

# WIRELESS PC TO PC COMMUNICATION

## PROJECT REPORT



P - 887

*Submitted in partial fulfillment of the requirements for the award  
of the degree of BACHELOR OF ENGINEERING -  
Information Technology of Bharathiar University, Coimbatore.*

*Submitted by*

**Arthi Shivashankar  
Parinitha Subramanya  
Uma.C  
B.Viswarohini**

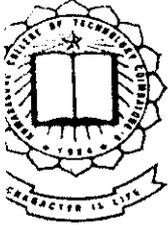


*under the guidance of*

**Mrs.N.Suganthi M.E.,**  
*Department Of Computer Science and Engineering,*

**Department Of Computer Science and Engineering  
Kumaraguru College of Technology  
Coimbatore, Tamilnadu-641 006.**

**MARCH 2003**



**KUMARAGURU COLLEGE OF TECHNOLOGY**  
**COIMBATORE, TAMILNADU-641 006**



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*Department Of Computer Science and Engineering*

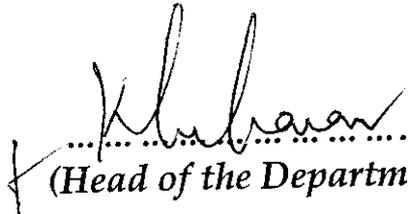
## **CERTIFICATE**

*This is to certify that the Project Report entitled*  
**"WIRELESS PC TO PC COMMUNICATION"**

*is a bonafide record of work done by*

**Arthi Shivashankar(9927S0049)**  
**Parinitha Subramanya(9927S0064)**  
**Uma.C(9927S0079)**  
**B.Viswarohini(9927S0084)**

*In partial fulfillment of the requirements for the award of the degree of*  
**BACHELOR OF ENGINEERING -INFORMATION**  
**TECHNOLOGY**  
*of Bharathiar University, Coimbatore during the academic year 2002-*  
*2003.*

  
.....  
(Head of the Department)

  
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(Guide)

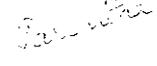
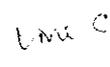
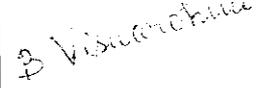
*Certified that the candidate was examined by us in the project work*  
*Viva Voce examination held on .20.10.2003.... and the*  
*University Register Number is .....*

.....  
(Internal Examiner)

.....  
(External Examiner)

# DECLARATION

We, Arthi Shivashankar, Parinitha Subramanya, Uma.C, B.Viswarohini hereby declare that this project entitled "WIRELESS PC TO PC COMMUNICATION" submitted to Kumaraguru College of Technology, Coimbatore (Affiliated to Bharathiar University) is a record of original work done by us under the supervision and guidance of Mrs.N.Suganthi M.E., Department of Computer Science and Engineering.

<i>NAME</i>	<i>REGISTRATION NUMBER</i>	<i>SIGNATURE</i>
Arthi Shivashankar	9927S0042	
Parinitha Subramanya	9927S0064	
Uma.C	9927S0079	
B.Viswarohini	9927S0084	

Countersigned:



Staff in Charge: **Mrs.N.Suganthi M.E.,**

Lecturer,

Department of Computer Science of Engineering,

Kumaraguru College of Technology, Coimbatore.

Place:

Date:

WIRELESS  
PC TO PC  
COMMUNICATION

## ACKNOWLEDGEMENT

We take this opportunity to express our gratitude to all the hands and hearts without whom this project would be incomplete.

We are extremely grateful to **Dr.K.K.Padmanabhan** B.Sc (Engg), M.Tech, Ph.D., Principal, Kumaraguru College of Technology for having given us a golden opportunity to embark on this project.

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We would like to express our sincere thanks to our class advisor, **Mrs.Chitra Devi M.E**, Department of Computer Science

and Engineering for their inspiration and support to do this project successfully.

We thank the **teaching and non-teaching** staffs of our department for providing us the technical support in the duration of our project

Above all we owe our gratitude and heartfelt thanks to our parents and our friends for their encouraging support and Almighty for His abundant blessing for finishing this project successfully in time.

Once again, we thank all of them who gave us the pleasure of learning & experiencing the meaning of the very word 'Project'.

## SYNOPSIS

The objective behind “Wireless PC to PC Communication” is to replace the wires, which run from PC to PC. Communication can be established within a short range of 10 to 15 meters. A frequency range of 5.5 MHz is used to transmit and receive

The message plain text from a PC is in the form of binary 1's and 0's. In digital data communication, binary code is transmitted by shifting a carrier frequency between two preset frequencies  $f_1$  and  $f_2$ . These frequencies are generated using Frequency shift Keying Generator. They are modulated using amplitude modulation and then transmitted.

At the receiver end they are converted back to their original form . The received analog signal is demodulated at the demodulator circuit. This is then given to a Differential Frequency Shift Keying circuit where 0's and 1's are separated out by using carrier at two different frequencies. Then the output is given to a PC .

The importance of this project is the replacement of cumbersome cords. It is convenient and less expensive to deploy than fixed services. It is highly flexible in supporting mobility of end systems and wireless access. It is gaining exponential growth in many countries where there is a lack of an appropriate fixed communication infrastructure.

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# INTRODUCTION

## 1.1 CURRENT SYSTEM

Wireless communication is enjoying its fastest growth in history. Wireless communication in the consumer sector has grown popularly. Wireless communication is likewise becoming the standard in the business and domestic world. Remote wireless Internet connection and wireless computer networks are appearing on the scene and will dramatically impact the way business does business in the future. It has truly become a wireless world.

However it has limited its expansion to mobile telephone and non-telephone mobile radio applications such as paging, amateur radio, dispatch, citizens band, public service, cordless phones, or terrestrial microwave radio systems. Currently wireless communication between PC to PC has not gained as much popularity as in developed countries. The ability to replace the cumbersome cords that connect devices to one another (such as printer cables, headphone cables, wires that run from a personal computer to a mouse) with an invisible, low power short-range wireless connection would provide convenience and flexibility.

## 1.2 RELEVANCE AND IMPORTANCE

Given the revolutionary strides that wireless technology has made in the recent past, we decided to build a system, which will establish wireless communication between two PC's. Wireless connectivity will allow the ability to move equipment throughout an office, and will allow collaborative communication between individuals, their appliances, and their environment.

A wireless workforce is one characteristic of the business world of today. With a wireless network workers are permitted to access information from almost anywhere.

## LITERATURE SURVEY

IEEE Potentials Apr-May 2002, authored by Tan.H.Nguyenan M.S.E.E and B.S.E.E with honors from Temple University Philadelphia and Matthew N.O Sadiku Senior Scientist at Boeing Satellite Systems Los Angeles, published an article on Wireless Communication. It is mentioned that Wireless Communication is expected to be a major driver for growth in the telecommunication industry over the next decade. It will become a Corner Stone of the Information Society. Future networks will pave the way for an environment in which information will be made more portable, personal and affordable.

IEEE Wireless Communications Oct-2002, authored by Theo G. Kanter, Ericsson Research, published an article titled HOTTOWN, enabling context-aware and extensible mobile interactive spaces. There he emphasized on the fact that computers are no longer heavy and bulky and hidden away under a desk, but available as miniature notebooks with built-in electronics for wireless communication.

We came across an interesting article titled "Past Events and a Future Perspective", written by Thodore S.Rappaport, A. Annamalai, R.M. Buehrer and William H.Tranter of Virginia Tech. The paper was published in IEEE Communications magazine, May 2002. Here the emphasis was on how the telecommunications industry is evolving from a niche business in the last decade to one of the most promising areas of growth in this century.

# SOFTWARE REQUIREMENT SPECIFICATION

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## **3.1 INTRODUCTION**

### **3.1.1 PURPOSE:**

The SRS should fully describe the eternal behavior of the application or subsystem identified. It also describes nonfunctional requirements, design constraints and other factors necessary to provide a complete and comprehensive description of the requirements of the software.

### **3.1.2 SCOPE:**

This SRS gives all requirements, specification details for the communication between two PC's without wires. This SRS is used for preparing the system design.

### **3.1.3 ABBREVIATIONS:**

This column gives some abbreviations used in our project.

FSK—Frequency Shift Keying

### **3.1.4 OVERVIEW:**

This gives overall description of the product developed, how the system responds, constraints of the system with specific requirements necessary to implement it.

## **3.2 FUNCTIONAL DESCRIPTION**

The perspective of the communicating system is to establish a wire free data transfer between two computers. This system is implemented using one computer acting as a transmitting device and another computer acting as a receiving device with a dedicated frequency for data transmission. With these assumptions and constraints, Wireless Communications between two PC's is implemented.

## **3.3 BEHAVIORAL DESCRIPTION**

The response of the system to external events depends on the operation, which the user intends to do. Acceptable inputs, which include text and file, are processed to satisfy the users need. Files are transferred using Hyper Terminal. Both the ends of communication can agree upon an Encryption strategy and, the text can be enciphered and deciphered respectively at the transmitting end and receiving end.

## **3.4 OPERATING ENVIRONMENT REQUIREMENTS**

This section of the SRS contains all the software requirements to a level of detail sufficient to enable users to communicate between two PC's without wires and this system satisfies those requirements.

### **3.4.1 HARDWARE REQUIREMENTS:**

- Transmitter Circuit
- Receiver Circuit

### **3.4.2. SOFTWARE REQUIREMENTS:**

- Windows 98 or 2000 Operating Systems
- C language
- Hyper Terminal

## **3.5 DESCRIPTION OF SOFTWARE**

C is one of the most widely used and accepted programming languages. To execute the programs written in C to transfer character by character, we require the windows operating system, as it is the most popular operating system. To transfer files we make use of the Hyper Terminal for which we require the Windows 98 or 2000 operating system.

To communicate with the hardware, the port addresses (Com1, Com2 etc.,) are required. Inbuilt functions are available in C language to send and receive Bytes from the respective ports. Each character before being transmitted is encrypted at the transmitting end and at the receiving end it is decrypted and displayed. Encryption algorithms like mono alphabetic substitution and classical product cipher (German ADFGVVS cipher) are implemented using C language.

## **3.6 SPECIFIC REQUIREMENTS**

### **3.6.1 FUNCTIONALITY:**

Wireless PC to Pc communication requires two users, one at the transmitting device and the other at the receiving device to communicate. The text to be transferred by the user is first encrypted using an encryption algorithm, transmitted to the other user through an antenna and once it is received it is decrypted and then viewed by the user at the receiving end.

### **3.6.2 USABILITY:**

- Two users are given a system each, one for transmission only and the other for reception only.

- The details of encryption and decryption mechanism are hidden from the users to avoid unauthorized access.

### **3.6.3 INTERFACES:**

The necessary hardware interface includes serial ports (Com1, Com2 Etc.). The user interface is the C output screen.

## **3.7 CONSTRAINTS**

- At the time of communication, both the users must be at their respective terminals.
- Header files should be included properly.
- The transmitter and receiver circuit should function properly.

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**❧ PROPOSED APPROACH ❧  
TO THE DETAILS OF  
HARDWARE & SOFTWARE**

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# PROPOSED APPROACH TO THE PRODUCT

## 4.1 PROJECT PLAN:

- The life cycle model for our project consists of the System Engineering, Analysis, Design, Coding and Testing.

1) System Study	-	Nov 14 <sup>th</sup> to Dec 7 <sup>th</sup> 2002
2) Requirements	-	Dec 8 <sup>th</sup> to Dec 16 <sup>th</sup> , 2002
3) Design	-	Dec 17 <sup>th</sup> to Jan 3 <sup>rd</sup> 2003
4) Implementation	-	Jan 4 <sup>th</sup> to Jan 10 <sup>th</sup> , 2003
5) Testing	-	Jan 11 <sup>th</sup> to Feb 15 <sup>th</sup> , 2003
6) Documentation	-	March 1 <sup>st</sup> to March 6 <sup>th</sup> , 2003

- Team structure will be democratic in which every member will contribute equally to the project development.



## **4.2 SOLUTION STRATEGY:**

### **PHASE I**

In this phase we designed the hardware circuit. The circuit diagram was drawn to satisfy the needs of an efficient transmitter and receiver circuit. The components required for designing the transmitter and the receiver were gathered and soldered on to a PCB board. Each component was tested using a CRO to check if it functions properly.

### **PHASE II**

The main objective behind this phase was to develop the software using C Language to carry out wireless communication between two PC's. A study was done on the ports and the interrupt needed for sending data, after which programming was carried out.

### **PHASE III**

The connection establishment was done in this phase. The working of the developed system was tested. The frequency had to be tuned to match 5.5MHz accurately. The two programs were executed simultaneously to test the correctness of the programming and to verify that the transmitted data was correctly received.

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**❧ DETAILS OF THE DESIGN ❧**

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## DETAILS OF THE DESIGN

The design phase has been split into two modules

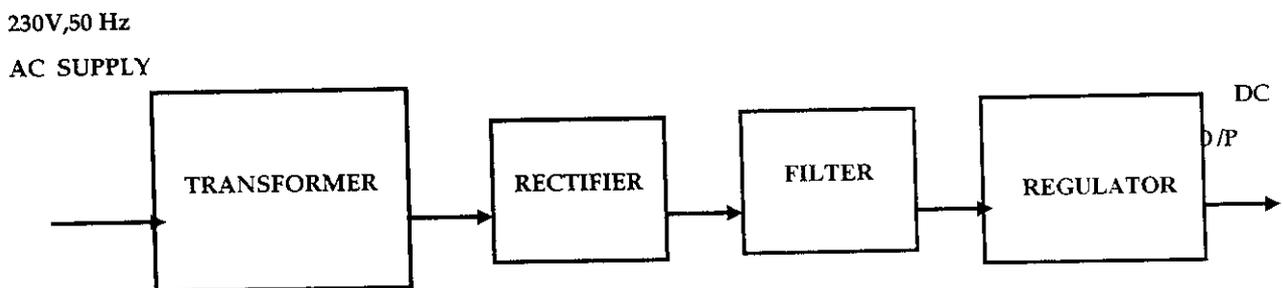
- Hardware Design
- Software Design

### HARDWARE DESIGN:

Hardware design deals with the circuitry of **Power supply, Transmitter and Receiver.**

### POWER SUPPLY:

#### BLOCK DIAGRAM:



All electronic circuits work only with low D.C. voltage. Therefore we need a power supply unit to provide the appropriate voltage supply. This unit consists of transformer, rectifier, filter and regulator. A.C. voltage typically 230V rms is connected to a transformer which steps that AC voltage down to the level to the desired AC voltage. A diode rectifier then provides a full-wave

rectified voltage that is initially filtered by a simple capacitor filter to produce a DC voltage. This resulting DC voltage usually has some ripple or AC voltage variations. A regulator circuit can use this DC input to provide DC voltage that not only has much less ripple voltage but also remains the same DC value even if the DC voltage varies or the load connected to the output DC voltages changes.

### **TRANSFORMER:**

A transformer is a static (or stationary) piece with which electric power in one circuit is transformed into electric power of the same frequency in another circuit. It can raise or lower the voltage in a circuit but with a corresponding decrease or increase in current. It works with the principle of mutual induction. In our project we are using step down transformer for providing a necessary supply for the electronic circuits. In our project we are using a 15-0-15 center tapped transformer.

### **RECTIFIER:**

The DC level obtained from a sinusoidal input can be improved 100% using a process called full-wave rectification. It uses 4 diodes in a bridge configuration. From the basic bridge configuration we see that two diodes (say D2 & D3) are conducting while the other two diodes (D1 & D4) are in "off" state during the period  $t = 0$  to  $T/2$ .

Accordingly for the negative of the input the conducting diodes are D1 & D4. Thus the polarity across the load is the same.

### **FILTER:**

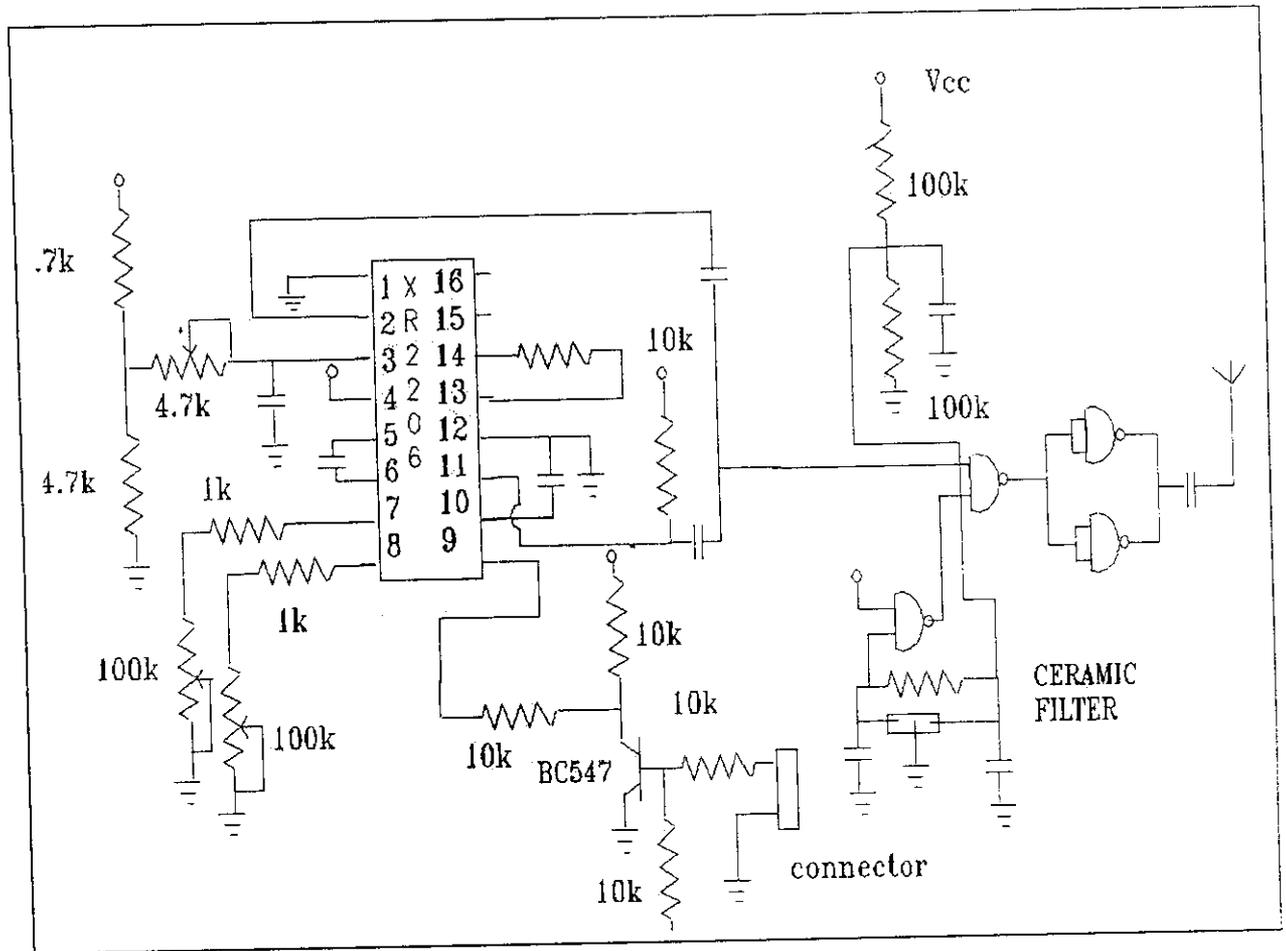
The filter circuit used here is the capacitor filter circuit where a capacitor is connected at the rectifier output, and a DC is obtained across it. The filtered waveform is essentially a DC voltage with negligible ripples, which is ultimately fed to the load.

### **REGULATOR:**

The output voltage from the capacitor is further filtered and finally regulated. The voltage regulator is a device, which maintains a constant output voltage irrespective of the change in supply variations, load variation and temperature changes. Here we use two fixed voltage regulators namely LM 7812, LM 7805 and LM7912. The IC 7812 is a +12V regulator IC 7912 is a -12V regulator and IC 7805 is a +5V regulator.

## TRANSMITTER:

### CIRCUIT DIAGRAM:

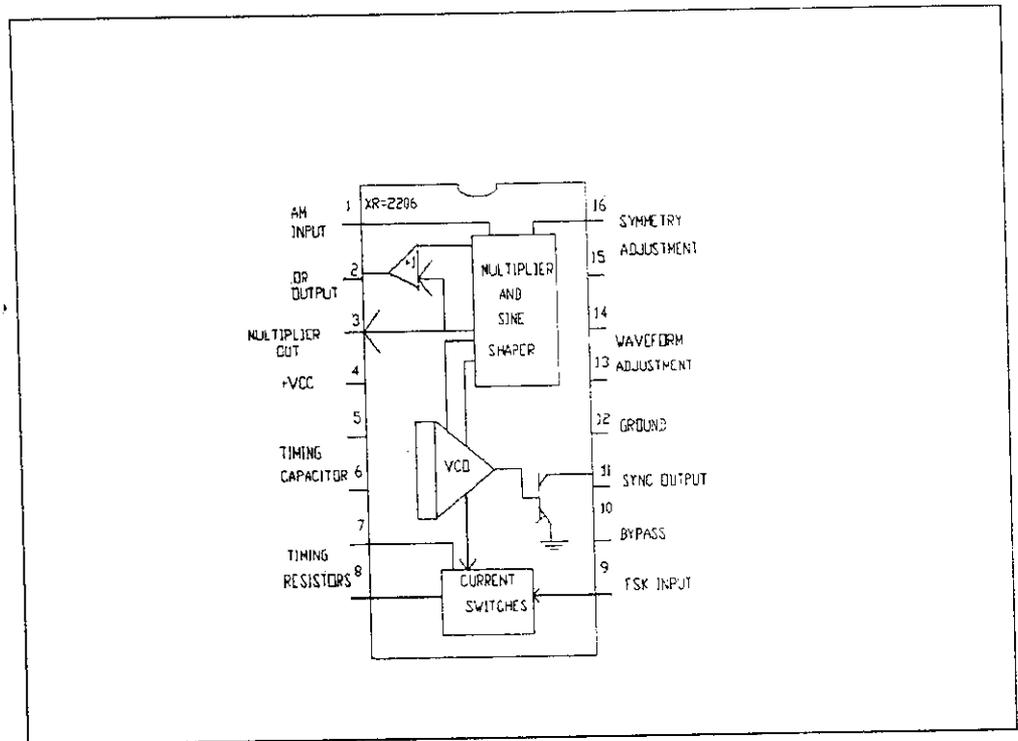


The components required in a transmitter circuit are

- FSK Generator
- AM Modulator

## FSK GENERATOR:

### CIRCUIT DIAGRAM:



In digital data communication, shifting a carrier frequency between two preset frequencies transmits a binary code. This type of transmission is called Frequency Shift Keying technique. A 555 timer in astable mode can be used to generate FSK signals. When the input is high, transistor Q is cutoff and 555 timer works in the normal astable mode of operation. The frequency of the output waveform is given by

$$F_0 = 1.45 / (R_A + 2R_B) C$$

When the input is low Q goes on and connects the resistance RC across Ra. The output frequency is given by

$$F_0 = 1.45 / ((R_A \parallel R_C) + 2R_B) C$$

The resistance is used to get the desired output frequency.

Frequency shift keying (FSK) is the most widely used method for transmitting digital data over telecommunications links. In order to use FSK a modulator-demodulator (modem) is needed to translate digital 1's and 0's into their respective frequencies and back again.

In FSK modulation, the carrier frequency is shifted in steps (or) levels corresponding to the levels of the digital modulating signal. In case of binary signal, two carrier frequencies are used; one corresponds to binary '0' and another to binary '1'.

### **TIMER:**

555 timer used in the above circuit is highly stable for generating time delays or oscillations. A single 555 timer can provide a time delay ranging from microseconds to hours where as counter timer can have maximum timing range of days. The 555 timers can be used with supply voltage in the range of +5volts to +18volts and can drive load up to 200milli ampere. It is compatible with both TTL and CMOS logic circuits. Because of wide range of supply voltage the

555timers are versatile and easy to use in various applications. In this circuit, astable mode of 555 timers is used.

## **MODULATOR:**

The purpose of a communication is the source and user being physically separate from each other. To do this, the transmitter modifies the message signal into a suitable form for transmission over the channel. This modification is achieved by a process known as modulation, which involves varying some parameters of a carrier wave

in accordance with the message signal. The receiver recreates the original message signal from a degraded version of the transmitted signal after propagation through the channel.

There are basically two types of modulation: Frequency modulation and Amplitude modulation. In this project modulation is achieved by varying the Amplitude. The amplitude of the carrier wave is varied in accordance with the amplitude of the modulating signal.

Consider a sinusoidal carrier wave  $c(t)$  defined by,

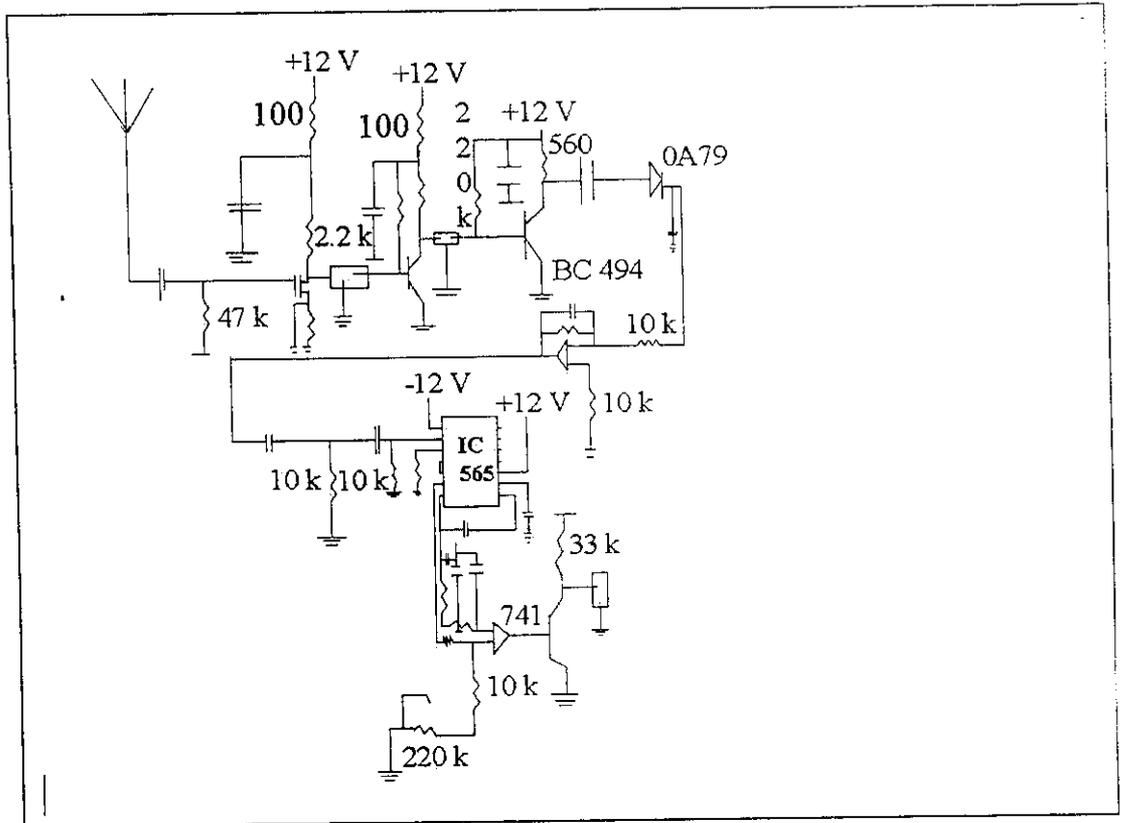
$$C(t) = A_c \cos(2\pi F_c t + \phi),$$

where  $A_c$  is the carrier amplitude and  $F_c$  is the carrier frequency. We have assumed that the phase of the carrier wave is zero for specification of the message. The source of the carrier wave  $c(t)$  is physically independent of the source responsible for generating  $m(t)$ . An amplitude-modulated wave may thus describe, in its most general form, as a function of time.

In the circuit shown, schmitt trigger NAND gate CD4011 is used. The carrier frequency is generated using the ceramic filter of value 10.7 MHz. The resistor R1 and R2 provide the necessary biasing. The modulated output is then transmitted through the antenna after passing through a capacitor. In this project the transmitted frequency is 5.5 MHz. The maximum distance to which we can transmit is around 10ft. The distance to which it can be transmitted can be improved further by providing some amplification at the output of the amplitude modulation circuit.

## RECEIVER:

## CIRCUIT DIAGRAM:



The components required in a receiver circuit are

- AM Demodulator
- DFSK

The encoded message has to be decoded now. The encoded message is received by receiving antenna and then given to demodulator circuit. This is then given to a DFSK circuit where 0's and 1's are separated out by using carrier at two different frequencies. Then the output is given to a P.C where message is decoded.

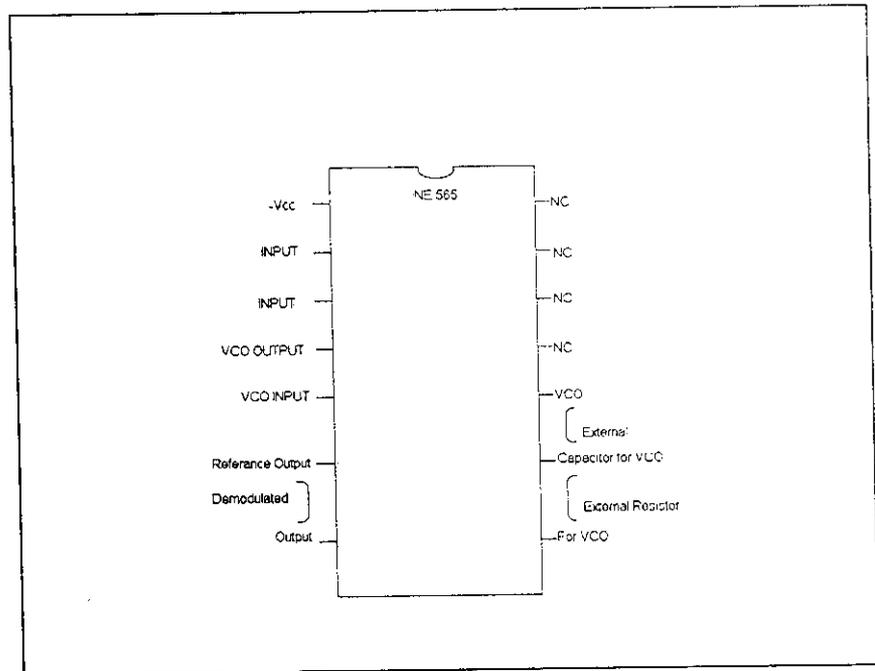
## AM DEMODULATOR:

An envelope detector is a simple and yet highly effective device that is well suited for the demodulation of a narrow band AM wave, for which the percentage modulation is less than 100%. Ideally, an envelope detector produces an output signal that follows the envelope of the input signal waveform.

Envelope detector consists of a diode and a resistor-capacitor filter. The operation is as follows. On the positive half-cycle of the input signal, the diode is forward-biased and the capacitor C charges up rapidly to the peak value of the input signal. When the input signal falls below this value, the diode becomes reverse biased and the capacitor C discharges slowly to the load resistor  $R_L$ . The discharging process continues until the next positive half cycle. When the input signal becomes greater than the voltage across the capacitor, the diode conducts again and the process is repeated. Thus demodulation is carried out. In this circuit we are using 0A79 diode.

## DFSK:

### CIRCUIT DIAGRAM:



The binary data can be retrieved using DFSK at the receiving end. 565 PLL is very useful as a DFSK demodulator. As the signal appears at the input, the loop locks to the input frequency and tracks it between the two frequencies with a corresponding DC shift at the output. A three-stage filter removes the carrier component and the output signal is made logically compatible by the voltage comparator.

The phase detector of this PLL is comprised of differential amplifier pairs provided with current sink bias source. The output voltage phase detector is limited by diodes to a maximum of +0.7V. This limiting action helps to minimize the effect of high amplitude noise pulses and other transient effects on the operation of the PLL.

The phase detector has a balanced output and is supplied to the differential amplifier pair, which serves as an amplifier stage in amplifying the phase detector. A single ended output is taken from this stage across the load resistor R1 and connected internally to the VCO.

Connection of an external capacitor C between Pin 7 and ground, will produce a first order low-pass (lag) network. A capacitor C and a resistor R2 connected in series between pin 7 and ground will result in lag lead network.

The VCO consists of a voltage controlled current source, which supplies equal magnitude of charging and discharging currents to an externally connected (pin 9) timing capacitor C0. A timing resistor is connected between pin8 and positive power supply.

The rest of the VCO circuit is Schmitt trigger with a differential amplifier output circuit. This controls the turn-on and turn-off for the switching action of the current source for the charging and discharging.

## SOFTWARE DESIGN:

The software is designed using C Language. Programming is done differently for transmission and reception. Serial data transmission is done for which ports are required such as COM1, COM2 etc.,

C language has an inbuilt function `outportb()` which has two parameters-port address and value to be transmitted.

In the receiving program interrupt 14 is generated to check for any new data in the serial port. If data is detected in the serial port then the first bit of 'ah' register will go high and the data is read from the serial port using the inbuilt function `inportb()`. This function has one parameter-port address. This returns the value that is read from the port and displays it on the screen.

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**❧ IMPLEMENTATION DETAILS ❧**

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# IMPLEMENTATION

## 6.1 DEVELOPMENT & OPERATING ENVIRONMENT

### S/W ENVIRONMENT:

Platform	: Windows
Programming language	: C
OS	: Windows 98
Language tools	: C Compiler

### H/W COMPONENTS:

Transmitter  
Receiver

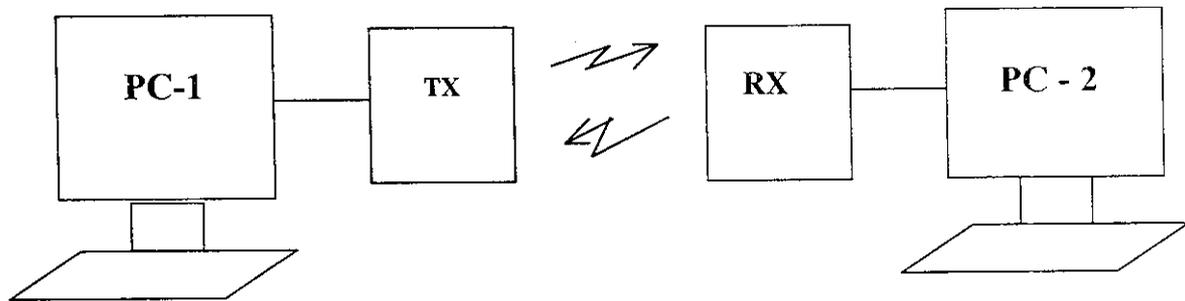
### H/W ENVIRONMENT:

Transmission	: Serial Data
Baud Rate	:110
Ports	:com1,com2
Frequency	:5.5MHz
Coverage Area	:10 to 15 feet

## 6.2 EXTERNAL INTERFACES AND DATAFLOWS

Data is transmitted in the form of RF Waves using FM. Digital data is converted to analog in the transmitter side. The received analog signal is converted to digital signal at the receiver end.

## DATAFLOW DIAGRAM:



### 6.3 FUNCTIONAL SPECIFICATION

#### MODULE I:

**DESCRIPTION :** Designing h/w Components

(transmitter and receiver) for Wireless PC to PC communication.

**TECHNICAL SPECIFICATION :** The message plaintext is given to the FSK circuit where the frequency is shifted to 0's and 1's to transmit them serially. This is given to AM circuit where it is modulated by a high frequency carrier and then sent to the transmitting antenna.

The incoming modulated signal is first demodulated at the DM circuit. This is then given to the DFSK circuit where 0's and 1's are separated using at two different frequencies and the original message is received.

## **MODULE II:**

**DESCRIPTION :** Connection Establishment

**TECHNICAL SPECIFICATION:** Port address should be known before hand. The transmitter and the receiver circuits are connected to the ports. The third pin of transmitter port is used to send data, which is received, in the second pin of receiver port.

## **MODULE III:**

**DESCRIPTION :** S/W design

**TECHNICAL SPECIFICATION:** Programming Language like C is used to implement the product design. In the transmitter side the `outportb()` outputs the byte to the hardware. In the receiver side the `inportb()` inputs the byte from the hardware.

### **6.4 OPTIMIZATION AND FUTURE ENHANCEMENTS**

In future this technology can be expanded to establish communication between small network such as, within a college campus different blocks can communicate without cabling. It is also used to create an interactive environment. Connection to the Internet can also be done.

### **6.5 ACCEPTANCE CRITERIA**

Initially the project can be tested with two PC`s. Slowly it can be implemented to many PC`s.

# TESTING

## 7.1.PLAN FOR TESTING

- a) Jan 11<sup>th</sup> 2003 - Manual Testing
- b) Jan 13<sup>th</sup> 2003 - Regression Testing
- c) Jan 15<sup>th</sup> 2003 - Functional Testing
- d) Jan 20<sup>th</sup> 2003 - Recovery Testing
- e) Jan 27<sup>th</sup> 2003 - Stress Testing
- f) Feb 1<sup>st</sup> 2003 - Disaster Testing
- g) Feb 8<sup>th</sup> 2003 - Operations Testing
- h) Feb 15<sup>th</sup> 2003 - Installation Phase Testing

The Operations testing is conducted by the normal operating staff. Once the proper frequency is set, the project development personnel should not be allowed to assist or hint the operating staff at any cost.

The Installation phase testing process may involve the processes like connecting the designed circuits to appropriate PC's, transmitting the data and checked whether the correct data is received in the receiver side.

## CONCLUSION

Wireless communication developed was successful in establishing an effective communication between two PC's, which are separated at a distance of 10 to 15 feet.

This project has a limited speed and frequency of 5.5MHz. Data transmitted won't be received if the frequency is greater than or lesser than 5.5MHz.

The user should have an idea about Circuit design and Programming Language like C.

Instead of being restricted by wires, new wireless technology has freed users to remain connected to the network no matter where they may roam

This project can be modified to suit other needs and we hope that this project serves the purpose of simplicity and reliability.

## FUTURE OUTLOOK

In future wireless PC to PC communication technology can be expanded to establish communication between small n/w such as, within a college campus different blocks can communicate without cabling.

Our product mainly aims at mobility i.e., the freedom to move without being tethered to the network by wires. In the event of any disaster, speedy recovery is possible which is an advantage of wireless communication.

Users have started to throw off these wires that chained their computers to the wall. Today they are beginning to experience the newfound freedom of being connected to the network from almost anywhere. Instead of being restricted by wires, new wireless technology has freed users to remain connected to the network no matter where they may roam.

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❧ APPENDICES ❧

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## APPENDICES

### 10.1 SOURCE CODE:

#### TRANSMITTER

```
#include<stdio.h>
#include<dos.h>
#include<conio.h>

void main()
{
    char a;
    int i;
    clrscr();
    printf("\n WIRELESS PC - PC COMMUNICATION");
    printf("\n\n TYPE YOUR TEXT HERE\n\n");
    while ((a==getch())!='\n')
    {
        outportb(0x3f8,a);
    }
}
```

## **10.2 INPUT SCREEN:**

WIRELESS PC - PC COMMUNICATION

TYPE YOUR TEXT HERE

asdfghjklqwertyuiop1234567890

## **10.3 OUTPUT SCREEN:**

asdfghjklqwertyuiop1234567890