

# GSM Based Alphanumeric Scrolling Display System

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**Abstract**— In this technical paper explains how a reliable and an authentic wireless communication could be easily developed between a mobile phone and microcontroller using GSM Technology. This technical paper explains "GSM based Alphanumeric Scrolling Display System" which can be widely used for displaying notices in colleges, advertisement in stock market, public place on digital notice board by sending messages in form of SMS through mobile. The hardware board contains PIC 16F877A microcontroller at the heart of the system. The microcontroller is interfaced with GSM Modem via MAX232 level convertor. It is used to convert RS232 voltage levels to TTL voltage levels and vice versa. Hardware also contains a real time clock DS1307 to maintain track of time. A 16x2 Character LCD display and Alphanumeric panel is attached to microcontroller for display. Microcontroller coding will be done using Embedded C and MpLab. Multiple Users are authorized to update notices on the digital notice board.

**Index Terms**—GSM Module, Alphanumeric display board, LCD, PIC Controller.

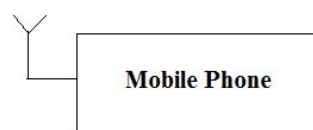
## I. INTRODUCTION

Wireless communication has announced its arrival on big stage and the world is going mobile. Man want to control everything and without moving an inch. This remote control of appliances is possible through an Embedded Systems. An embedded system is a combination of hardware and software to perform a specific function. Notice Board is primary devices in any institution / organization or public utility places like bus stations, railway stations and parks to display any text information. But to change or manage information time-to-time is a difficult process. so, an advanced wireless notice board system is required.

In this paper, advance wireless notice board system is proposed to display notice/advertisement sent through a SMS from an transmitter. The receiver will receives the SMS, validates the authentic code send with an SMS and displays the desired information after necessary code conversion.

## II. BLOCK DIAGRAM

### A. Transmitter



### B. Receiver

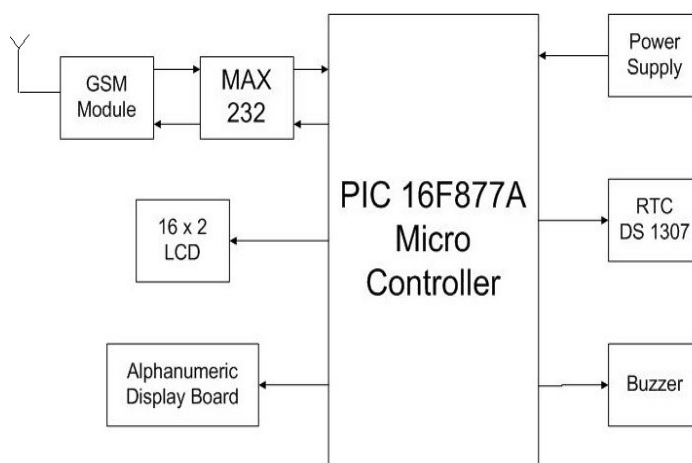


Figure 1. Block Diagram of the System

Block diagram of proposed system "GSM based Alphanumeric Scrolling Display System" is shown in figure 1. This system is basically divided into two part (i) Transmitter (ii) Receiver . Mobile phone acts as transmitter which is used to send SMS to the receiver part. Receiver part is consist of GSM Modem, Microcontroller, MAX232, Buzzer, 16x2 LCD and Alphanumeric Display. In this paper LCD is interface with port A of controller, Alphanumeric Panel is interface with port B and D of the controller while buzzer, RTC and GSM modem is interface with port C of controller. GSM modem operates on 12V power supply. The core part of receiver is PIC microcontroller which is energized by 5V power supply.

The SMS is received by microcontroller which is in the form of ASCII characters. The MAX232 circuit is used to level the voltage difference between GSM module and microcontroller. Arrived SMS is stored in EEPROM. After

the authentication of the code by the microcontroller, SMS is finally displayed on Moving Display Board. The buzzer is connected to the microcontroller for indication of new message arrived for display. Hardware also contains a real time clock DS1307 to maintain track of time. Both these ICs are interfaced with microcontroller using I2C interface. A 16x2 Character LCD display is attached in byte mode to port A of microcontroller and it is also display arrived messages.

### III. HARDWARE DESCRIPTION

#### A. Microcontroller

A Microcontroller is a small computer on a single IC containing processor core, memory and programmable input/output peripherals. It is the brain of the embedded system. In this paper PIC16F877A[1] microcontroller is used for interfacing the LCD, memory, Alphanumeric display board and other peripheral with GSM modem. PIC16F877A is a power full 40 pin microcontroller which provide 33 input/output pin, 5 I/O ports 8Kbyte on chip flash memory, 256 bytes EEPROM. The flash memory allows the program memory to be reprogrammed in system or by a nonvolatile memory programmer.

#### B. GSM Modem

A GSM modem is a specialized [2] 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. A GSM modem can be either external device like Wavecom FASTRACK modem or PC card. AT commands instructions used to control a modem. Reading of message from the SIM card inserted into the modem is done by sending of appropriate AT commands to modem. GSM supported an extended set of AT commands. some common basic AT commands are shown in below table [3].

AT commands	Meaning
AT+CMGR	Read SMS Message
AT+CMGS	Send SMS Message
AT+CMSS	Send SMS from Storage
AT+CMGD	Delete SMS Message

#### C. Max232

Max232 [4] is used to convert a RS232 logic level to TTL logic level and vice-versa, during serial communication of microcontroller and GSM modem because GSM modem work at RS232 voltage levels logic 1 varies from -3 to -15 volts and logic 0 varies from +3 to +15 volts where the controller which works on TTL logic levels logic 1 is +5 volts and logic 0 is 0 volts.

#### D. 16x2 LCD

LCD(Liquid Crystal Display) is an electronic devices for displaying Alphanumeric. In this paper 14 pin LCD is used to display the character which being displayed by alphanumeric panel with the real time clock.

#### E. Alphanumeric Display Board

LED displays have two main types: numeric display and alphanumeric display. LED numeric display is called 7 segment led display, too. 7 segment led display is applied widely to electrical appliances. It can be used in instruments and meters. LED numeric displays show Arabic numerals. LED numeric display shows information related to numbers: temperature, time, speed and so on. LED alphanumeric display can show led number and led letter in alphabet and Arabic numerals. LED alphanumeric display is widely used in instruments and meters too. But LED alpha numeric display is used less than led numeric displays.

In this Paper 16 alphanumeric segment are connected in series with driver circuit to display the advertisement.

#### F. DS1306 Real time clock

The DS1307[5] is a low-power clock/calendar with 56 bytes of battery-backed SRAM. The clock/calendar provides seconds, minutes, hours, day, date, month, and year information. The date at the end of the month is automatically adjusted for months with fewer than 31 days, including corrections for leap year.

The DS1307 operates as a slave device on the I2C bus. Access is obtained by implementing START condition and providing a device identification code followed by a register address. Subsequent registers can be accessed sequentially until a STOP condition is executed. When VCC falls below 1.25 x VBAT, the device terminates an access in progress and resets the device address counter. Inputs to the device will not be recognized at this time to prevent erroneous data from being written to the device from an out-of tolerance system. When VCC falls below VBAT, the device switches into a low-current battery-backup mode. Upon power-up, the device switches from battery to VCC when VCC is greater than VBAT +0.2V and recognizes inputs when VCC is greater than 1.25 x VBAT. The block diagram in Figure 1 shows the main elements of the serial RTC.

#### G. Buzzer

Buzzer is an electronic devices that makes a buzzing sound when powered. buzzer is controlled by the microcontroller using single pin. In this system it is used to define the arrival of new message for display.

### IV. FLOW DIAGRAM

The operational flowchart of the system is shown in figure 2.

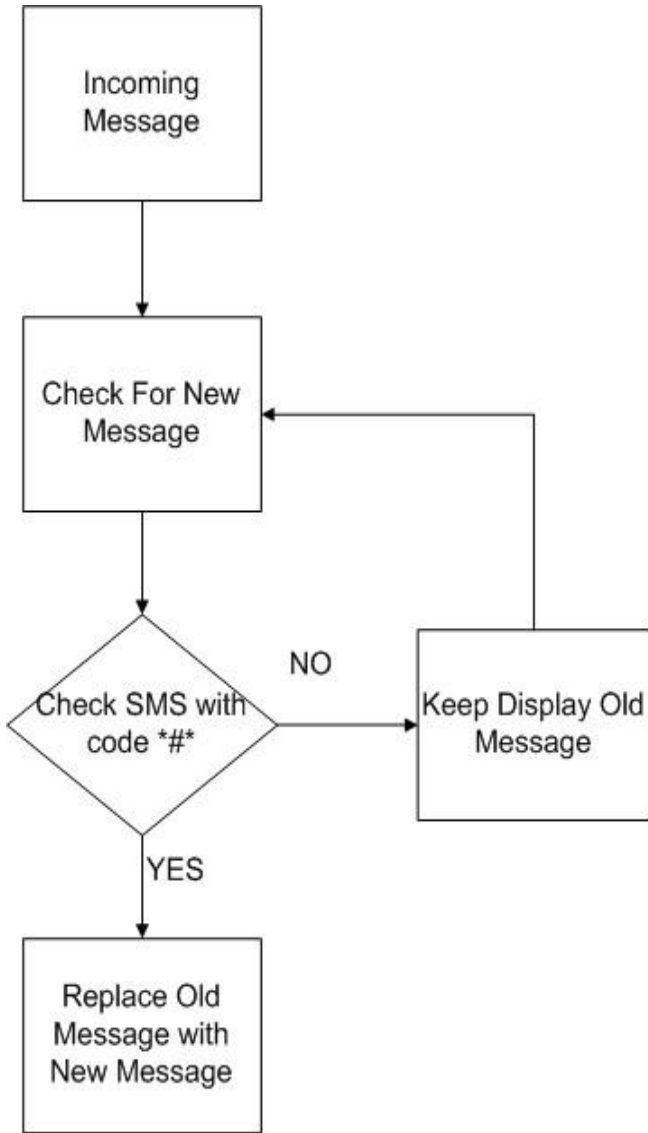


Figure 2. Flow diagram of system

### V. SOFTWARE

#### A. MPLAB IDE

MPLAB IDE is a free integrated toolset for the development of embedded applications on Microchip's PIC. written code is tested and debug in MPLAB v8.56 IDE.

#### B. Hyper terminal

HyperTerminal is a program, to connect computer with other computers, Telnet sites, bulletin board systems, online services, and host computers. HyperTerminal connections are made using a modem, a null modem cable, or an Ethernet connection. it can also useful in diagnosing whether a connection problem is due to modem/line issues or dial-up networking issue[6]. and if GSM/GPRS modem work properly then with help of Hyper terminal user send AT commands to mobile phone or GSM/GPRS modem which is connected with the system.

### VI. CIRCUIT DIAGRAM

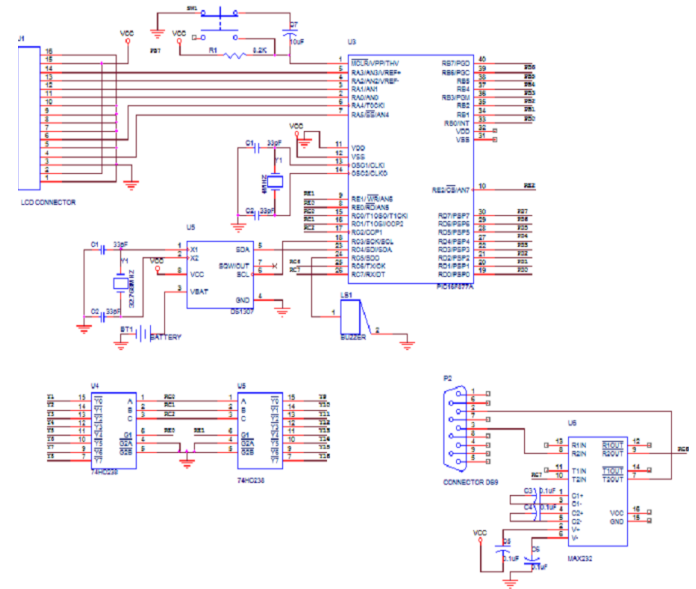


Figure 3. Circuit Diagram of the System

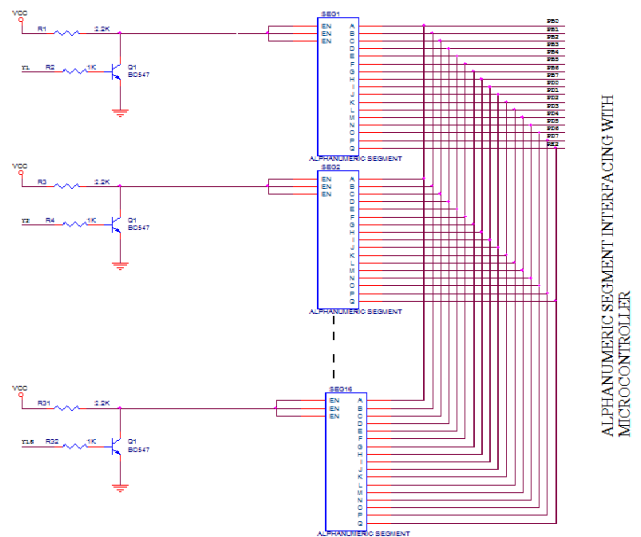


Figure 4. Circuit diagram to interfacing of Alphanumeric Segment with PIC Microcontroller

### VII. APPLICATION

- Hospitals
- Banks
- Sports stadium
- Airports
- Railway stations
- Education Sector
- Stock market

### VIII. RESULTS

Figure 5. shows developed hardware system. After the software and hardware designs have been completed, the ultimate generated codes are compiled and downloaded in microcontroller for testing. First compiled code is tested in

Hyper terminal which are shown in figure 6.

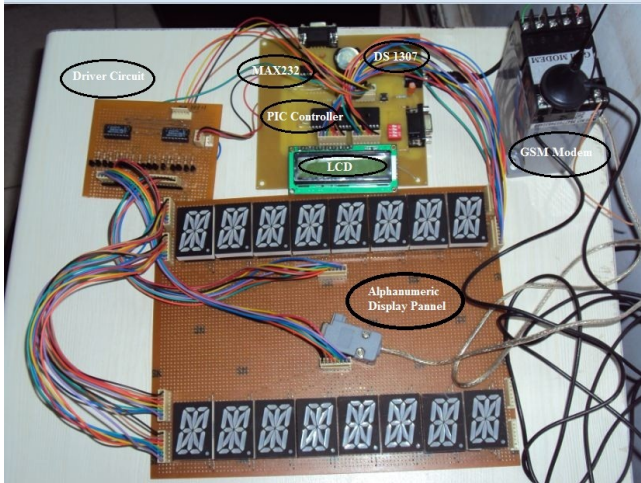


Figure 5. Designed Hardware of System

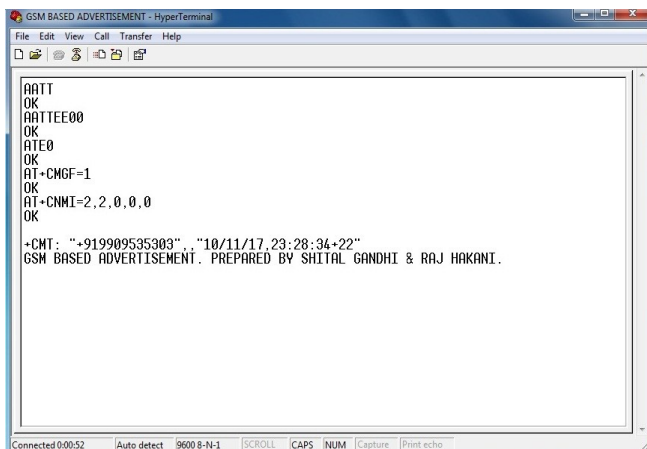


Figure 6. Received Message on Hyper Terminal

After initializing the Alphanumeric panel and verifying the GSM module the system is ready to receive the SMS. In this paper display board can receive message of max 60 character using GSM modem.



Figure 7. Display Received Message on Alphanumeric Display Board

PIC controller gives indicate by buzzer for arrival of new message and the one by one bit of message stored in array ,

this array then display by display board according to programming. Message displayed on to Alpha numeric segment board as shown in figure 7.

The other thing is lcd displays continuous scrolling received message and gives IST time due to rtc DS1307 programming which are shown in figure 8.



Figure 8. Display Real time clock and date

## IX. CONCLUSION

The Proposed designed in this paper has been successfully completed and tested with integration of the features of every hardware component for its development. The GSM modem accepts the SMS, and check for valid code if code is valid then displays it in the LCD as well as on Alphanumeric modules. if code is not valid then it displays previous received SMS. The major constraints is it received only 60 character for display. These limitation is can be removed by use of extended RAM. Multiple display board are also used to display same message at different places at same time

## REFERENCES

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