



## SECURITY FOR ORGANIZING GSM DIGITAL NOTICE BOARD

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### ABSTRACT

**A GSM based digital notice board and a home automation system has a very low cost of installation and maintenance. GSM SIM900 is the most popular standard for mobiles in the world. It presents an SMS based notice board incorporating the widely used GSM to facilitate the communication of displaying message on notice board via user's mobile phone. When the user sends a SMS via a registered number from his mobile phone, it is received by SIM900 GSM modem at the receiver's end. If the user wants to display any message, he can send the information by SMS and thus update the LCD display accordingly. The system consists of a 8-bit Micro controller ATMEL 89C51, GSM SIM900 module, an LCD, a motor and an android application for user interface with the hardware.**

### 1. INTRODUCTION

Every system is automated in order to face new challenges in the present day situation. Automated systems have less manual operations, so that the flexibility, reliabilities are high and accurate. Hence every field prefers automated control systems. Especially in the field of electronics automated systems are doing better performance increasingly. Probably the most useful thing to know about the global system for mobile communication is that it is an international standard. If you travel in parts of world, GSM is only type of cellular service available. Instead of analog services, GSM was developed as a digital system using TDMA technology. The main aim of this paper is to module GSM based wireless smart home and digital notice board for the development of a

system, which uses Mobile technology that keeps monitoring of the various appliances, and will control the operation of these appliances with respect to the signal sent by the mobile. For utilization of appliances the new concept has been thought to manage them remotely by using GSM, which enables the user to remotely control switching of domestic appliances. Just by dialing keypad of remote telephone, from where you are calling you can perform ON / OFF operation of the appliances.

### 2. METHODOLOGY

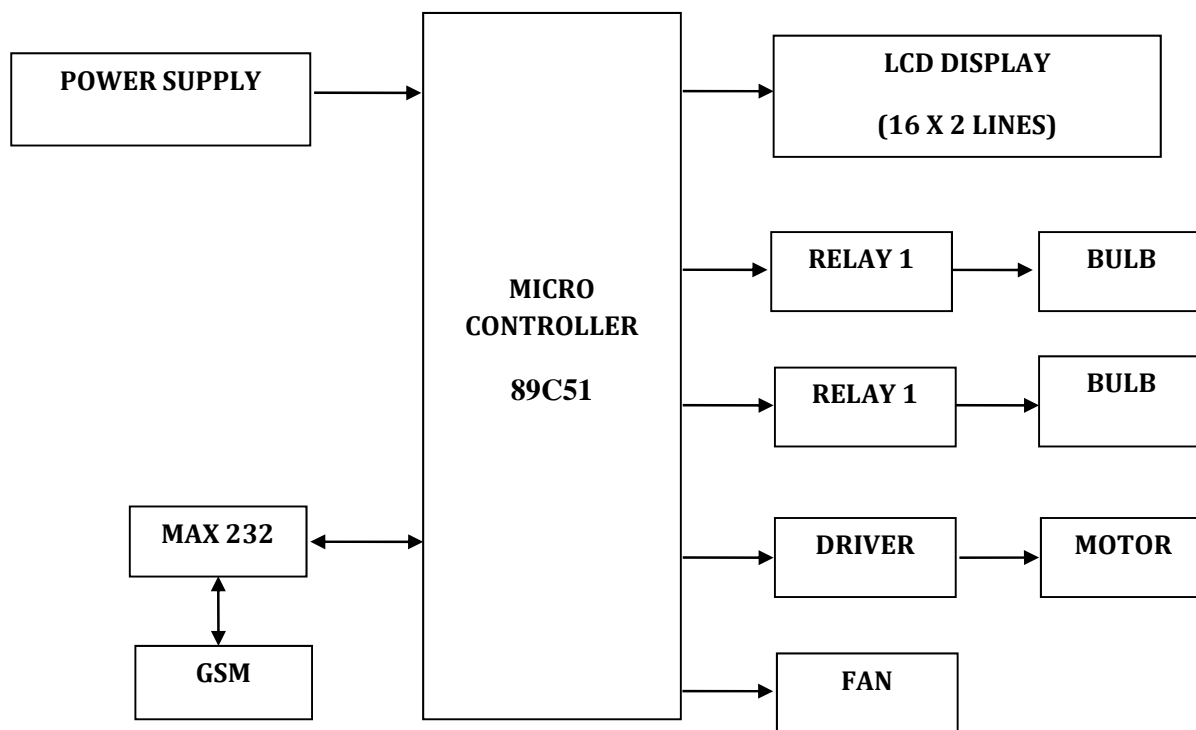
In this paper we are monitoring and controlling appliances of home remotely using GSM technology. The required operating voltage for Microcontroller 89C51 is 5V. Hence the 5V D.C. power supply is needed by the same. This regulated 5V is generated by stepping down the voltage from 230V to 12V using step down transformer. Now the step downed A.C voltage is being rectified by the Bridge Rectifier using 1N4007 diodes. The rectified A.C voltage is now filtered using a 'C' filter. Now the rectified, filtered D.C. voltage is fed to the Voltage Regulator. This voltage regulator provides us to have a Regulated constant Voltage which is of +5V. The rectified filtered and regulated voltage is a gain filtered for ripples using an electrolytic capacitor 100 $\mu$ F. Now the output from this section is fed to 40<sup>th</sup> pin of 89C51 microcontroller to supply operating voltage. The microcontroller 89C51 with Pull up resistors at Port0 and crystal oscillator of 11.0592 MHz crystal in conjunction with couple of 30-33pf capacitors is placed at 18<sup>th</sup> & 19<sup>th</sup> pins of 89C51 to make it work (execute) properly. Operating voltage for the GSM modem will depends on its type and an adaptor is provided with the GSM

modem set itself. Now to monitor and control the appliances of home, just we need to send a SMS from remote telephone to the GSM modem which is present in home. Modem will read this SMS and forwards to the microcontroller. Now the controller will process this data and depending upon the message sent it will perform the action. Such that to operate the lamps in the home controller will gives signals to the corresponding relays to perform that action and to operate the DC Fan or DC motor signal is to its respective drivers.

Like this all the appliances in home can be controlled by using this GSM technology. If we want to know the status of appliances in home just a SMS is sent through the GSM modem via network paths using AT commands to our mobiles which includes the status of the appliances.

### 3. GSM BASED SMART HOME AND DIGITAL NOTICE BOARD

The main aim of this paper GSM based wireless smart home and digital notice board is to develop a system, which uses Mobile technology that keeps monitoring of the various appliances, and will control the operation of these appliances with respect to the signal sent by the mobile. For utilization of appliances the new concept has been thought to manage them remotely by using GSM, which enables the user to remotely control switching of domestic appliances. Just by dialing keypad of remote telephone, from where you are calling you can perform ON / OFF operation of the appliances. The block diagram of the proposed approach is shown in Figure 1 and it consists of Microcontroller, MAX 232, GSM, LCD display, power supply, relay, driver, fan and bulbs.



**Fig 1 BLOCK DIAGRAM OF GSM BASED SMART HOME AND DIGITAL NOTICE BOARD**

Micro-controllers were originally used as components in complicated process-control systems. However, because of their small size and low price, Micro-controllers are now also being used in regulators for individual control loops. In several areas Micro-controllers are now outperforming their analog counterparts and are cheaper as well. To allow compatibility among

data communication equipment made by various manufactures, and interfacing standard called RS232 was set by the Electronic Industries Association (EIA). This RS-232 standard is used in PCs and numerous types of equipment. However, since the standard was set long before the advent of the TTL logic family, its input and output voltage levels are not TTL compatible. In

RS-232, a 1 is represented by -3 to -25V, while a 0 bit is +3 to +25V, making -3 to +3 undefined. For this reason, to connect any RS-232 to a microcontroller system we must use voltage converters such as MAX232 to convert the TTL logic levels to the RS-232 voltage levels and vice versa. So here we are using this MAX-232 to have compatibility between the RFID READER and microcontroller.

GSM based wireless home appliances monitoring and control using GSM, which enables the user to remotely control switching of domestic appliances. Just by dialing keypad from where you are calling you can perform ON / OFF operation of the home appliances. A variable regulated power supply, also called a variable bench power supply, is one where you can continuously adjust the output voltage to your requirements. Varying the output of the power supply is the recommended way to test a project after having double checked parts placement against circuit drawings and the parts placement guide. This type of regulation is ideal for having a simple variable bench power supply. Actually this is quite important because one of the first projects a hobbyist should undertake is the construction of a variable regulated power supply. While a

dedicated supply is quite handy e.g. 5V or 12V, it's much handier to have a variable supply on hand, especially for testing. Most digital logic circuits and processors need a 5 volt power supply. To use these parts we need to build a regulated 5 volt source. Usually you start with an unregulated power supply ranging from 9 volts to 24 volts DC (A 12 volt power supply is included with the Beginner Kit and the Microcontroller Beginner Kit.). To make a 5 volt power supply, we use a LM7805 voltage regulator IC.

The LM7805 is simple to use. You simply connect the positive lead of your unregulated DC power supply (anything from 9VDC to 24VDC) to the Input pin, connect the negative lead to the Common pin and then when you turn on the power, you get a 5 volt supply from the Output pin. LCD is used to display the information about the current process. A relay is an electrical switch that opens and closes under control of another electrical circuit. In the original form, the switch is operated by an electromagnet to open or close one or many sets of contacts. The schematic representations of GSM based smart home are shown in Figure 2.

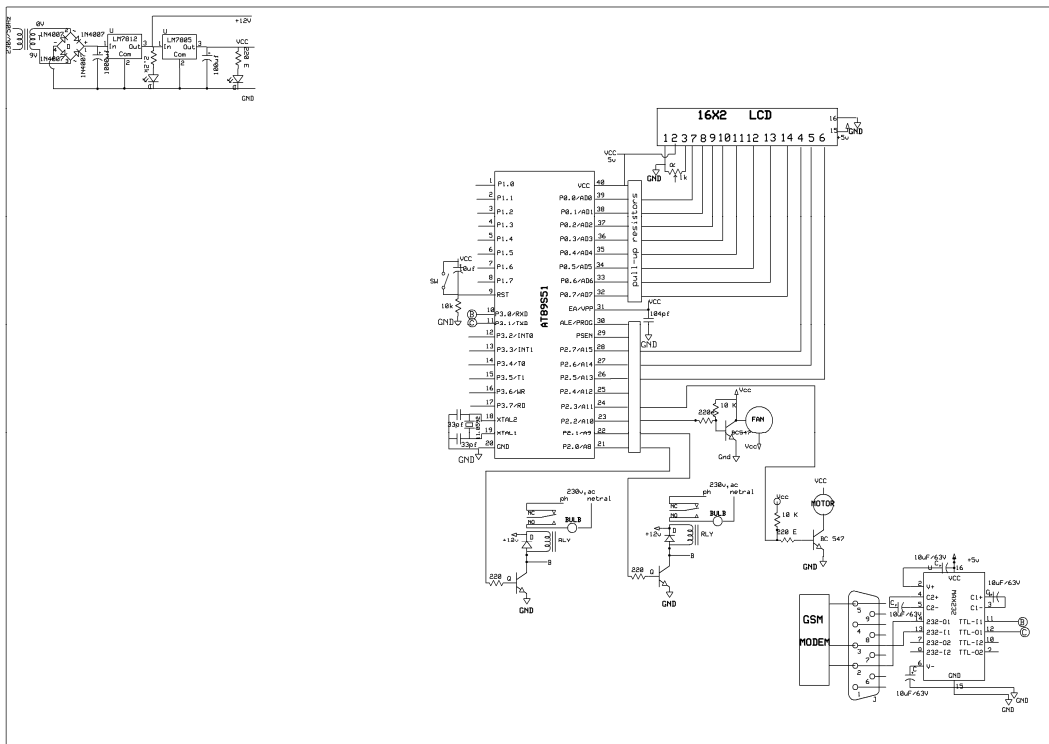


Fig 2 SCHEMATIC DESCRIPTION OF GSM BASED SMART HOME

Firstly, the required operating voltage for Microcontroller AT89S51 is 5V. Hence the 5V D.C. power supply is needed by the same. This regulated 5V is generated by first stepping down the 230V to 18V by the step down transformer. In the both the Power supplies the step downed A.C.voltage is being rectified by the Bridge Rectifier. The diodes used are 1N4007. The rectified A.C. voltage is now filtered using a ‘C’ filter. Now the rectified, filtered D.C. voltage is fed to the Voltage Regulator. This voltage regulator allows us to have a Regulated Voltage. In Power supply given to Microcontroller 5V is generated using 7805 and in other two power supply 12V is generated using 7812. The rectified; filtered and regulated voltage is again

filtered for ripples using an electrolytic capacitor 100µF. Now the output from the first section is fed to 40<sup>th</sup> pin of AT89S51 microcontroller to supply operating voltage and from other power supply to circuitry. The microcontroller AT89S51 with Pull up resistors at Port0 and crystal oscillator of 11.0592 MHz crystal in conjunction with couple of capacitors of is placed at 18<sup>th</sup> & 19<sup>th</sup> pins of AT89S51 to make it work (execute) properly.P0 is connected to the data pins of the LCD. P2.5, P2.6, P2.7 are connected to control pins of the LCD.20<sup>th</sup> is connected to GROUND and 40<sup>th</sup> is connected to VCC. The architecture of GSM network is shown in Figure 3.

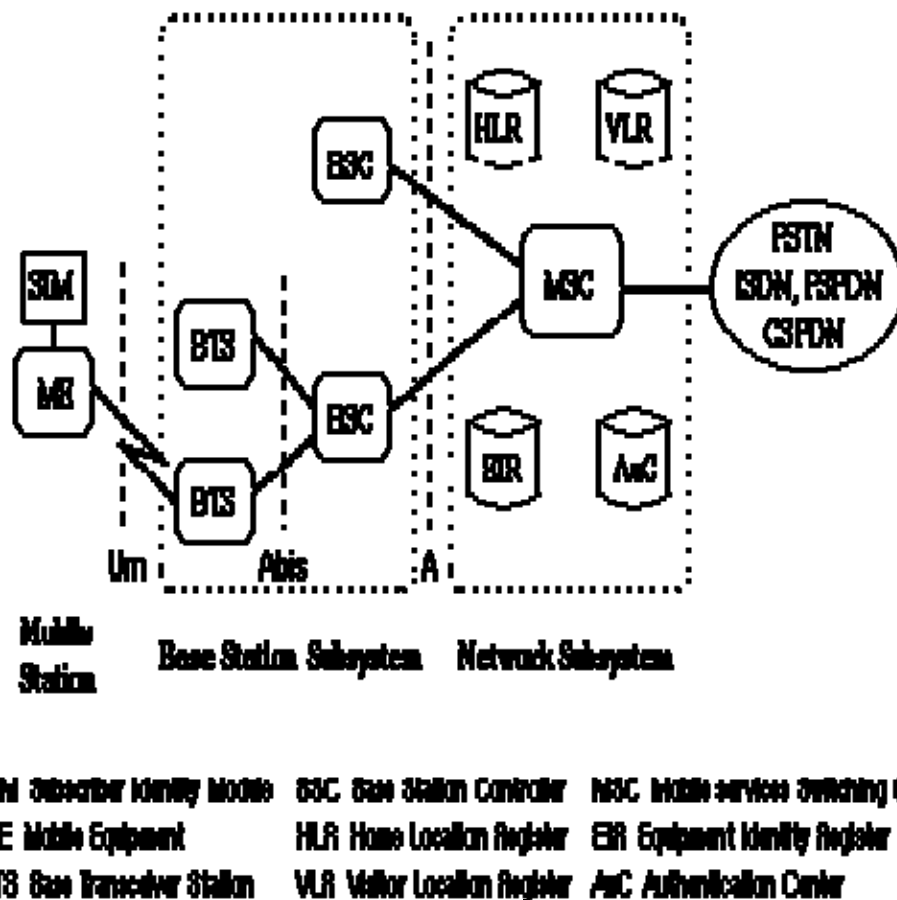


Fig 3 General architecture of a GSM network

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current

can be on or off so relays have two switch positions and they are double throw (changeover) switches and the figure is shown in Figure 4.

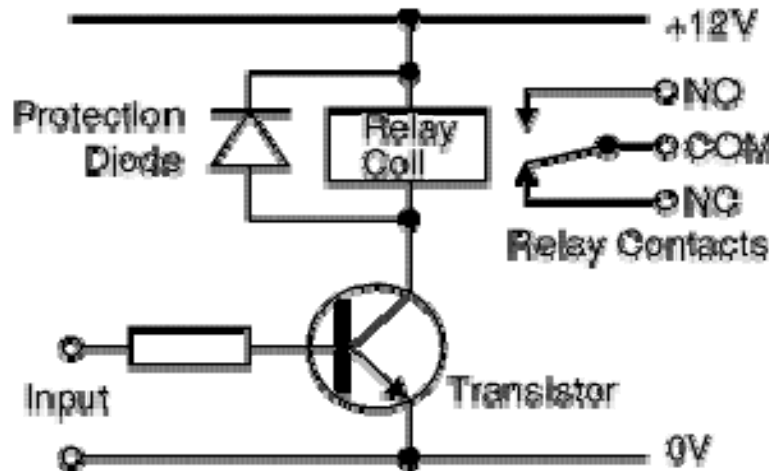


Fig 4 Relay

Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example a low voltage battery circuit can use a relay to switch a 230V AC mains circuit. There is no electrical connection inside the relay between the two circuits; the link is magnetic and mechanical. The coil of a relay passes a relatively large current, typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. Most ICs (chips) cannot provide this current and a transistor is usually used to amplify the small IC current to the larger value required for the relay coil. The maximum output current for the popular 555 timer IC is 200mA so these devices can supply relay coils directly without

amplification. The relay's switch connections are usually labeled COM, NC and NO:

- COM = Common, always connect to this; it is the moving part of the switch.
- NC = Normally Closed, COM is connected to this when the relay coil is off.
- NO = Normally Open, COM is connected to this when the relay coil is on.
- Connect to COM and NO if you want the switched circuit to be on when the relay coil is on.
- Connect to COM and NC if you want the switched circuit to be on when the relay coil is off.

The flowchart of GSM based smart Notice Board is shown in Figure 5.

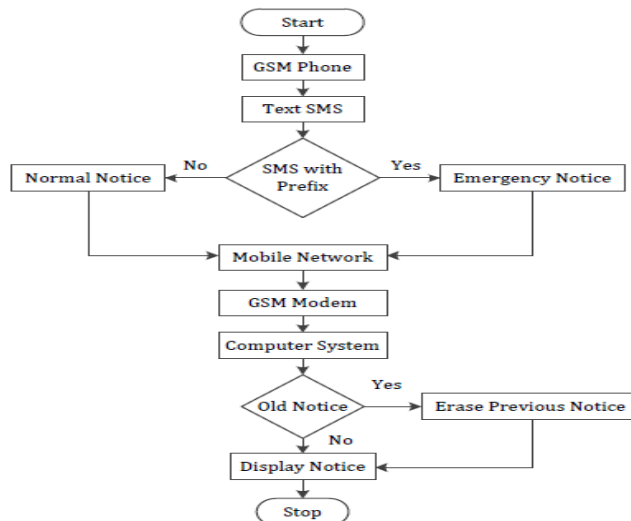


Fig: 5 FLOW CHART

#### 4. IMPLEMENTATION

The microcontroller receives an SMS through the GSM module on occurrence of one of the two events: (a) when a notice is sent by a user through application; (b) user clicks on ON/OFF button in the application. When the SIM inserted in the GSM module receives a notice as an SMS from a user, it saves the SMS and the data is transferred to LPC2148 through DB9 port of GSM to USB port of ARM development board connected by USB to RS232 driver. On receiving data from the GSM, LPC2148 sends a write command to the 16\*2 alphanumeric LCD followed by transfer of data to the 8 data pins of the LCD. The application named Home Automation is used to send message that gets displayed in the LCD. On clicking an ON/OFF button, an SMS is generated and sent by the application Home Automation to the SIM in GSM module. The GSM module transfers the data to LPC2148 as explained. On receiving the data, LPC2148 sends a signal (logic 0 or logic 1) to the relay driver which turns the motors ON/OFF as per the message. Microcontroller LPC2148 and the GSM SIM900 module communicate through any one of the two UART devices which are 16C550 present in the LPC2148 chip. In this project, UART0 has been used to connect to the GSM module. Among all the 64 pins of the microcontroller, pin P0.0 is the TXD0 (transmit) pin and pin P0.1 is the RXD0 (receive) pin. The RXD0 and TXD0 pins of LPC2148 are connected to the TX and RX of the GSM Module respectively with jumper wires. The UART is initialized for communication to happen. The Frequency Of Crystal Oscillator (FOSC) is 12MHz and to maintain a frequency of 60MHz for the CPU (FCCLK) through Phase Locked Loop (PLL) output, the multiplier is set as M=5 and the following registers are configured: PLL0CON=0x01 PLL0CFG=0x24 The sequence fed is: PLL0FEED=0Xaa PLL0FEED=0x55. Hence, the peripheral clock frequency FPCLK is set as FCCLK/4.

After ensuring connection established, the GSM modem is set to text mode to read the SMS in text mode otherwise it gets displayed in binary mode. So, the string "AT+CMGF=1" is sent to GSM module which sets the SMS at index 1 in text mode. Since, it is known that the latest SMS is always stored at index 1, the data sent is "AT+CMGF=1" where 1 is the index

number of the message. Next, in order to read the message and send it for display the string "AT+CMGR=1" is sent to GSM. Finally, after the message is read, it is sent to LCD in 4-bit mode and displayed.

The 16\*2 LCD has eight data pins and three special pins namely, Read/Write (R/W), Enable (E) or Register Select (RS). In 8-bit mode, all the eight data lines of LCD are connected to eight I/O pins of LPC2148 along with three other pins also connected to the microcontroller but in 4-bit mode, only four data lines are connected to the microcontroller. Here, 4-bit mode has been used to display

In 4-bit mode, the data lines D0-D3 of LCD are not connected and D4-D7 are connected to pins P0.19-P0.22 of LPC2148. The R/W, E and RS pins are connected to pins P0.16, P0.17 and P0.18 pins of LPC2148 respectively. Initially, the LCD is initialized and then the data is sent to it to get it displayed. RS pin, if high, selects the data register and LCD interprets any data sent to it as data to be displayed and if RS pin is low, command register is selected so the data sent to LCD is interpreted as a command by the LCD. The enable pin is used to enable transfer of command or data to LCD from microcontroller. The command/data transfer is enabled when E pin gets a transition from high to low. The R/W pin, if high gives read operation and gives write operation otherwise.

For initialization, the pins R/W is kept low (write), RS is kept low and command is sent through the 4-bit mode and But to place the command into command register, E pin is transitioned from high to low each time a byte is sent to the LCD. The commands sent for initialization in hexadecimal are, 28H, 20H, 06H, 01H and 80H. The application includes Home appliance control, Industrial applications, Hotel lights / fans control Shops and showrooms.

#### CONCLUSION

The paper GSM based smart home and digital notice board has been successfully designed and tested. It has been developed by integrating features of all the hardware components used. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit. Secondly, using highly advanced IC's and with the help of growing technology on digital has been successfully

implemented. It can decrease use of papers and hence deforestation can be turned into Afforestation. It can reduce physical effort of printing- It is cheap and secured for any organizing paper based notices. It requires to circulate notices regularly and reduces physical effort as well as ensures energy consumption management for any user. Although only fan has been driven through the system, in future, other devices like microwave, washing machine can also be operated while the user is aged.

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