Chapter 1

Introduction

1.1Aim of the Project:

This project is an implementation to the idea of the wireless communication between a mobile phone and a microcontroller.

What makes SMS messaging so successful worldwide SMS is a success all over the world. The number of SMS messages exchanged every day is enormous. SMS messaging is now one of the most important revenue sources of wireless carriers. What is so special about SMS that makes it so popular worldwide some of the reasons are discussed below.

SMS messages can be sent and read at any time,nowadays almost every person has a mobile phone and carries it most of the time. With a mobile phone, you can send and read SMS messages at any time, no matter you are in your office, on a bus or at home.

SMS messages can be sent to an Offline Mobile Phone unlike a phone call, you can send an SMS message to your friend even when he/she has not switched on the mobile phone or when he/she is in a place where the wireless signal is temporarily unavailable. The SMS system of the mobile network operator will store the SMS message and later send it to your friend when his/her mobile phone is online.

SMS messaging is less disturbing while you can still stay in such unlike a phone call, you do not need to read or reply an SMS message immediately. Besides, writing and reading SMS messages do not make any noise. While you have to run out of a theatre or library to answer a phone call, you do not need to do so if SMS messaging is used.

SMS messages are supported by 100% GSM mobile phones and they can be exchanged between different wireless carriers, SMS messaging is a very mature technology. All GSM mobile phones support it. Not only that you can exchange SMS messages with mobile users of the same wireless carrier, but you can also exchange SMS messages with mobile users of many other wireless carriers worldwide.

SMS is a suitable technology for wireless applications to build onhere are some of the reasons that make SMS a suitable technology for wireless applications to build on.

Firstly, SMS messaging is supported by 100% GSM mobile phones. Building wireless applications on top of the SMS technology can maximize the potential user base.

Secondly, SMS messages are capable of carrying binary data besides text. They can be used to transfer ringtones, pictures, operator logos, wallpapers, animations, Cards,(calendar entries), etc.

1.2 Organization of Report

The chapter 2 gives detailed literature explanation regarding the existing wireless technology and various microcontrollers. It has also describes the basic concepts of wireless communication.

The chapter 3 deals with the hardware & software used in implementation of GSM based notice board.

In chapter 4 we have discussed about the PCB layout, interface details, schematic diagram of GSM based notice board.

In chapter 5 we have given conclusion and the future scope of project GSM based notice board.

Chapter 2

Literature Survey

2.1 Introduction

There are various types of wireless technologies available for designing the GSM based notice board. Among of all the technologies few like CDMA, GPRS and GSM are described as follows.

CDMA

Code division multiple access (CDMA) is a form of multiplexing (not a modulation scheme) and a method of multiple access that does not divide up the channel by time (as in time division multiple access), or frequency (as in frequency-division multiple access), but instead encodes data with a special code associated with each channel and uses the constructive interference properties of the special codes to perform the multiplexing. CDMA also refers to digital cellular telephony systems that make use of this multiple access scheme, such as those pioneered by Qualcomm & W-CDMA by the International Telecommunication union or ITU.

CDMA has since been used in many communications systems, including the Global Positioning System and in the Omni TRACS satellite system for transportation logistics. Number of different terms are used to refer to CDMA implementations. The original U.S. standard defined by QUALCOMM was known as IS-95, the IS referring to an Interim Standard of the Telecommunications Industry Association (TIA). IS-95 is often referred to as 2G or second generation cellular. The QUALCOMM brand name CDMA one may also be used to refer to the 2G CDMA standard. The CDMA has been submitted for approval as a mobile air interface standard to the ITU International Telecommunication Union. Whereas the Global System for Mobile Communications (GSM) standard is a specification of an entire network infrastructure, the CDMA interface relates only to the air interface—the radio part of the technology. For example GSM specifies an infrastructure based on internationally approved standard while CDMA allows each operator to provide the network features as it finds suited. On the air interface, the signalling suite (GSM: ISDN SS7) work has been progressing to harmonise these.

After a couple of revisions, IS-95 was superseded by the IS-2000 standard. This standard was introduced to meet some of the criteria laid out in the IMT-2000 specification for 3G, or third generation, cellular. It is also referred to as 1xRTT which simply means "1 times Radio Transmission Technology" and indicates that IS-2000 uses the same 1.25 MHz shared channel as the original IS-95 standard. A related scheme called 3xRTT uses three 1.25 MHz carriers for a 3.75 MHz bandwidth that would allow higher data burst rates for an individual user, but the 3xRTT scheme has not been commercially deployed. More recently, QUALCOMM has led the creation of a new CDMA-based technology called 1xEV-DO, or IS-856, which provides the higher packet data transmission rates required by IMT-2000 and desired by wireless network operators.

The QUALCOMM CDMA system includes highly accurate time signals (usually referenced to a GPS receiver in the cell base station), so cell phone CDMA-based clocks are an increasingly popular type of radio clock for use in computer networks. The main advantage of using CDMA cell phone signals for reference clock purposes is that they work better inside buildings, thus often eliminating the need to mount a GPS antenna on the outside of a building.

This CDMA system is frequently confused with a similar but incompatible technology called Wideband Code Division Multiple Access (W-CDMA) which forms the basis of the W-CDMA air interface. The W-CDMA air interface is used in the global 3G standard UMTS and the Japanese 3G standard FOMA, by NTT DoCoMo and Vodafone; however, the CDMA family of US national standards (including cdmaOne and CDMA2000) are not compatible with the W-CDMA family of International Telecommunication Union (ITU) standards.

The size of a given cell depends on the power of the signal transmitted by the handset, the terrain, and the radio frequency being used. Various algorithms can reduce the noise introduced by variations in terrain, but require extra information be sent to validate the transfer. Hence, the radio frequency and power of the handset effectively determine the cell size. Long wavelengths need less energy to travel a given distance vs. short wavelengths, so lower frequencies generally result in greater coverage while higher frequencies result in shorter coverage. These characteristics are used by mobile network planners in determining the size and placement of the cells in the network. In cities, many small cells are needed; the use of high frequencies allows sites to be placed more-closely together, with more subscribers

provided service. In rural areas with a lower density of subscribers, use of lower frequencies allows each site to provide broader coverage.

Various companies use different variants of CDMA to provide fixed-line networks using Wireless local loop (WLL) technology. Since they can plan with a specific number of subscribers per cell in mind, and these are all stationary, this application of CDMA can be found in most parts of the world.

CDMA is suited for data transfer with busty behaviour and where delays can be accepted. It is therefore used in Wireless LAN applications; the cell size here is 500 feet because of the high frequency (2.4 GHz) and low power. The suitability for data transfer is the reason for why W-CDMA seems to be "winning technology" for the data portion of third-generation.

The first radiotelephone service was introduced in the US at the end of the 1940s, and was meant to connect mobile users in cars to the public fixed network. In the 1960s, a new system launched by Bell Systems, called Improved Mobile Telephone Service" (IMTS), brought many improvements like direct dialling and higher bandwidth. The first analog cellular systems were based on IMTS and developed in the late 1960s and early 1970s. The systems were "cellular" because coverage areas were split into smaller areas or "cells", each of which is served by a low power transmitter and receiver.

First generation (1G) analog system for mobile communications saw two key improvements during the 1970s: the invention of the microprocessor and the digitization of the control link between the mobile phone and the cell site.

Second generation (2G) digital cellular systems were first developed at the end of the 1980s. These systems digitized not only the control link but also the voice signal. The new system provided better quality and higher capacity at lower cost to consumers.

Third generation (3G) systems promise faster communications services, including voice, fax and Internet, anytime and anywhere with seamless global roaming. ITU's IMT-2000 global standard for 3G has opened the way to enabling innovative applications and services (e.g. multimedia entertainment, infotainment and location-based services, among others). The

first 3G network was deployed in Japan in 2001. 2.5G networks, such as GPRS (Global Packet Radio Service) are already available in some parts of Europe.

It is to be noted that analog and digital systems, 1G and 2G, still co-exist in many areas. Mobile operators use radio spectrum to provide their services. Spectrum is generally considered a scarce resource, and has been allocated as such. It has traditionally been shared by a number of industries, including broadcasting, mobile communications and the military. At the World Radio Conference (WRC) in 1993, spectrum allocations for 2G mobile were agreed based on expected demand growth at the time. At WRC 2000, the resolutions of the WRC expanded significantly the spectrum capacity to be used for 3G, by allowing the use of current 2G spectrum blocks for 3G technology and allocating 3G spectrum to an upper limit of 3GHz.

Before the advent of cellular technology, capacity was enhanced through a division of frequencies, and the resulting addition of available channels. However, this reduced the total bandwidth available to each user, affecting the quality of service. Cellular technology allowed for the division of geographical areas, rather than frequencies, leading to a more efficient use of the radio spectrum. This geographical re-use of radio channels is known as "frequency reuse".

In a cellular network, cells are generally organized in groups of seven to form a cluster. There is a "cell site" or "base station" at the centre of each cell, which houses the transmitter/receiver antennae and switching equipment. The size of a cell depends on the density of subscribers in an area for instance, in a densely populated area, the capacity of the network can be improved by reducing the size of a cell or by adding more overlapping cells. This increases the number of channels available without increasing the actual number of frequencies being used. All base stations of each cell are connected to a central point, called the Mobile Switching Office (MSO), either by fixed lines or microwave. The MSO is generally connected to the PSTN (Public Switched Telephone Network):

GPRS

General packet radio service (GPRS) is a packet-based wireless data communication service designed to replace the current circuit-switched services available on the second-

generation global system for mobile communications (GSM) and time division multiple access (TDMA) IS-136 networks. GSM and TDMA networks were designed for voice communication, dividing the available bandwidth into multiple channels, each of which is constantly allocated to an individual call (circuit-switched). These channels can be used for the purpose of data transmission, but they only provide a maximum transmission speed of around 9.6Kbps (kilobits per second).

GPRS distributes packets of data from several different terminals in the system across multiple channels, making a much more efficient use of the bandwidth currently available for 'bursty' applications such as internet access. In theory, using all eight channels in a GSM network at once, a GPRS connection can achieve a data transfer rate of up to 114Kbps. These higher data rates will allow users to interact with multimedia websites and similar applications using a mobile handset or notebook computer. In theory, GPRS services should be cheaper than circuit-switched connections, with the network only being used when data is being transmitted.

GPRS communication is designed to complement but not replace current circuit-switched networks, being used solely as an extra means of data communication. In practice, connection speeds will be significantly lower than the theoretical maximum, depending upon the amount of traffic on the network and upon the number of simultaneous channels supported by the handsets. In practice, GPRS is an evolutionary step towards enhanced data for global eve. As a packet-switched technology, GPRS supports the internet protocol (IP) and X.25, packet-switched standards currently used in wire line communications. As such, any service that is used on the fixed internet today will also be able to be used over GPRS. Because GPRS uses the same protocols as the internet, the networks can be seen as subsets of the internet, with the GPRS devices as hosts, potentially with their own IP addresses.

GPRS is based on a modulation technique called Gaussian minimum-shift keying (GMSK). This is where the rectangular pulses corresponding to the bit stream are filtered, using a Gaussian-shaped impulse response filter, producing lower side lobes than would otherwise be the case. This modulation technique does not allow as high a bit rate across the air interfaces as eight-phase-shift keying (8 PSK) modulation, which is being introduced in EDGE systems.

Enabling GPRS on a GSM or TDMA network requires the addition of two core modules, the Gateway GPRS Service Node (GGSN) and the Serving GPRS Service Node (SGSN). The GGSN acts as a gateway between the GPRS network and the public data networks such as IP and X.25. They also connect to other GPRS networks to enable roaming. The SGSN provides packet routing to all of the users in its service area.

As well as the addition of these nodes, GSM and TDMA networks have to have several extra upgrades to cope with GPRS traffic. Packet control units have to be added and mobility management, air interface and security upgrades have to be performed.

GSM

GSM is a complex system and difficult to understand. The Mobile Station (MS) refers to the mobile equipment. The Base Station Subsystem controls the radio link with the Mobile Station. The Network Subsystem performs main functions such as switching of calls between mobile users, mobility management operations, and proper operation and setup of a network these functions are controlled by the Mobile Services Switching Centre (MSC).GSM is a cellular network, which means that mobile phones connect to it by searching for cells in the immediate vicinity.

One of the key features of GSM is the Subscriber Identity Module, commonly known as a SIM card. The SIM is a detachable smart card containing the user's subscription information and phone book. This allows the user to retain his or her information after switching handsets. Alternatively, the user can also change operators while retaining the handset simply by changing the SIM. Some operators will block this by allowing the phone to use only a single SIM, or only a SIM issued by them; this practice is known as SIM locking, and is illegal in some countries

GSM networks operate in a number of different frequency ranges (separated into GSM frequency ranges for 2G and UMTS frequency bands for 3G). Most 2G GSM networks operate in the 900 MHz or 1800 MHz bands. Some countries in the Americas (including Canada and the United States) use the 850 MHz and 1900 MHz bands because the 900 and 1800 MHz frequency bands were already allocated. Most 3G GSM networks in Europe operate in the 2100 MHz frequency band.

GSM was designed with a moderate level of security. The system was designed to authenticate the subscriber using a pre-shared key and challenge-response. Communications between the subscriber and the base station can be encrypted.

The network behind the GSM seen by the customer is large and complicated in order to provide all of the services which are required. The Base Station Subsystem (the base stations and their controllers).The Network and Switching Subsystem (the part of the network most similar to a fixed network). This is sometimes also just called the core network. The GPRS Core Network (the optional part which allows packet based Internet connections).All of the elements in the system combine to produce many GSM services such as voice calls and SMS.

A variety of data services is offered. GSM users can send and receive data, at rates up to 9600 bps, to users on POTS (Plain Old Telephone Service), ISDN, Packet Switched Public Data Networks, and Circuit Switched Public Data Networks using a variety of access methods and protocols, such as X.25 or X.32. Since GSM is a digital network, a modem is not required between the user and GSM network, although an audio modem is required inside the GSM network to interwork with POTS. Other data services include Group 3 facsimile, as described in ITU-T recommendationT.30, which is supported by use of an appropriate fax adaptor. A unique feature of GSM, not found in older analog systems, is the Short Message Service (SMS). SMS is a bidirectional service for short alphanumeric (up to 160 bytes) messages. Messages are transported in a store-and-forward fashion. As traffic updates or news updates. Messages can also be stored in the SIM card for later retrieval .Supplementary services are provided on top of tele-services or bearer services.

A **microcontroller** (sometimes abbreviated **µC**, **uC** or **MCU**) is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals. Program memory in the form of NOR flash or OTP ROM is also often included on chip, as well as a typically small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications.

Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems. By reducing the size

and cost compared to a design that uses a separate microprocessor, memory, and input/output devices, microcontrollers make it economical to digitally control even more devices and processes. Mixed signal microcontrollers are common, integrating analog components needed to control non-digital electronic systems.

Some microcontrollers may use four-bit words and operate at clock rate frequencies as low as 4 kHz, for low power consumption (mill watts or microwatts). They will generally have the ability to retain functionality while waiting for an event such as a button press or other interrupt; power consumption while sleeping (CPU clock and most peripherals off) may be just nano watts, making many of them well suited for long lasting battery applications. Other microcontrollers may serve performance-critical roles, where they may need to act more like a digital signal processor (DSP), with higher clock speeds and power consumption.

Microcontrollers usually contain from several to dozens of general purpose input/output pins (GPIO). GPIO pins are software configurable to either an input or an output state. When GPIO pins are configured to an input state, they are often used to read sensors or external signals. Configured to the output state, GPIO pins can drive external devices such as LEDs or motors. Many embedded systems need to read sensors that produce analog signals. This is the purpose of the analog-to-digital converter (ADC). Since processors are built to interpret and process digital data, i.e. 1s and 0s, they are not able to do anything with the analog signals that may be sent to it by a device. So the analog to digital converter is used to convert the incoming data into a form that the processor can recognize. A less common feature on some microcontrollers is a digital-to-analog converter (DAC) that allows the processor to output analog signals or voltage levels.

In addition to the converters, many embedded microprocessors include a variety of timers as well. One of the most common types of timers is the Programmable Interval Timer (PIT). A PIT may either count down from some value to zero, or up to the capacity of the count register, overflowing to zero. Once it reaches zero, it sends an interrupt to the processor indicating that it has finished counting. This is useful for devices such as thermostats, which periodically test the temperature around them to see if they need to turn the air conditioner on, the heater on, etc.

A dedicated Pulse Width Modulation (PWM) block makes it possible for the CPU to control power converters, resistive loads, motors, etc., without using lots of CPU resources in tight timer loops. Universal (UART) block makes it possible to receive and transmit data over

a serial line with very little load on the CPU. Dedicated on-chip hardware also often includes capabilities to communicate with other devices (chips) in digital formats such as I²C and Serial Peripheral Interface (SPI).

2.2 Previous work done

William D. Richard, Member, IEEE, David E. Taylor, and David M. Zar, Member,IEEE, Multiuser SMS Based Wireless Electronic Notice Board

This is the project for displaying notices in colleges on electronic notice board by sending messages in form of SMS through mobile; it is a wireless transmission system which has very less errors and maintenance. The hardware board contains microcontroller AT89c52 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. The hardware also has a 64K EEPROM chip AT24C64. This EEPROM is used to store the timings and messages to be displayed. Hardware also contains a real time clock DS1307 to maintain track of time. A 16x2 Character LCD display is attached to microcontroller for display. Microcontroller coding will be done using Embedded C and Kiel. PC Coding will be done using Visual Basic. Multiple Users are authorized to update notices on the electronic notice board by providing them password. [1]

The short message service (SMS), a bidirectional service for short alphanumeric (up to 160 bytes) messages, is a unique feature of GSM not found in older analog systems. The multi receiver's short message traffic has increased amazingly over the years.

In this paper, we propose a multicast SMS architecture over our backbone network. Then, we demonstrate some approaches to maintain the location information of SMS centre consistent to the home location register and illustrate our scheme for mobile terminated short message transfer. Finally, we simulate and evaluate this architecture. Our simulation indicates that the proposed strong consistency approaches have optimal efficiency by adjusting parameters, and the proposed architecture efficiently provides self-routing capability and multicast functionality in our cellular back-bone network. This study also provides a further insight on the issues of multicast wireless cellular backbone network and demonstrates a referable methodology to propose and analyse a multicast cellular backbone network, which can promote the technology of personal communication network. Index Terms—Cellular core

network, multi destination multicast, multiple-receivers short messages, shuffle-exchange network. [2]

The inspiration behind the wireless world came from the need to provide users with mobility and to offer an alternative to the limitations of wired mediums. As a result, there are various wireless mobile technologies like GSM, GPRS, WLAN, and Bluetooth available. The user interface and the size of mobile devices are one of the main concerns in the design of mobile devices. In this paper, we design a single layered touch screen based user interface. Unlike conventional multi-layered user interface, a single-layered user interface will make the user interface more user-friendly with smaller size. The memory requirements can be further reduced by implementing it in low-level languages. After design and implementation of the user interface, we integrate the user interface with the hardware of mobile devices through serial port with the help of AT commands. [3]

The current trend of increasing instant messaging (IM) use and its potential growth motivate this study. It offers a novel exploration of users' preferences for IM in the context of the use of other traditional and new communication media: face-to-face, telephone, email, and short messaging service (SMS) in two distinct cultures: Australia and China. It examines the impact of demographics, media experience, media richness perception, and national culture on media preferences. Our results, based on a student survey conducted in the two countries, show that women prefer IM for communication activities that require more attention and personal presence and prefer email for communication activities that require less personal presence. Communication technology experience may predict the adoption of new technology, such as IM and SMS, but has no effect on media that are already widely adopted, such as email. Email was clustered with face-to-face and telephone as the most preferred media for any communication activity, while IM and SMS clustered together and were the least preferred media for communication. After controlling for demographics and media experience, we found significant cultural differences in IM, telephone, and email preferences. Chinese preferred to use IM and telephone, while Australians preferred to use email. The cultural impact on technology use is persistent. [4]

In this paper, it is proposed to design a model where the message to be displayed is sent through a SMS from an authorized transmitter. The toolkit receives the SMS, validates the user and displays the desired information after necessary code conversion. The main components of the toolkit contains microcontroller 89c52 which is interfaced with PC via

MAX232 level convertor. MAX 232 level converter is used to convert RS232 voltage to TTL voltage levels and vice versa. We use PC's serial port to interface microcontroller. A 16x2 Character LCD display is attached in byte mode to port 1 of microcontroller. This display will be used to display the messages /advertisements. Microcontroller coding will be done using Embedded C and Kiel. PC Coding will be done using VB. Nokia PC Connectivity SDK is a tool used in VB for GSM modem interfacing. The modem transmits the stored message through the COM port. The microcontroller displays the message in the LCD display board. The microcontroller used in this case is AT89c52. MATRIX SIMADO GDT11 is used as a GSM modem. In the prototype model, LCD display is used for simulation purpose. While implementation this can be replaced by actual display boards. [5]

Conclusion

After the survey we done on various wireless technology, we have decided to use GSM technology in our wireless notice board. Further as we did survey on microcontrollers and we found that 89c51 microcontroller is of the series of 8051&one of oldest yet commonly used microcontroller. 89c51 have the less complex features then other microcontroller and it is also easily available in comparison of other microcontrollers.

In the next chapter we have discussed the complete implementation process of our project. The whole process is divided into two parts, hardware and software implementation. Each of the implementation process is explained thoroughly.

Chapter3

Methodology & Implementation

3.1 Block Diagram of GSM based notice board

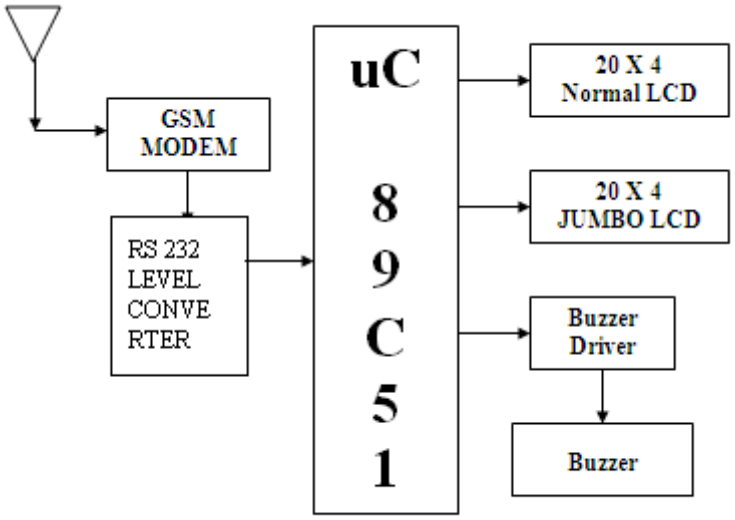


Fig.3.1 Block diagram of GSM based notice board

As shown in the block diagram microcontroller block is a low-power, high-performance CMOS 8-bit microcomputer with 4K bytes of Flash Programmable and Erasable Read Only Memory PEROM). The device is manufactured using Atmel's high-density non-volatile memory technology and is compatible with the MCS-51™ instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non-volatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel micro-controller is a powerful microcomputer, which provides a highly flexible and cost effective solution so many embedded control applications.

The LCD blocks signifies the two LCD's connected in the circuit. We are using 20 X 4 LCD to display the notice, which will be with transmitter. JUMBO LCD is also used for the public purpose which will be visible to everyone.

In fig.3.1 the output signal from micro-controller 89C51 is weak so we have to amplify that signal. Buzzer driver block i.e. amplifier block amplifies the signal for driving the Buzzer. For amplification Transistor BC 547 is used to ring the Buzzer as output device. When SMS is received the Buzzer turns ON for some time. Again when SMS is read the Buzzer Turns On for some time. Again when SMS is deleted then Buzzer turns on for some time.

For our project we require + 5 Volt and +12 Volts supply. +5 Volts is given to Micro-controller board, and LCD display, And +12 Volts are used for GSM MODEM.

The RS-232 interface is used for GSM modem which works on the RS-232 voltage levels, logic 1 varies from -3 to -15 volts and logic 0 from +3 to +15 volts. The microcontroller which works on TTL logic levels, logic 1 is +5 volts and logic 0 is 0 volts. Therefore to interface the two we use a MAX 232 driver IC manufactured by Maxim.

As shown in fig.3.1 the GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate.

A GSM modem can be an external unit or a PCMCIA card (also called PC Card). An external GSM modem is connected to a PC through a serial cable, a USB cable, Bluetooth or Infrared. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate.

PC's use AT commands to control a GSM modems. You can use a GSM modem just like a Hayes compatible modem. GSM modems support an extended set of AT commands. These extended AT commands are defined in the GSM standards.

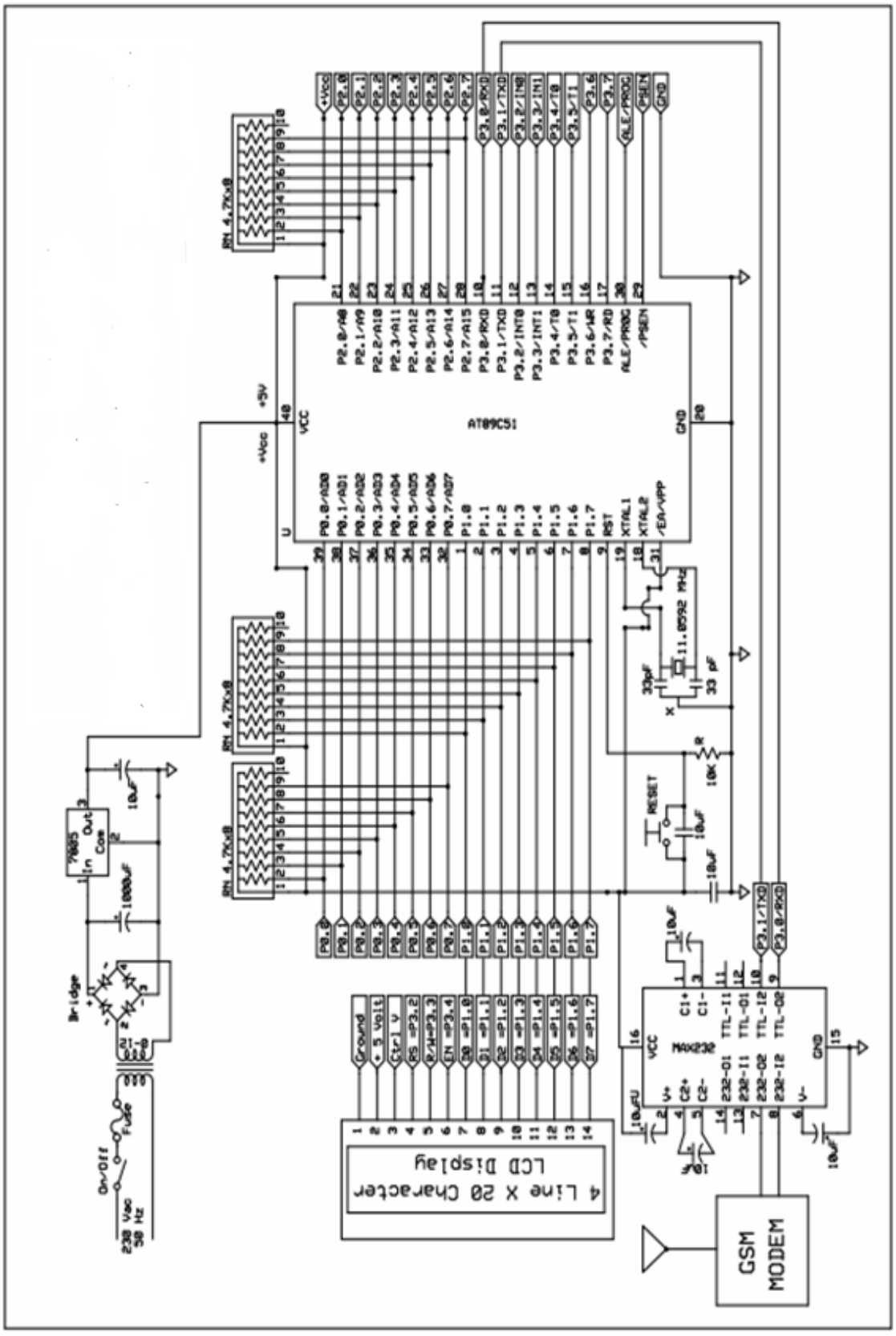


Fig.3.2 Schematic of GSM based notice board

As shown in schematic fig.3.2, we are using 89C51 micro-controller as CPU. 89C51 micro-controller requires some extra supporting hardware like + 5 volts power supply, POR as well as manual RESET, Clock generator and pull up resisters, which can be explained as follows.

For getting +5 volts supply, the + 12 volts supply from transformer output is taken. And through bridge rectifier it is given to 7805. The minimum input to 7805 is +7 Vdc and maximum input is + 35 vdc. And we are giving + 9 Vdc as input to the 7805. Therefore the output of the 7805 is constant regulated +5 Vdc.

When we switch ON the power supply of the CPU board then micro-controller must be RESET to start the program execution from 0000H memory location. Therefore POR is must. POR means Power on Reset. For this purpose we have to use RC differentiator circuit. RC differentiator circuit will provide logic High pulse to RESET pin of 89C51, when you switch ON the power supply. Sometimes we requires manual RESET. For this purpose one push to ON tact switch is used. When you press this tact switch then logic high signal is given to the RESET pin of the Micro-controller 89C51.

In schematic fig.3.2, the maximum clock frequency of the Micro-controller 89C51 is 24 MHz, Therefore we can use any frequency less than 24 MHz, but if we are using PC interfacing then for selecting the bits per second we have to use particular crystal. For selecting 9600 bits per second we have to use 11.0593 MHz crystal. Now just connecting the crystal is not sufficient to generate the clock, it requires two additional capacitors to generate the starting spike pulse.

In micro-controller port 0 does not have internal pull up resister therefore we have to use the external pull up resister at port 0. At other ports external pull up resistor is optional. But we had connected the external pull up registers for other ports also.

In our project to monitor the status of sensor, we require LCD display. The disadvantage of LCD is it will not emit the light. Therefore to remove this disadvantage we have to select the LCD, which has backlight LED. Four lines are sufficient for our project. Therefore we can select 4 line 20 character LCD displays.

For GSM modem which works on the RS-232 voltage levels, logic 1 varies from -3 to -15 volts and logic 0 from +3 to +15 volts. The microcontroller which works on TTL logic levels, logic 1 is +5 volts and logic 0 is 0 volts. Hence to interface the two we use a MAX 232 driver IC manufactured by Maxim.

A standard serial interfacing for PC, RS232C, requires negative logic, i.e., logic '1' is -3V to -12V and logic '0' is +3V to +12V. To convert a TTL logic, say, TxD and RxD pins of the uC chips, thus need a converter chip. A MAX232 chip has long been using in many uC boards. It provides 2-channel RS232C port and requires external 10uF capacitors.

3.2 GSM modem interfacing:

This project is mainly depending on the GSM Modem. A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate.

A GSM modem can be an external unit or a PCMCIA card (also called PC Card). An external GSM modem is connected to a PC through a serial cable, a USB cable, Bluetooth or Infrared. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate.

PC's use AT commands to control a GSM modem and normal Hayes modems support a common set of AT commands. You can use a GSM modem just like a Hayes compatible modem. GSM modems support an extended set of AT commands. These extended AT commands are defined in the GSM standards.

With these we can:

- Send SMS messages.
- Monitor the signal strength.
- Monitor the charging status and charge level of the battery.
- Read, write and search phone book entries.

The number of SMS messages that can be processed by a GSM modem is pretty low, approximately six messages per minute.

3.3 PCB Preparation Technique

P.C.B CONSTRUCTION

A Printed Circuit Board (P.C.B) can be defined as an insulating base material to which is permanently attached a flat metallic network of conducting paths whose dimensions depends upon the current that can be handled by them. The P.C.B may be either single sided or double sided. The P.C.B used for this project is single sided one.

The basic material used may be resin coated papers, fibre glass, ceramic and the flat board configuration however is most widely used and it may be of the nature of the single "Mother Board" into which smaller boards are plugged by the especially designed connectors which ensures adequate and permanent low resistance coupling.

PCB designing is the most important and requires great care during work. In this case great care must be taken while tracing the circuit or layout on the board. Because once PCB is designed, it is virtually impossible to alter it. While designing a circuit, designer should take care to avoid crossing of conducting paths (tracks) as possible. Crossover are unavoidable then only of the jumpers can be used. A circuit board carrying copper on both sides can also help to solve this problem when circuit is complicated.

The next stage lies in proportion to designing i.e. to prepare "Master Diagram ",which is commonly made twice as the finished circuit, since this makes the working on that much easier, especially when circuit is complicated photography eventually reduces the size of diagram to that of the circuit, before proceeding we must know some rules regarding the designing.

1. The space between the conductors must be strictly controlled to avoid the possibility of electrical discharge or unwanted capacitance. The amount by which the master diagram is to reduce in size is thus a critical design feature.

2. The conductor must be wider in those parts of the circuits that are going to handle large currents must be handle without undue temperature of conductors.

3. The minimum width of copper should not generally be less than about 1.5mm. This is related to mechanical strength rather than the electrical properties and it also ensures that strips remains securely bounded to the base material.

4. The points where the components holes for lead wires occurs must be sited to suit the dimensions of the components and dimensions between lead-out wires, so that, the components can be situated correctly on finished board. The conductor is also men large at the point of holes.

When the master diagram probable twice the size of real PCB has been evolved, the text major step consist of etching or dissolving the unwanted metal from copper cladded board to create the circuit as depicted by master diagram. It must be stressed that very accurate checking of master is essential at this stage. Then, the master point is mounted on a special frame on easy facing of a larger camera and with the aid of the very powerful illumination a master diagram is clearly photographed on a glass sensitive plate. This is developed to give photographic negative. Next so called “step and repeat camera." Is brought into operation. This comprises the camera body mounted so that sideways after each exposure. In this way number of copies of the original master diagram is set out exactly to cover standard sheet of copper clad laminate laboratory method of making PCB.

There are several important factors that need not be taken into account, if the finished device is to work properly we must consider gain factor and ensure that the input and output parts are sufficiently well isolated to avoid the possibility. We must also ensure that conductors and components carrying high frequency current are well separated from these parts of the circuits. We are also to make sure that all components need to return to earth are properly connected and that possibility of common impedance arising in earth returned. Other factors that have to successfully studied include availability of adequate return points on board and it's mounting from accessibility of switch connections made for mechanical fixing ventilation effect of vibration.

The copper side of the board must be thoroughly cleaned before Circuit plan is transferred to it. This is very important because even slightest trace of graze (from figure of instance) will impure the etching process and When the circuit plan has been neatly transferred to copper in this manner the board is held under, running tap and the allowed to dry before resist is applied.

Now, once cleaning is done plan has to transfer on copper surface of PCB material. A convenient way to do this is simply put a carbon paper between a copper surface of the board and working plan and carefully trace the lines of original plan with a ball pen.

Resist is nothing more than a substrate that is unaffected by presence etching chemicals. It is usually coloured so that, it can be easily seen the copper surface. When plan is clearly worked on clean copper then that are to be left in fact as the copper conductors must be covered when resists the leaguer type of paints possess good resist properties but disadvantages of relatively long time taken for drying. It is essential to resist through hardening before etching is started. Nail polished are better as they quickly and are less difficult to remove. Now-a-days etching taps along with IC pads are commonly used. To this, chances of short circulating due to paints are completely the avoid etching tapes and pads are available in different sizes.

When a result has been thoroughly hardened any errors that have been made can usually be corrected by gently scratching away with knife. To ensure clear out lines round edges of copper conductors on board the resist must be applied with steady band. Next comes etching of unwanted copper and whether a small single is all that is required as quantity of board to be produce certain precautions must be taken before operation is commenced the most etch ant I ferric chloride and to this is added small quantity of HCL to accelerate, But not critical as lab construction is concerned. Mixing 10 grams of ferric chloride and 25 grams of HCL with 15 grams of water can produce a good etchant.

Small plastic bath is ideal for storing the etchant process. The Depth of liquid must be sufficient to completely cover laminate, the laminated board carrying the resist pattern circuit is then dropped into etchant bath and the gentle agitation takes 5 to 20 minutes to complete depending on the strength of the etchant temperature and thickness of copper foil.

When all unwanted copper is dissolved from areas between conductors, board should be taken from an etchant and washed in water. The resist must be removed using proper solvent. After this the copper surface must be polished with any kind of cleaner. It should be seen that there is no slight incomplete etching between the conducting paths of the PCB. The PCB's are coated coating material for protection in lab coating material itself is a solder. This process is called Tinning. This process of coating involves tracks with soldier. Advantage of tinning the effect of environment of conductors, then PCB is drilled i.e. holes for filling and mounting the components on PCB are drilled with suitable drill bit.

After the holes are drilled, the components have to be assembled on PCB before assembling the components it is necessary to clean soldering iron in order to get easy and accurate soldering. Removing impurity particles that are gathered on iron bit due to repetitive use cleans soldering iron.

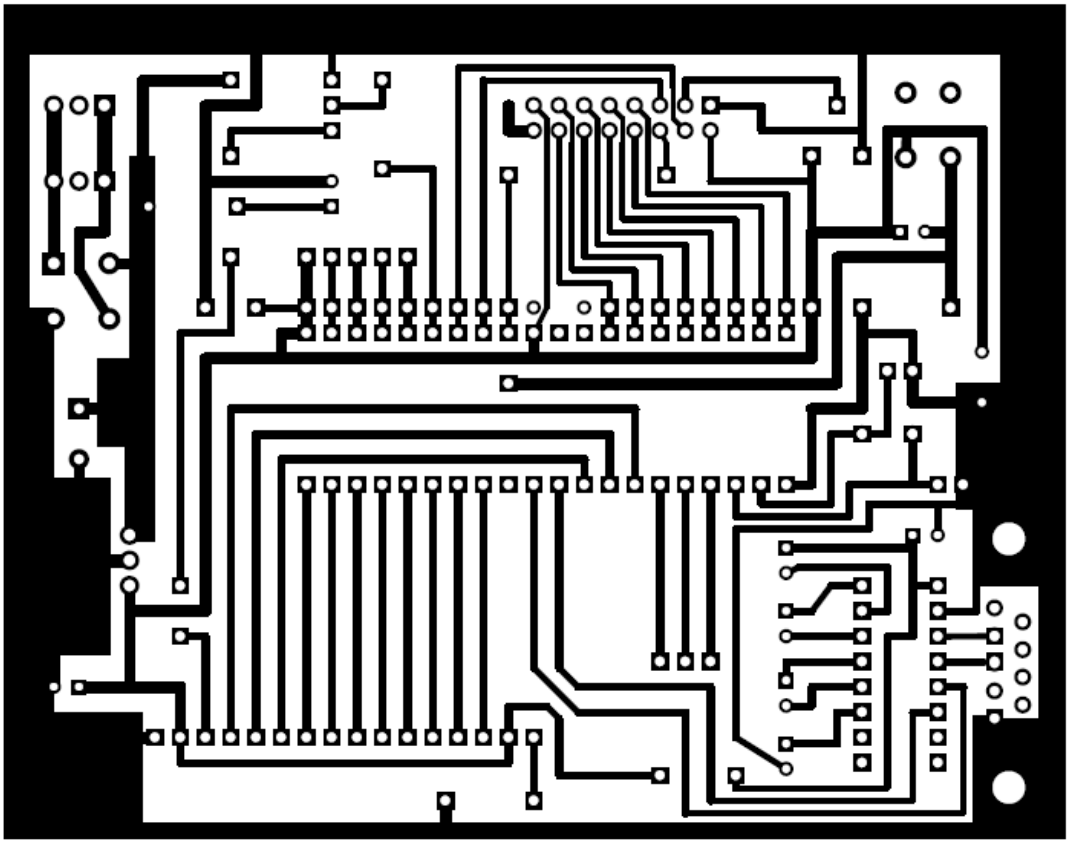


Fig.3.3 PCB Layout

3.4 Component List

Table 3.1 Component List

Sr. No.	Sr. No.	Item	Quantity	Rate	Total
A		**CPU - 89C51 Section**			
A.1		**89C51**			
A.1.a	1	Microcontroller 89C51	1	**50**	**50**
A.1.b	2	IC base 40 pin	1	**8**	**8**
A.2		**Power supply**			
A.2.a	3	Mains Cord	1	15	**15**
A.2.b	4	Transformer 0 - 12 Volts	1	70	**70**
A.2.c	5	Bridge W04	1	15	**15**
A.2.d	6	Filter 1000uF/25V	1	8	**8**
A.2.e	7	Regulator 7805	1	15	**15**
A.2.f	8	Capacitor 10uF/25V	1	4	**4**
A.2.g	9	Resistor 1 K	1	1	**1**
A.2.h	10	LED	1	1	**1**
A.3		**Clock**			
A.3.a	11	Crystal 11.0592 MHz	1	15	**15**
A.3.b	12	Capacitor 33pf	2	1	**2**
A.4		**RESET**			
A.4.a	13	Micro Switch 4 terminal	1	5	**5**
A.4.b	14	10 uF/25V	2	4	**8**
A.4.c	15	Resistor 10K	1	1	**1**
A.4.d	16	Capacitor 0.1uF Box type	1	3	**3**
A.5		**PULL UP Resister**			
A.5.1	17	4.7 K SIL Resistor	3	8	**24**
A.6		**LCD**			
A.6.a	18	LCD 20X4	1	600	**600**
A.6.b	19	LCD Male connector	1	5	**5**
A.6.c	20	LCD Fe-Male connector	1	5	**5**
A.6.d	21	Pre-set 1K	1	5	**5**
A.6.e	22	Resistor 1K	1	1	**1**
B		**INPUT Section**			
B.1		**GSM Section**			
B.1.a	23	GSM Modem	1	3500	**3500**
C		**OUTPUT Section**			
C.1		**Buzzer Section**			
C.1.a	24	Transistor BC 547	1	1	**1**
C.1.b	25	Resistor 1K	2	1	**2**
C.1.c	26	LED	1	1	**1**
C.1.d	27	Buzzer 12 V	1	25	**25**
D		**LEVEL Converter**			
D.1.a	28	IC Max 232	1	25	**25**
D.1.b	29	16 Pin IC Base	1	4	**4**
D.1.c	30	9 Pin D type Female Connector	1	25	**25**
D.1.d	31	Capacitor 10 uF/25 V	5	4	**20**

3.5 Software Implementation

We use different software for various purposes, there description is as follows.

EDIT.com is a software used for the editing of the images and photographs of the project GSM based notice board.

ASM31.exe is a software used as assembler in our project. This assembler is used to assemble the programs of microcontroller. The assembler is a software which converts the assembly language to the machine language.

Express PCB is one of the most important software used in our project. This software is used to design the layout of the main circuit of GSM based notice board. This software gives direct compact layout of PCB after designing circuit in it.

µC flash is a software used for the programming of microcontroller. The program is typed n checked in this software by executing it. All microcontrollers are compatible in this software, hence its widely used software for the microcontroller programming.

Algorithm for the circuit

1. Start.

In this step after switching on the power supply the circuit gets on and LED glows showing that the circuit is properly working.

2. Initialize the microcontroller.

In this step the microcontroller gets initialized and waits for the notice.

3. Send message through the mobile phone.

This step includes the sending of message through any general mobile phone.

4. Wait for the message to be received.

The modem of the circuit waits for the message to be arrived for displaying it.

5. Display the message on the LCD.

After receiving the message n proper code conversion the message is displayed on both the LCD screen.

6. Delete the message from memory.

After displaying the message its gets deleted from memory so as to make space available for the new message.

7. Wait for the new notice to be arrived.

In this step the old notice is displayed on LCD and it waits for the new notice.

3.6 Flowchart

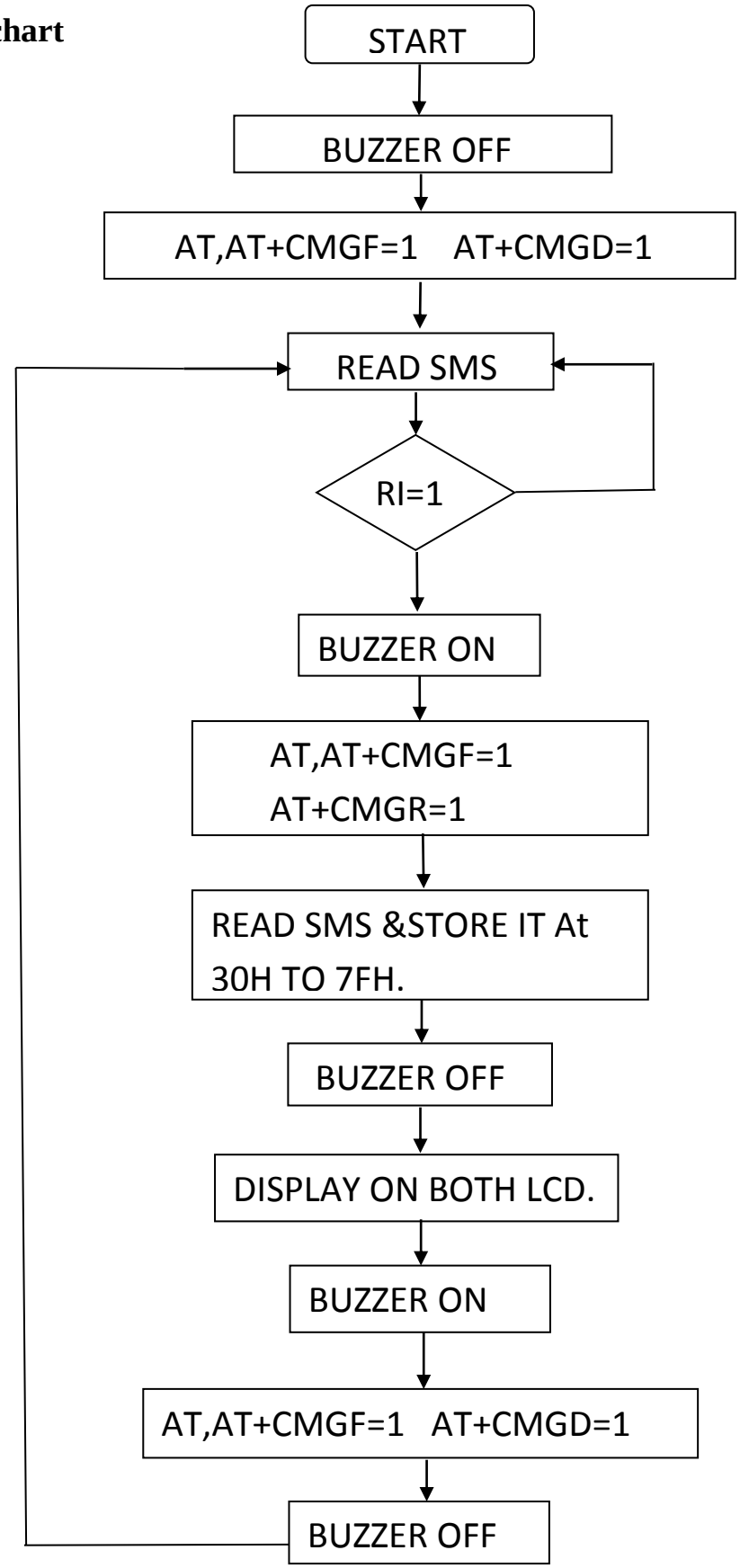


Fig.3.4 Flowchart of operation

The flowchart shown in fig.3.4 describes the complete functioning of the project GSM based notice board. This prototype of the GSM based digital notice board was efficiently designed. The buzzer of circuit gets on after switching on the power supply. This prototype has facilities to be integrated with a display board thus making it truly mobile. The toolkit accepts the SMS, notifies everyone by switching on the buzzer, stores it, validates it and then displays it in the LCD module. The SMS is deleted from the SIM each time it is read, and it again ring the buzzer, thus making room for the next SMS. In this case, it can solve the problem of instant information transfer in the campus.

CHAPTER 4

Result & Discussion

4.1 Hardware Result:

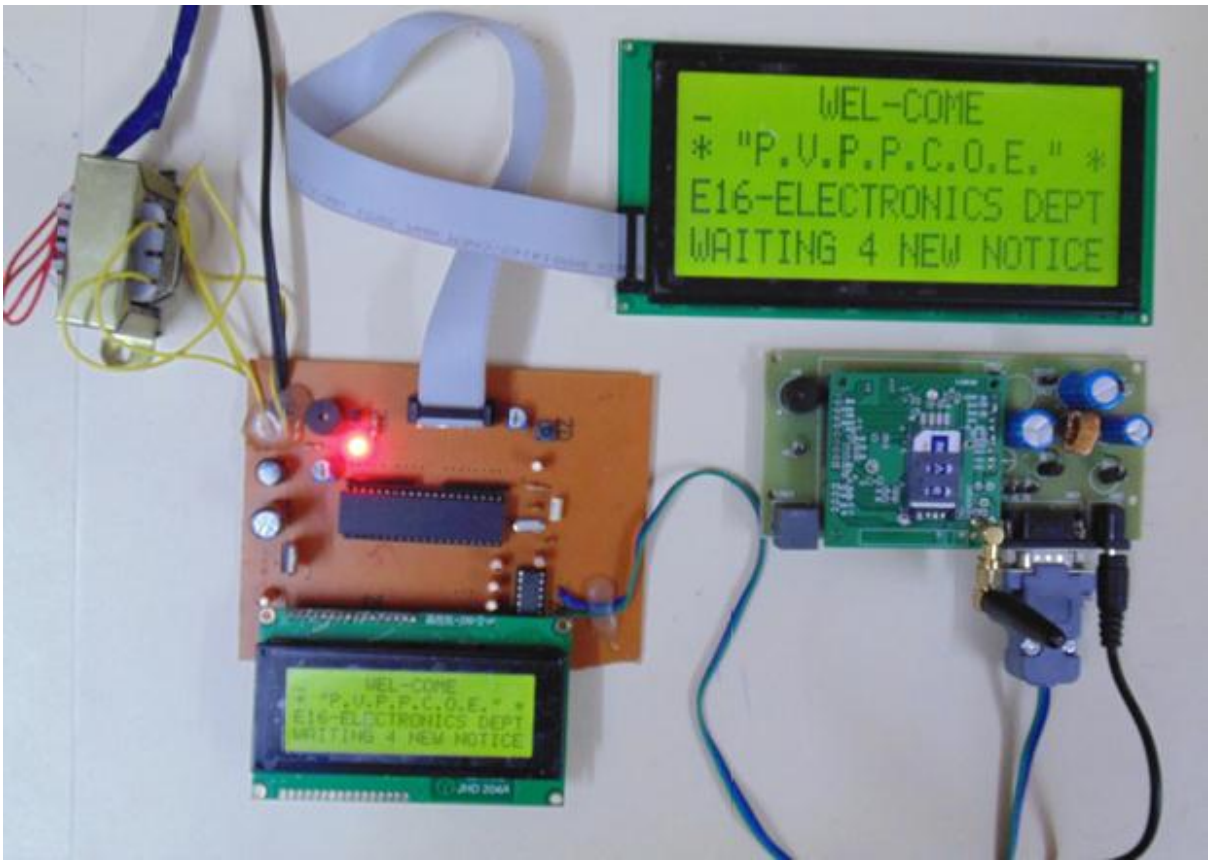


Fig.4.1 Photograph of GSM Based Notice Board

As shown in the fig.4.1, when the power supply is swicthed ON the cicuit gets ON. The LED glowing on the circuit board indicates that the circuit is getting proper input. Now this welcome message is shown every time the device is starts or its done reset.

Fig.4.2 Photograph of wait State

This fig.4.2 shows the default display whenever the circuit is ON. In this state the device is waiting for the new notice to be arrived by the message.

Fig.4.3 Snapshot of Read State

The fig.4.3 shows that the new message has been acquired by the GSM modem and the data is actually under processing. Whenever the new notice comes the device shows this display n indicates that the device is actually reading the notice to be displayed.

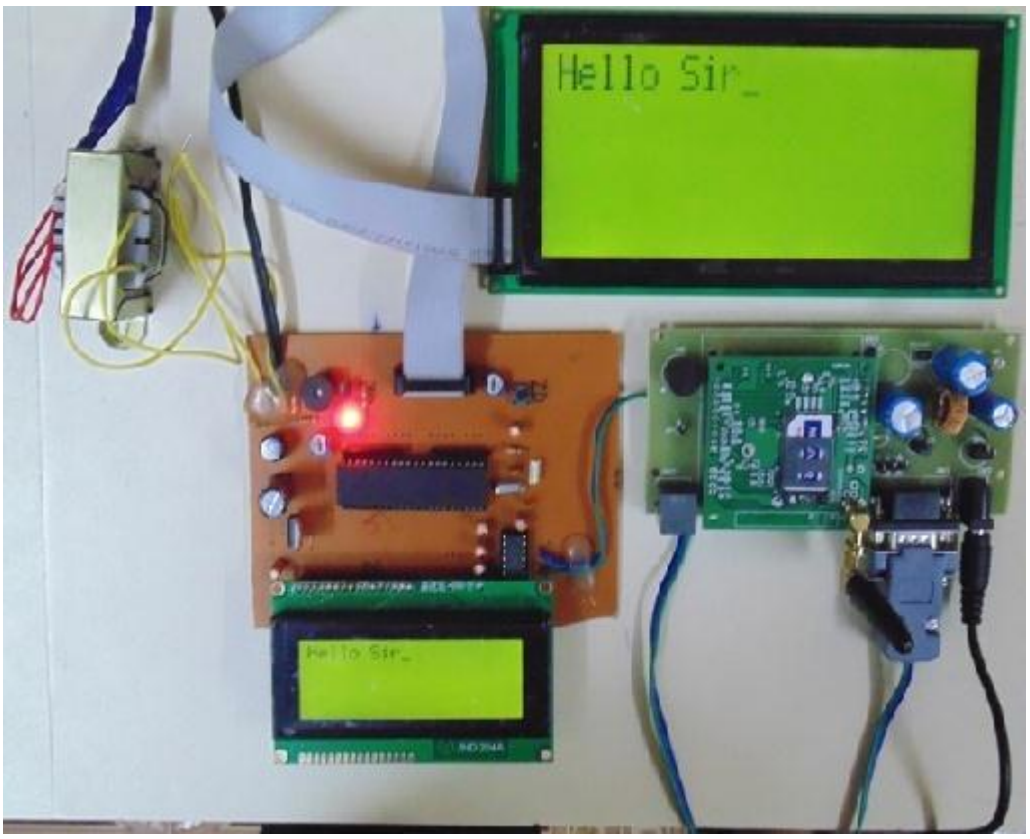


Fig.4.4 Photograph of Displaying Notice

After reading the new notice and proper code conversion the fig.4.4 indicates that the notice is displayed on both the LCD's. Whenever the new message is arrived at the GSM modem the previous notice gets replaced by the new notice.

4.2 Software Result

The software results are given below,

The above picture is a direct screenshot of device GSM based notice board. As we can see that after acquiring message from GSM modem the microcontroller does the necessary code conversion an as a result the message which is been sent by the mobile phone is displayed on the LCD's as it is. This process takes very less time and fast notice display is achieved.

Chapter 5

Conclusion

5.1 Summary

The wireless technologies change constantly with new and new technologies being developed and older technologies replaced with the new upgraded one. By introducing the concept of wireless technology in the field of communication we can make our communication more efficient and faster, with greater efficiency we can display the messages and with less errors and maintenance.

The wireless technology we have used is GSM technology. The main objective of our project was to provide a complete wireless notice board. We have successfully achieved the objective of faster and efficient notice display. This model can be used very efficiently used in establishments like chain restaurants wherein the order and special discounts can be displayed at all branches simultaneously, in colleges wherein students and staffs can be informed simultaneously in no time.

It can be set up at public transport places like railways, bus station, and airport and also at roadside for traffic control and in emergency situations, it is cost efficient system and very easy to handle. Latency involved in using of papers in displaying of notices is avoided and the information can be updated by the authorized persons.

5.2 Future Scope

First we tried to display the notices with the LED display but as it lead to the complex circuit for the construction of display we decided to carry on with the LCD display. As future development commercial model can be able to display the notice using the big size LED display.

In our project we are sending messages via GSM network and displaying only one message at a time due to time constraints, in future by using external memory like RAM & higher end microcontrollers can be used to display more than one message at a time. The GSM technology principle can be applied to control electrical appliances at a distant location.

Our prototype is mainly used for the text notice display, the same concept can be used to display the image files or pdf's with the use of better wireless technologies than GSM like Bluetooth or Wi-Fi systems with better extended memories.

APPENDIX

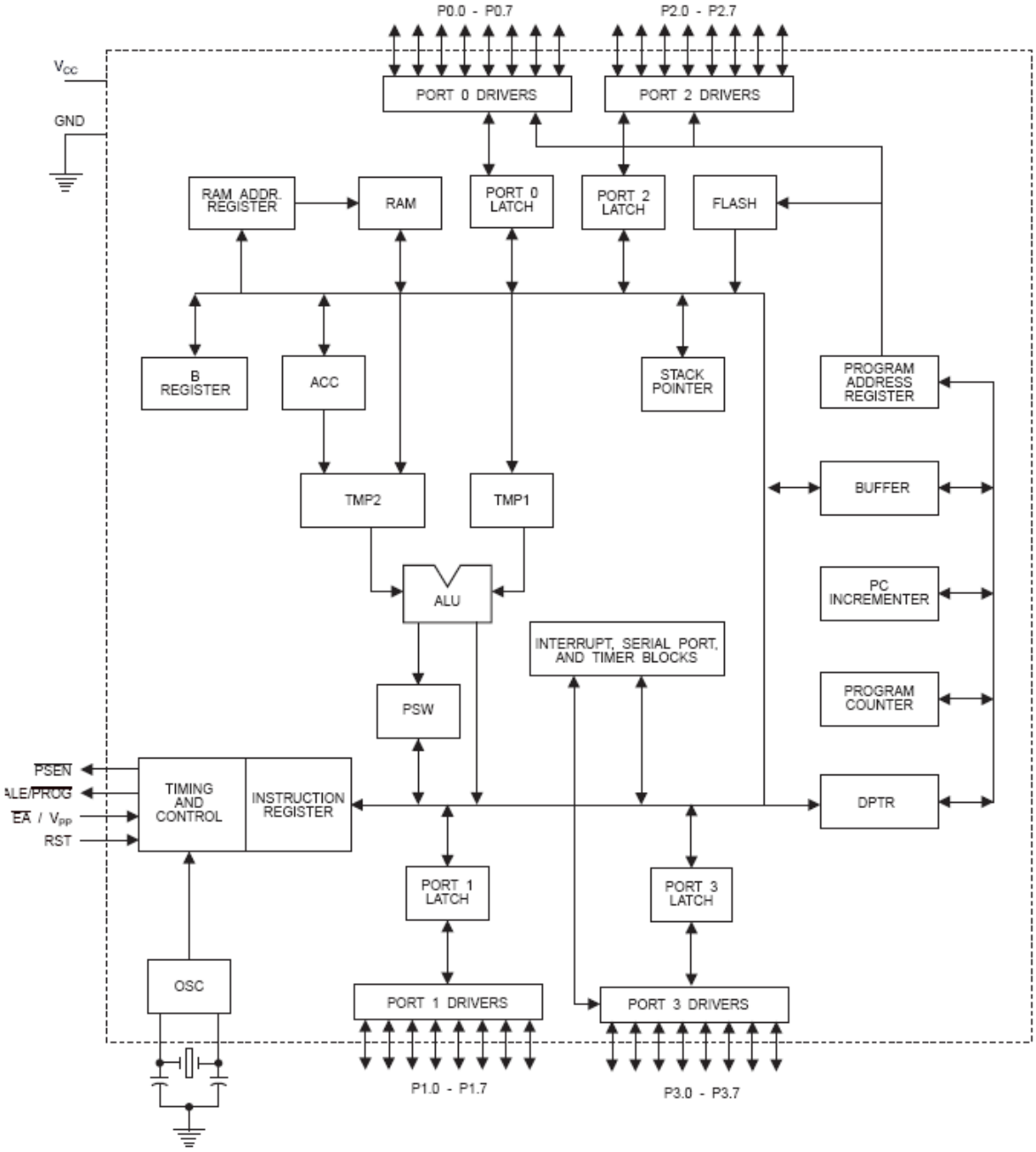
DATA SHEETS

8.1 Microcontroller 89C51

The AT89C51 is a low-power, high-performance CMOS 8-bit microcomputer with 4K bytes of flash programmable and erasable read only memory (PEROM). The device is manufactured using Atmel's high-density non-volatile memory technology and is compatible with the industry-standard MCS-51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non-volatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C51 is a powerful microcomputer which provides a highly-flexible and cost-effective solution to many embedded control applications.

The AT89C51 is designed with static logic for operation down to zero frequency and supports two Software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer / counters, serial port and interrupt system to continue functioning. The Power-down Mode saves the RAM contents but freezes the oscillator disabling all other chip functions until the next Hardware reset.

Block Diagram



Features of 89C51

Following are the features of 89C51 Micro-controller as per the datasheet given by Atmel-

i. Compatible with MCS-51™ Products.

ii. 4K Bytes of In-system Programmable Flash Memory Endurance

iii. 1,000 Write / Erase Cycles.

iv. Fully Static Operation : 0 Hz to 24 MHz

v. Three-level Program Memory Lock

vi. 128 x 8-bit Internal RAM

vii. 32 Programmable I / O Lines.

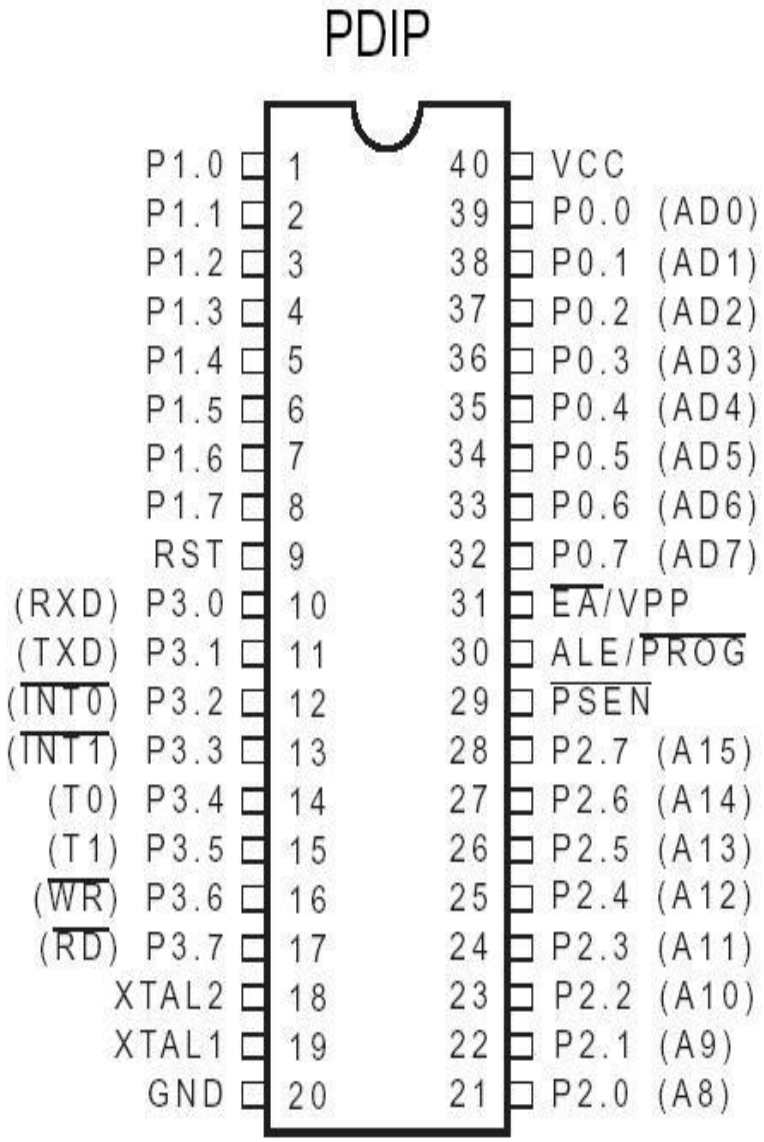
viii. Two 16-bit Timer / Counters

ix. Six Interrupt Sources

x. Programmable Serial Channel

xi. Low-power Idle and Power-down Modes

Pin Diagram of 89C51 Microcontroller



Pin Description

VCC: - Supply Voltage

GND: - Ground

Port 0:-

Port 0 is an 8-bit open-drain bi-directional I /O port. As an output port, each pin can sink eight TTL inputs. When 1s are written to port 0 pins, the pins can be used as high impedance inputs. Port 0 may also be configured to be the multiplexed low order address / data bus during accesses to external program and data memory. In this mode P0 has internal pull-ups. Port 0 also receives the code bytes during Flash programming, and outputs the code bytes during program verification. External pull-ups are required during program verification.

Port 1:-

Port 1 is an 8-bit bi-directional I / O port with internal pull-ups. The port 1output buffers can sink/source four TTL inputs. When 1s are written to port 1 pins they are pulled high by the internal pull-ups and can be used as inputs. As inputs, Port 1 pins that are externally being pulled low will source current (IIL) because of the internal pull-ups. Port 1 also receives the low-order address bytes during Flash programming and verification.

Port 2:-

Port 2 is an 8-bit bi-directional I / O port with internal pull-ups. The port 2 output buffers can sink / source four TTL inputs. When 1s are written to Port 2 pins they are pulled high by the internal pull-ups and can be used as inputs. As inputs, Port 2 pins that are externally being pulled low will source current (IIL) because of the internal pull-ups. Port 2 emits the high-order address byte during fetches from external program memory and during accesses to external data memory that uses 16-bit addresses (MOVX @ DPTR). In this application, it uses strong internal pull-ups when emitting 1s. During accesses to external data memory that uses 8-bit addresses (MOVX @ RI); Port 2 emits the contents of the P2 Special Function Register. Port 2 also receives the high-order address bits and some control signals during Flash programming and verification.

Port 3:-

Port 3 is an 8-bit bi-directional I /O port with internal pull-ups. The Port 3 output buffers can sink / source four TTL inputs. When 1s are written to Port 3 pins they are pulled high by the internal pull-ups and can be used as inputs. As inputs, Port 3 pins that are externally being pulled low will source Current (IIL) because of the pull-ups.

Port 3 also serves the functions of various special features of the AT89C51 as listed below, Port Pin Alternate Functions –

P3.0	RXD (Serial input port)
P3.1	TXD (Serial output port)
P3.2	INT0 (External Interrupt 0)
P3.3	INT1 (External Interrupt 1)
P3.4	T0 (Timer 0 external input)
P3.5	T1 (Timer 1external input)
P3.6	WR (External data memory write strobe)
P3.7	RD (External data memory read strobe)

RST:-

Reset input, a high on this pin for two machine cycles while the oscillator is running resets the device.

ALE / PROG:-

Address Latch Enable output pulse for latching the low byte of the address during accesses to external memory. This pin is also the program pulse input (PROG) during Flash programming. In normal operation ALE is emitted at a constant rate 1 / 6 the oscillator frequency, and may be used for external timing or clocking purposes. Note, however, that one ALE pulse is skipped during each access to external Data Memory. If desired, ALE operation can be disabled by setting bit 0 of SFR location 8EH. With the bit set, ALE is active only during a MOVX or MOVC instruction. Otherwise, the pin is weakly pulled high. Setting the ALE-disable bit has no effect if the Microcontroller is in external execution mode.

PSEN:-

Program Store Enable is the read strobe to external program memory. When the AT89C51 is executing code from external program memory, PSEN is activated twice each cycle, except that two PSEN activations are skipped during each access to external data memory.

EA / VPP:-

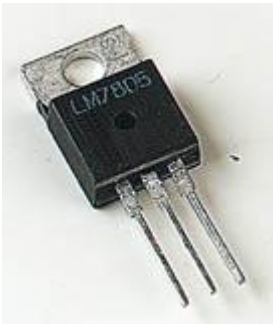
External Access Enable. EA must be strapped to GND in order to enable the device to fetch code from external program memory locations starting at 0000H up to FFFFH. Note, however, that if lock bit 1 is programmed, EA will be internally latched on reset. EA should be strapped to VCC for internal program executions. The pin also receives the 12-volt programming enable voltage (VPP) during Flash programming, for parts that require 12-volt VPP.

XTAL1:- Input to the inverting oscillator amplifier and input to the internal clock operating circuit.

XTAL2:- Output from the inverting oscillator amplifier.

Three Terminal Voltage Regulator-

General Features: -



A three terminal voltage regulator is a regulator in which the output voltage is set at some predetermined value. Such regulators do not require an external feedback connection. Hence, only three terminals are required for device of such types, input (Vin) output (Vo) and a ground terminal. Since the regulator operates at a preset output voltage the current limiting resistor is also internal to the device. The main advantages of such regulators are the simplicity of connections to the external circuit and the minimum of external components. Fig. Shows the basic circuit configuration of the three terminal voltage regulator. Although, the three terminal regulators offers only fixed output voltages, there are wide variety of voltages available, both positive and negative. The output current range from 100 mA to 3 A.

LM 78 MXX series 3 terminal positive voltage regulators.

General description: -

The LX78MXX series of three terminal regulators is available with several fixed output voltages making them useful in a wide range of applications. The voltage available allows these regulators to be used in logic system, instrumentation, Hi – Fi and other solid state electronic equipment. Although designed primarily devices can be used with external component to obtain adjustable voltage and current.

Features:

Internal thermal overload protection.

NO external components required.

Output transistor safe area protection.

Internal short circuit current limit.

Circularity allows start up even if output is pulled to negative voltage (I supplies)

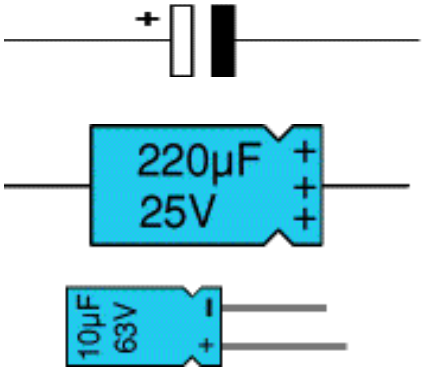
Absolute maximum ratings:

Input voltage	35 V
Internal power dissipation	internally limited.
Operating temperature range	0^0 C to 70^0 C
Maximum junction temperature	+ 125^0C
Storage temperature range	- 65^0 C to 150^0 C
Lead temperature	+ 230^0 C

Capacitors

Capacitors store electric charge. They are used to smooth varying DC supplies by acting as a reservoir of charge. They are also used in filter circuits because capacitors easily pass AC (changing) signals but they block DC (constant) signals.

Polarised capacitors (large values, 1µF +)

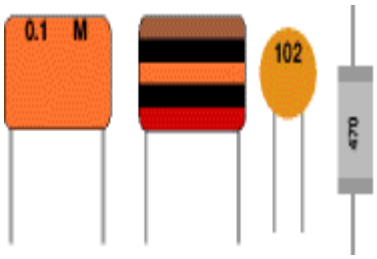


Electrolytic capacitors are polarized and they must be connected the correct way round, at least one of their leads will be marked + or -. They are not damaged by heat when soldering.

There are two designs of electrolytic capacitors; axial where the leads are attached to each end (220µF in picture) and radial where both leads are at the same end (10µF in picture). Radial capacitors tend to be a little smaller and they stand upright on the circuit board.

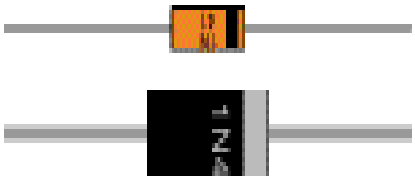
It is easy to find the value of electrolytic capacitors because they are clearly printed with their capacitance and voltage rating. The voltage rating can be quite low and it should always be checked when selecting an electrolytic capacitor.

Unpolarised capacitors (small values, up to 1µF)



Small value capacitors are un polarised and may be connected either way round. They are not damaged by heat when soldering, except for one unusual type (polystyrene). It can be difficult to find the values of these small capacitors because there are many types of them and several different labelling systems. Many small value capacitors have their value printed but without a multiplier, so you need to use experience to work out what the multiplier should be.

Diodes



Diodes allow electricity to flow in only one direction. The arrow of the circuit symbol shows the direction in which the current can flow. Diodes are the electrical version of a valve and early diodes were actually called valves.

Forward Voltage Drop

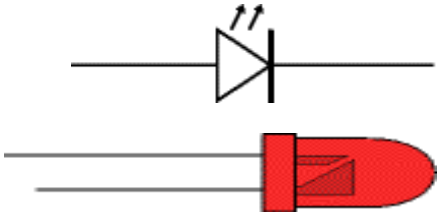
Electricity uses up a little energy pushing its way through the diode, rather like a person pushing through a door with a spring. This means that there is a small voltage across a conducting diode, it is called the forward voltage drop and is about 0.7V for all normal diodes, which are made from silicon. The forward voltage drop of a diode is almost constant whatever the current passing through the diode so they have a very steep characteristic (current-voltage graph).

Reverse Voltage

When a reverse voltage is applied a perfect diode does not conduct, but all real diodes leak a very tiny current of a few µA or less. This can be ignored in most circuits because it will be very much smaller than the current flowing in the forward direction. However, all diodes have a maximum reverse voltage (usually 50V or more) and if this is exceeded the diode will fail and pass a large current in the reverse direction, this is called breakdown.

Ordinary diodes can be split into two types: Signal diodes which pass small currents of 100mA or less and Rectifier diodes which can pass large currents. In addition there are LED (which have their own page) and Zener diodes (at the bottom of this page).

Light Emitting Diodes (LEDs)



LEDs emit light when an electric current passes through them.

Colours of LEDs

LEDs are available in red, orange, amber, yellow, green, blue and white. Blue and white LEDs are much more expensive than the other colours.

The colour of an LED is determined by the semiconductor material, not by the colouring of the 'package' (the plastic body). LEDs of all colours are available in uncoloured packages which may be diffused (milky) or clear (often described as 'water clear'). The coloured packages are also available as diffused (the standard type) or transparent.

Pre-sets

These are miniature versions of the standard variable resistor. They are designed to be mounted directly onto the circuit board and adjusted only when the circuit is built. For example to set the frequency of an alarm tone or the sensitivity of a light-sensitive circuit. A small screwdriver or similar tool is required to adjust pre-sets.

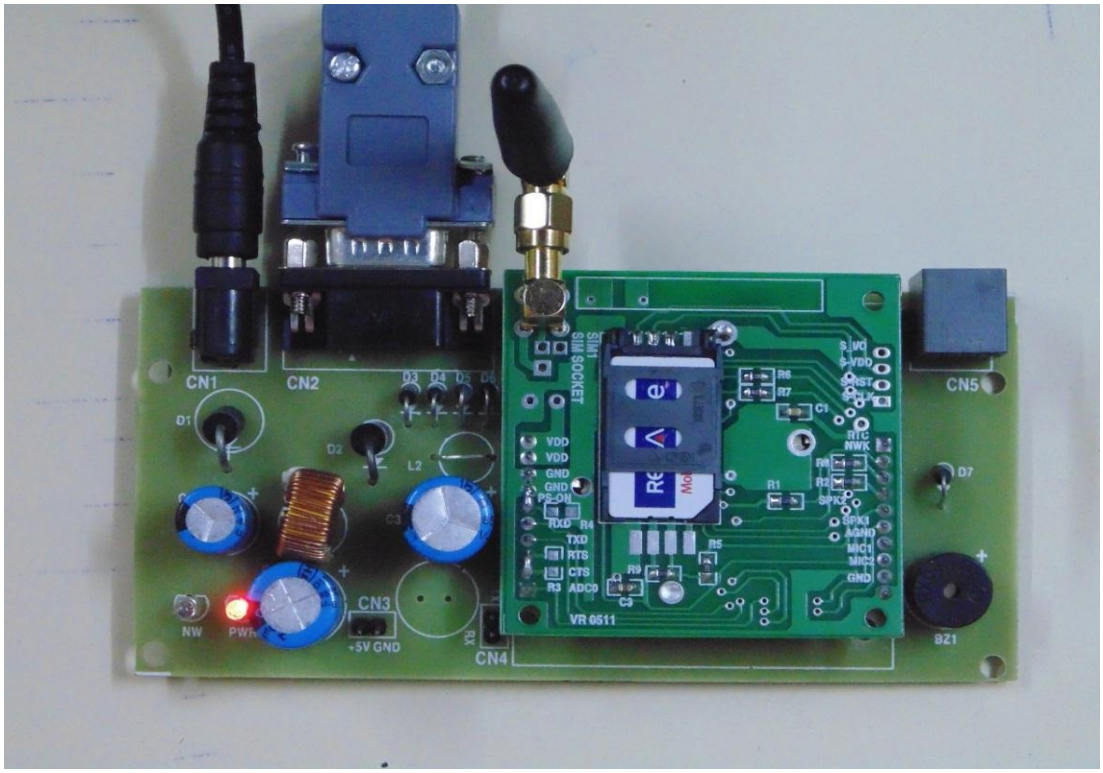
Pre-sets are much cheaper than standard variable resistors so they are sometimes used in projects where a standard variable resistor would normally be used.

Multi-turn pre-sets are used where very precise adjustments must be made. The screw must be turned many times (10+) to move the slider from one end of the track to the other, giving very fine control.

LCD display:

This display contains two internal byte wise resisters, One for the commands (RS=0) and second for character to be displayed (RS=1). It also contains a user programmed RAM area (the character RAM) that can be programmed to generate any desired character that can form using a dot matrix. To distinguish between these two data areas, the hex command byte 80H will be used to signify that display RAM address 00H is chosen. Port 1 is used to furnish the command or data byte, and ports 3.2 to 3.4 furnish register select and read/write levels. The display takes varying amounts of time to accomplish the functions.

GSM MODEM:



GSM/GPRS Modem-TTL (5V) from rhydo LABZ is built with Tri-band GSM/GPRS engine, works on frequencies EGSM 900 MHz, DCS 1800 MHz and PCS 1900 MHz It is very compact in size and easy to use as plug in module. The Modem is coming with 5V TTL interface, which allows you to connect directly to 5V microcontroller Adriano. The baud rate is configurable from 9600-115200 through AT command. The GSM/GPRS TTL Modem is having internal TCP/IP stack to enable you to connect with internet via GPRS. It is suitable for SMS as well as DATA transfer application in M2M interface. You need only two wire (Tx Rx) except Power supply to interface with microcontroller Adriano. The built in Switching Power supply allows you to connect wide range unregulated power supply. Using this modem, you can send SMS, data and read SMS through simple AT command.

Feature:

 High Quality Product (Not hobby grade)

 Plug and Play Module

 Tri-Band GSM/GPRS 900/ 1800/ 1900 MHz

 5V TTL interface for direct connection with MCU/Adriano

 Configurable baud rate

 SMA connector with GSM Antenna.

built in SIM Card holder.

 Built in Network Status LED

 Inbuilt Powerful TCP/IP protocol stack for internet data transfer over GPRS.

 Standard 2.54mm Connector Pitch

 Switch ON/OFF Pin at connector

 Status LED Pin at connector

 Hardware Flow controlling pins available at connector

Specifications:

 Tri-Band GSM/GPRS 900/ 1800/ 1900 MHz

 GPRS multi-slot class 10

 Compliant to GSM phase 2/2+

 Class 4 (2W@ 900 MHz)

 Class 1 (1W@ 1800/1900MHz)

 Built in Powerful TCP/IP

 Data Specifications

 GPRS Class 10 - max 85.6 kbps (downlink)

coding scheme 1, 2, 3, 4

 CSD up to 14.4 kbps

 PPP Stack

 Non transparent mode

 Input Voltage: 9-12VDC

GSM IMP:

GSM (Global System for Mobile communications: originally from Group spatial Mobile) is the most popular standard for mobile phones in the world. Its promoter, the GSM Association, estimates that 80% of the global mobile market uses the standard. GSM is used by over 3 billion people across more than 212 countries and territories. Its ubiquity makes international roaming very common between mobile phone operators, enabling subscribers to use their phones in many parts of the world. GSM differs from its predecessors in that both signalling and speech channels are digital, and thus is considered a second generation (2G) mobile phone system. This has also meant that data communication was easy to build into the system.

TECHNICAL DETAILS

GSM is a cellular network, which means that mobile phones connect to it by searching for cells in the immediate vicinity. There are five different cell sizes in a GSM network, micro, Pico, Femto and umbrella cells. The coverage area of each cell varies according to the implementation environment. Macro cells can be regarded as cells where the base station antenna is installed on a mast or a building above average roof top level. Micro cells are cells whose antenna height is under average roof top level; they are typically used in urban areas. Pico cells are small cells whose coverage diameter is a few dozen meters; they are mainly used indoors. Femto cells are cells designed for use in residential or small business environments and connect to the service provider as network via a broadband internet connection. Umbrella cells are used to cover shadowed regions of smaller cells and fill in gaps in coverage between those cells. Cell horizontal radius varies depending on antenna height, antenna gain and propagation conditions from a couple of hundred meters to several tens of kilometres. The longest distance the GSM specification supports in practical use is 35 kilometres (22 mi). There are also several implementations of the concept of an extended cell, where the cell radius could be double or even more, depending on the antenna system, the type of terrain and the timing advance. Indoor coverage is also supported by GSM and may be achieved by using an indoor Pico cell base station, or an indoor repeater with distributed indoor antennas fed through power splitters, to deliver the radio signals from an antenna outdoors to the separate indoor distributed antenna system. These are typically deployed when a lot of call capacity is needed indoors, for example in shopping centres or airports. However, this is not a prerequisite, since indoor coverage is also provided by in-building penetration of the radio signals from nearby cell.

The modulation used in GSM is Gaussian minimum-shift keying (GMSK), a kind of continuous-phase frequency shift keying. In GMSK, the signal to be modulated onto the carrier is first smoothed with a Gaussian low-pass filter prior to being fed to a frequency modulator, which greatly reduces the interference to neighbouring channels (adjacent channel interference).

GSM FREQUENCIES

GSM networks operate in a number of different frequency ranges (separated into GSM frequency ranges for 2G and UMTS frequency bands for 3G). Most 2G GSM networks operate in the 900 MHz or 1800 MHz bands. Some countries in the Americas (including Canada and the United States) use the 850 MHz and 1900 MHz bands because the 900 and 1800 MHz frequency bands were already allocated. Most 3G GSM networks in Europe operate in the 2100 MHz frequency band.

NETWORK STRUCTURE

The network behind the GSM seen by the customer is large and complicated in order to provide all of the services which are required. It is divided into a number of sections and these are each covered in separate articles.

* The Base Station Subsystem (the base stations and their controllers).

* The Network and Switching Subsystem (the part of the network most similar to a fixed network). This is sometimes also just called the core network.

* The GPRS Core Network (the optional part which allows packet based Internet connections).

* All of the elements in the system combine to produce many GSM services such as voice calls and SMS.

SUBSCRIBER IDENTITY MODULE (SIM)

One of the key features of GSM is the Subscriber Identity Module, commonly known as a SIM card. The SIM is a detachable smart card containing the user's subscription information and phone book. This allows the user to retain his or her information after switching handsets. Alternatively, the user can also change operators while retaining the handset simply by changing the SIM. Some operators will block this by allowing the phone to use only a single SIM, or only a SIM issued by them; this practice is known as SIM locking, and is illegal in some countries.

GSM SECURITY

GSM was designed with a moderate level of security. The system was designed to authenticate the subscriber using a pre-shared key and challenge-response. Communications between the subscriber and the base station can be encrypted. The development of UMTS introduces an optional USIM, that uses a longer authentication key to give greater security, as well as mutually authenticating the network and the user - whereas GSM only authenticates the user to the network (and not vice versa). The security model therefore offers confidentiality and authentication, but limited authorization capabilities, and no non-repudiation. GSM uses several cryptographic algorithms for security. The A5/1 and A5/2 stream ciphers are used for ensuring over-the-air voice privacy. A5/1 was developed first and is a stronger algorithm used within Europe and the United States; A5/2 is weaker and used in other countries. Serious weaknesses have been found in both algorithms: it is possible to break A5/2 in real-time with a cipher text-only attack, and in February 2008, Pico Computing, Inc revealed its ability and plans to commercialize FPGAs that allow A5/1 to be broken with a rainbow table attack. The system supports multiple algorithms so operators may replace that cipher with a stronger one.

References

[1] T.L.Singhal,"*Wireless communication*"

[2] V. K. Garg, *Principles and Applications of GSM*, Prentice Hall: New York, 1998, pp 424-438.

[3] B. Barry, *Microprocessor/Hardware Interfacing*, Addison Wesley: New York 201)

[4] Muhammad A. Mazidi "8051 microcontroller and Embedded systems "

[5] Pawan Kumar, Vikas Bhrdwaj, Kiran Pal, Narayan Singh Rathor, Amit Mishra,"*GSM based e-Notice Board: Wireless Communication*"International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-2, Issue-3, July 2012.

[6] Darshankumar C. Dalwadi, Ninad Trivedi , Amit Kasundra , "*Wireless Notice Board",* ,National Conference on Recent Trends in Engineering & Technology.

[7] J. Pinson, *Designing Screen Interfaces in C*, Prentice Hall: New Yprk, 2000, pp. 64-91.

[8] M. J. Rochkind, *Advanced C Programming for Displays*, Addison Wesley: New York 1998, pp 423-494.

[9] B. Barry, *Microprocessor/Hardware Interfacing*, Addison Wesley: New York 2000, pp 212-228.

[10] http://www.alldatasheet.com/view.jsp?Searchword=MC 8051

[11] http://en.wikipedia.org/wiki/SMS

[12] http://en.wikipedia.org/wiki/Gsm

[13] http://www.matrixcomsec.com/telecomsolutions/gsm-fct-data.html

[14] http://www.8052.com/tut8051