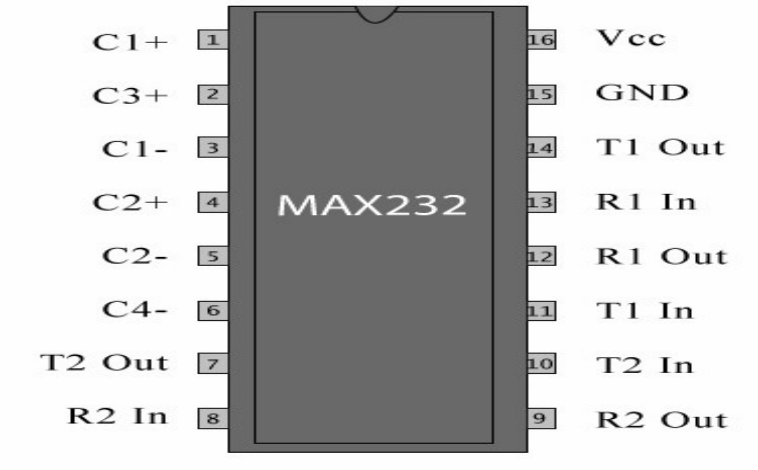
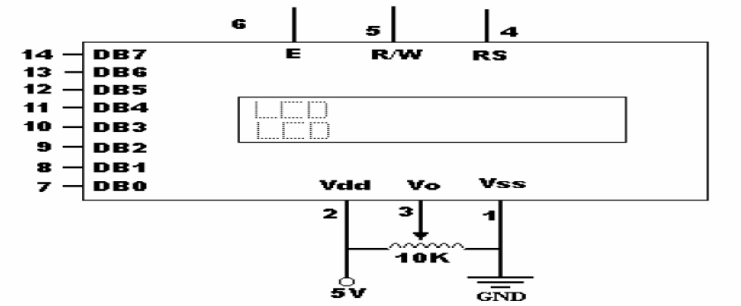


Figure 7: Pin diagram of max232

MAX 232 is used to convert TTL into RS232 logic level converter used between the microcontroller and the GSM board. The signal at pin 11 of the microcontroller is sent to the GSM modem through pin 11 of MAX232. This signal is received at pin 2 (RX) of the GSM modem. The GSM modem transmits the signals from pin 3(TX) to the microcontroller through MAX232, which is received at pin 10 IC1.

3.4.6 Liquid crystal display (LCD): 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 color or monochrome.



3.4.7 GSM MODULE: The GSM module consists of Wireless CPU, SIM card holder and powered. It helps to transmit and receive the SMS with UART. GSM is an open, nonproprietary system that is constantly evolving. One of its great strengths is the international roaming capability. GSM satellite roaming has extended service access to areas where terrestrial coverage is not available. GSM differs from first generation wireless systems in that it uses digital technology and time division multiple access transmission methods. Voice is digitally encoded via a unique encoder, which emulates the characteristics of human speech. This method of transmission permits a very efficient data rate/information content ratio.

3.4.8 RFID MODULE: RFID technology is based on the concept of magnetic coupling, which is the principle that current flowing in one circuit can induce current flow in another circuit through a magnetic field generated in the space between the circuits.

3.4.9 Light-emitting diode (LED): A light-emitting diode (LED) is an electronic light source. LED consists of a chip of semiconducting material impregnated, or doped, with impurities to create a p-n junction. As in other diodes, current flows easily from the p-side, or anode, to the n-side, or cathode, but not in the reverse direction. Charge-carriers which are electrons and holes flow into the junction from electrodes with different voltages.

3.4.10 TRANSISTORS: Transistors are three terminal active devices made from different semiconductor materials that can act as either an insulator or a conductor by the application of a small signal voltage. The transistor's ability to change between these two states enables it to have two basic functions: switching or amplification. Then bipolar transistors have the ability to operate within three different regions:

- Active Region - the transistor operates as an amplifier and IC = β IB
- Saturation - the transistor is fully-ON operating as a switch and IC = I saturation
- Cut-off - the transistor is "fully-OFF" operating as a switch and IC = 0

3.4.11 KEYBOARDS: It is a set of button arranged in a block (pad) which usually bear digit, symbols and usually a complete set of alphabetical letters .If it mostly contains numbers then it can also be called numeric keypad. Keypads are found on many alphanumeric keyboards and on other devices such as calculators, pushbutton telephone combination locks, and digital door locks which require mainly numeric input

3.4.12 SPEAKERS: Speakers are one of the most common output devices used with computer systems. Regardless of their design, the purpose of speakers to produce audio output that can be heard by the listener. Speakers are transducers that convert electromagnetic wave into sound wave.

The speakers receive audio input from a device such as a computer or an audio receiver. This input may be either in analog or digital form. Analog speakers simply amplify the analog electromagnetic wave into sound waves. Since sound waves are produced in analog form, digital speakers must first convert the digital input to an analogy signal, then generate the sound waves.

3.4.13 RELAY: When an electric current is passed through the coil it generates a magnetic field that attracts the armature and the consequent movement of the movable contact either makes or breaks a connection with a fixed contact. If the set of contacts was closed when the relay was de-energized, then the movement opens the contacts and breaks the connection, and vice versa if the contacts were open. When the current to the coil is switched off, the armature is returned by a force, approximately half as strong as the magnetic force, to its relaxed position. Usually this force is provided by a spring, but gravity is also used commonly in industrial motor starters. Most relays are manufactured to operate quickly. In a low-voltage application this reduces noise; in a high voltage or current application it reduces arcing.

In Single Pole Single Throw relay, current will only flow through the contacts when the relay coil is energized.

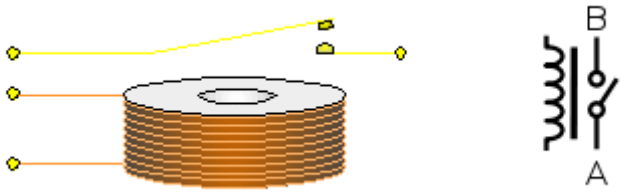


Figure 8: Single pole single throw Relay and its circuit symbol

3.5 CIRCUIT DESCRIPTION

The above figure (Figure) shows the circuit of the locker security system based on RFID and GSM technology. The compact circuitry is built around Atmel AT89C51 microcontroller. The AT89C51 is a low-power; high performance CMOS 8-bit microcomputer with 8kB of Flash programmable and erasable read only memory (PEROM). It has 256 bytes of RAM, 32 input/output (I/O) lines, three 16-bit timers/ counters, a six-vector two- level interrupt architecture, a full-duplex serial port, an on- chip oscillator and clock circuitry. The system clock also plays a significant role in operation of the microcontroller. An 11.0592MHz quartz crystal connected to pins 18 and 19 provides basic clock to the microcontroller. Power-on reset is

provided by the combination of electrolytic capacitor C3 and resistor R1. Port pins P2.0 through P2.7 of the microcontroller are connected to data port pins D0 through D7 of the LCD, respectively. Port pins P3.7 and P3.6 of the microcontroller are connected to register -select (RS) and enable (E) pins of the LCD, respectively. Read/write R/W pin of the LCD is grounded to enable for write operation. All the data is sent to the LCD in ASCII format for display. Only the commands are sent in hex form. Register-select (RS) signal is used to distinguish between data (RS=1) and command (RS=0). Preset RV1 is used to control the contrast of the LCD Resistor 10k limits the current through the backlight of the LCD. Port pins P3.0 (RXD) and P3.1 (TXD) of the microcontroller are used to interface with the RFID reader through Max232(1) and GSM Modem are used to interface through Max232(2). When an allowed person having the tag enters the RF field generated by the RFID reader, RF signal is generated by the RFID reader to transmit energy to the tag and retrieve data from the tag. Then the RFID reader communicates through RXD and TXD pins of the microcontroller for further processing. Thus on identifying the authorized person, the authorized person enters the password through keyboard and send to the microcontroller. If the password is correct then the microcontroller send the SMS to the account holder person, account holder again send the password through SMS to the microcontroller. The microcontroller verifies the password and received password through GSM mobile. If this password is correct, the microcontroller provides high signal to port pin P3.2, transistor Q2 drives into saturation, and relay RL1 energizes to open the locker. Simultaneously, the LCD shows “access granted” message and send to and port pin P1.7 drives piezo buzzer PZ1 via transistor T1 for aural indication. If the password is not valid, the LCD shows “access denied” and the locker doesn’t open.

4 RESULTS AND IMPLICATION

1. our project provides quick data communication over long distance also.
2. RFID system helps us to provide the maximum security to authenticate the user at minimum cost.
3. It requires very less power supply i.e. from 5V to 12 V only, which is easily available.

Locker Security System using RFID and GSM technology which is able to identify authorized persons and allow only them. In this system only authenticated person can recover money from locker The system also helps user to save the time. The use of this project helps to produce a better quality product in terms of documentation standards, acceptability to user, maintainability and consistency of system. This system can also create a log containing check-in and check-out of each user along with basic information of user. User must have RFID tag Which contains the personal information of that particular user. We can implement a locker security system based on RFID(Radio –frequency identification) and GSM technology containing door locking system using RFID and GSM technology which can activate ,authenticate and validate the user and unlock the door.

If the id number is valid then microcontroller sends the SMS request to the authenticated person's mobile through GSM, for getting original password to open the bank locker. when the person sends the password to the microcontroller, it will verify the passwords entered by the keyboard (by person present in front of locker) and received from authenticated person's mobile phone .If these two passwords are matched then locker will be opened otherwise it will remain in locked position .This system is more secured than other systems because two passwords are required for verification and the valid person can type password from his mobile and keypad of locker which should be same as that of stored (initially during account opening)

4.1 Limitations

In the course of developing this project we have faced many difficulties and hindrances .The following listed points is among those limitations

- Lack of internet access
- Shortage of necessary materials such as books, laptops, sample project etc. i.e. used to develop our project
- unavailability of equipment required for hardware implementation of our project
- lack of fully equipped laboratory in our campus for the project to be carried out
- This system may suffer at remote area where there is problem with GSM range. Also the attack from hackers may create problem but using high standard of encryption and availing GSM trans-receiver widely, one may overcome these limitations
- Lack of acceptance.

6. CONCLUSION

In the world of electronics it is important to develop the new technology to make secure the banks, homes and secured offices locker of keeping with authorization of user. Our project is one idea which can change the face of today's manual system of accessing locker and allow more than one person to access of the locker with two way password security. The total central access of all these activities provides the correct approach toward security.

This paper can be implemented as a locker security system using passive RFID and GSM for banks. It is a low cost, low in power consumption, compact in size and standalone system. The authenticated customer's information (such as name, id, phone number..) can be stored in microcontroller's memory database system and the memory capacity can also be increased if the customer limit exceeds. The microcontroller compares the passwords entered by keyboard and received through mobile phone. If these passwords (codes) are correct the microcontroller provides necessary control signal to open the locker otherwise door remains locked

7. RECOMMENDATION

Standing on the final development of this project, we recommended that:

- This project can be used as a reference material for students of electrical and computer engineering especially for electronic communication engineering students.
- This project will be used as sample project for all who wants to develop project on bank, homes, and office locker security system and related subject matter.
- Who want to have implemented safety of the money in the bank locker ,house ,office(treasury) by using RFID and GSM technology which will provide more security than other systems.

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