

MICROCOMPUTER COMMUNICATIONS

A Window on the World



Barbara E. McMullen
John F. McMullen

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MICROCOMPUTER COMMUNICATIONS:

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**by Barbara E. McMullen and
John F. McMullen**



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Preface

Books on microcomputers are difficult to write. Microcomputers, you see, have some interesting effects on people. Those of you who are not actively using microcomputers will experience some degree of difficulty in learning how to effectively use these tools for your own needs. The difficulty could be little or great or somewhere in between. Once you feel comfortable handling this machine that has taken up so much of your time, you will probably wonder how you could have gotten along without it before. After another period of time (again, short or long), dissatisfaction sets in. "Perhaps it could perform its work faster." "Why do I have to enter the same information in more than one place?" "Why do I have to shuffle so many diskettes?" These are a few of the questions that arise at some point after you become comfortable with your computer. You find out that there is a new solution on the market that eliminates these perceived problems. You purchase the solution and again are happy for some period of time. Then, dissatisfaction sets in once more. For a second time, you have reached what we call your "Next Level of Dissatisfaction."

We do not know at what level you now are. Our intent is to provide an overview of microcomputer communications; that is, communications with other microcomputers, with minis and mainframes, with time-sharing services and information utilities. This is not a technical book for the data processing professional. We feel, however, that there is something here for everyone else no matter what level of dissatisfaction he or she currently may be at.

We wrote the book because the communications capabilities of microcomputers are currently greatly underused. We feel, however, that this will shortly change as information available over telephone lines becomes cheaper, more plentiful, and easier to access. The more knowledgeable people are about what can be done in the area of data communications, and the more people use data communications, the faster the progress will be. We hope, then, that you both learn from reading this book and are stimulated to explore enthusiastically the wonderful world of microcomputer data communications.

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I Introduction

Step into a telephone booth, plug a device about the size of a paperback book into the telephone, and obtain current market prices for your securities holdings. . . . Sounds farfetched? You can do it right now!

You're sitting in your office or at home and find that you must travel to Albuquerque, New Mexico. You turn on a device and through relatively few commands:

- Obtain airline schedules and book passage

- Review restaurant ratings for the area

- Examine current weather and forecasts for the next week

. . . Sounds farfetched? You can do it right now!

It's 4:30 PM in La Jolla, California, and you must get a lengthy memorandum to your sales office in Bryn Mawr, Pennsylvania. It is imperative that it be read immediately on the opening of business tomorrow (it's now 7:30 PM in the Bryn Mawr office and when the office opens for business in the morning it will be 6:00 AM La Jolla time). You compose the memorandum on a personal computer, which is a device resembling a combination typewriter and television set. You obtain a printed copy, edit the copy, and make immediate corrections and changes through simple typewriter-like key strokes (the device has pointed out all possible misspellings to you). For little more than the cost of a local telephone call, you send the message to a confidential bulletin-board-like system where the message can be read only by your Bryn Mawr office. You then go home. When your Bryn Mawr personnel arrive in the morning, they—once again, for little more than the cost of a local telephone call—retrieve the message, print it, and if necessary, send a reply that will be waiting for you when you arrive in the morning. . . . Sounds farfetched? You can do it right now!

Your daughter has a sore throat. You sit down at a device about the size of a typewriter and for a little more than the cost of a local telephone call, interact with an automatic House Medical Guide which explains the symptoms and dangers of "strep" infections and reviews home treatment for "nonstrep" infections. . . . Sounds farfetched? You can do it right now!

Information must be sent daily from your firm's New York office to its San Francisco office. The information is available at the close of business each day in New York and is required by the San Francisco office early the next morning. You enter the information into a personal computer at 5:00 PM and go home. At 12:30 AM, when telephone rates are lowest, the unattended personal computer in your office calls an unattended personal computer in San Francisco and transmits the necessary information. The computer then hangs up. . . . Sounds farfetched? You can do it right now!

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PAGE 1		PEAR SYSTEM DEMO						04/15/83	
		PORTFOLIO APPRAISAL							
SOC. SEC. #123-45-6789		JOHN E. CASH						ACCT. #123456	

SHARES OR PAR VALUE	SECURITY	UNIT COST	INVENTORY	CURRENT PRICE	CURRENT MARKET VALUE	INT/DIV RATE	ANNUAL INCOME	YIELD %	% OF TYPE OR TOTAL
3,000	GEORGIA PACIFIC	28.20	84,614	26.250	78,750	1.20	3,600	4.57	31.6
1,685	GRACE W.R.	26.85	45,250	42.375	71,402	2.30	3,875	5.43	28.6
80	IBM CORP.	99.20	7,936	110.125	8,810	2.00	160	1.82	3.5
1,130	MOBIL OIL CORP.	28.05	31,700	29.375	33,194	2.50	2,825	8.51	13.3
3,000	NL INDUSTRIES	17.31	51,938	15.125	45,375	1.20	3,600	7.93	18.2
267	WESTINGHOUSE CORP	18.78	5,015	44.750	11,948	2.00	534	4.47	4.8
9,162	TOTAL COMMON STOCKS		226,453		249,479		14,594	5.85	38.6
800	ARCATA CV.A	26.98	21,584	27.750	22,200	2.16	1,728	7.78	45.4
600	JOHNSON CTRL CV.B	35.36	21,214	44.500	26,700	2.00	1,200	4.49	54.6
1,400	TOTAL PREFERRED STOCKS		42,798		48,900		2,928	5.99	7.6
35	ENGLHRD APR 60 CALL	4.48	15,672	2.875	10,062	0.00	0	0.00	83.4
10	HMSK APR 32 CALL	13.58	13,577	2.000	2,000	0.00	0	0.00	16.6
45	TOTAL OPTIONS		29,250		12,062		0	0.00	1.9
50,000	BENEFICIAL CORP DEB. 8% 06/15/01	100.00	50,000	97.000	48,500	80.00	4,000	8.32	48.7
50,000	PFIZER DEB. 9.25% 08/15/00	99.50	49,750	102.174	51,087	92.50	4,625	9.00	51.3
100,000	TOTAL CORPORATE BONDS		99,750		99,587		8,625	8.66	15.4
25,000	BOSTON MASS. 6.0. 6.25% 08/01/97	98.05	24,513	93.293	23,323	62.50	1,562	7.00	42.9
30,000	LITTLE ROCK ARK. 7.3% 09/01/11	87.00	26,100	103.677	31,103	73.00	2,190	7.00	57.1
55,000	TOTAL MUNICIPAL BONDS		50,613		54,426		3,752	6.89	8.4
50,000	GEN'L MGT ACCEP 4.5% 06/30/85	100.00	50,000	90.000	45,000	45.00	2,250	9.63	40.5
75,000	GEN'L MGT ACCEP 4.625% 06/30/86	100.00	75,000	88.250	66,187	46.25	3,469	8.92	59.5
125,000	TOTAL COMMERCIAL PAPER		125,000		111,187		5,719	5.14	17.2
50,000	U.S.TREASURY 9.75% 05/31/83	101.75	50,875	100.093	50,046	97.50	4,875	9.00	100.0
50,000	TOTAL U.S.TREASURIES		50,875		50,046		4,875	9.74	7.7
21,000	NAT'L LIQUID RESERVE	1.00	21,000	1.000	21,000	0.10	2,163	10.30	100.0
21,000	TOTAL LIQUID ASSETS		21,000		21,000		2,163	10.30	3.2
	TOTAL PORTFOLIO		645,738		646,689		42,657	6.60	100.0

FIGURE I-1 An example of a portfolio analysis report with current prices automatically retrieved from Dow Jones and Company using an Apple II Computer, DC Hayes Micromodem II, and the PEARS (portfolio evaluation reporting system) program.

-> airsched-d

Domestic Air Schedules (USA, CAN, MEX,)

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in part without written permission of Dittler Bros. Inc.

Enter Departure City / Destination City in the format
CITY, State / CITY, State TIME(s) (Times Optional)
EXAMPLE: Chicago, Il / New york, Ny 0900A-0200P

new york, ny / albuquerque, nm

FROM: NEW YORK, NY
TO: ALBUQUERQUE, NM

DEPART	APT	ARRIVE	APT	FLIGHT	CLASS	DAYS	MEALS	PLANE	STOPS
07:45A	L	11:31A		TW 0303	FY	123456	BBB	725	1
05:30P	E	09:49P		EA 0155	FYBML	1234567	DSD	757	1
06:10P	E	09:40P		DL 0247	FYBMV	12345 7	D D	725	1
07:25P	J	11:12P		TW 0089	FY	1234567	D D	725	1

Enter CITY, ST / CITY, ST TIME(s) (Times Optional)

FIGURE I-2 An example of the airline schedule from New York to Albuquerque, New Mexico, retrieved from The Source, which is an information utility. We used an Apple II Computer, a DC Hayes Micromodem II and the Data Capture program.

You wake up at 2:00 AM and are unable to get back to sleep. You feel like playing an adventure game. You sit down at a device about the size of a typewriter and, for a little more than the cost of a local telephone call, play Adventure for a half-hour. Next comes a game of Hangman, after which you plot your biorhythm for the next week and then go back to sleep. . . . Sounds farfetched? You can do it right now!

These examples and those shown in Figures I-1 and I-5 serve to point out that, in the words of George Allen, football coach of the Chicago Blitz, "*The future is now!*" The technology available to us today can make a significant impact on our lives in many ways. Information that was previously only available to us through painstaking manual research and compilation is now provided in a compact easy-to-use format. Now we can perform tedious tasks from the comfort of our homes and offices. We can expand our personal universe by mind-boggling degrees—and, by in large, *we don't know anything about it*.

Most of us can benefit from the new technology that includes low cost personal computers, or microcomputers. A computer is called a personal computer if it is designed to be used by one person at any one time. Personal computers are almost always microcomputers. Microcomputers are the smallest in physical size of the family of computers which includes minicomputers and mainframe computers (the largest in physical size).

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mail read
Version 6.47 SOURCEMAIL

From: TCY481 4-Lines
On: 10 MAY 1983 At: 00:53
To: TCC062
Subject: TITLE OF BOOK

--More--

attention barbara: we were talking on chat and you gave me the name
of a book to watch for. could you give it to me by source mail to tcy481.
my buffer filled up and i didnot get the name etc

Disposition:reply

Enter text:

hi john. the book is called "the communications companion"

hope you get to read it. tcc062

Wait...

Sent to - TCY481

Disposition:delete

FIGURE I-3 An example of electronic mail, the following message was left in our confidential Source mailbox. We retrieved it using an Apple II Computer with a DC Hayes Micromodem II and the Data Capture program. (Note that this text is presented exactly as it was typed on the network, complete with typographical errors.)

Although personal computers are increasingly growing in popularity, not all personal computer users are aware of the communications capabilities of their computers. Those computer users who are aware that personal computers can communicate electronically with other computers often do not take advantage of this capability because they feel that the cost might be prohibitive. The purpose of this book is to provide you with an understanding of the available computer services and the methods of obtaining them in a cost efficient manner. The intent is to do this without confusing you with a lot of computer buzzwords or jargon (although we will get into some fairly technical areas).

The personal computer or computer terminal should, for the majority of users, function as a telephone or adding machine does. You do not have to concern yourself with the internal workings of a telephone to use it effectively. You simply pick up the receiver and dial. The telephone makes a ringing sound while you are waiting for the person on the other end to answer, so that you are never in the dark about what is happening. You hear a different sound if the phone is busy; again, a clear indication of what is happening. If you encounter something confusing or have difficulty, there is help available simply by dialing the operator. To be of maximum use to the maximum number of people, personal computers and computer terminals must also function in this way. We need a tool that will improve, simplify, and expand our communications with the rest of the world; we do not need a new job to learn or a new science to study or new language skills to develop.

This book will show you to what extent the technology has attained these goals. It also strives to give you comfort during the transition period and to direct you toward those services, computers, and computer programs that have achieved the greatest inroads towards these goals.

SORE THROATS

"Strep throat" is a sore throat caused by the streptococcus bacteria and can lead to complications of rheumatic fever or kidney disease. A throat culture is the most accurate method for determining if the problem is strep. An increasing number of physicians are enabling their patients to get throat cultures without seeing the physician first. We applaud and encourage this movement since it eliminates unnecessary office visits and saves money. The cost of an office visit and throat culture may be twenty dollars or more, while the charge for a throat culture alone may be two to five dollars. Request a throat culture without a physician examination; the office nurse can take the culture.

If you have been exposed to strep, if you have a rash, or if you have had rheumatic fever or kidney disease in the past, it is important for you to see the physician. In these cases, antibiotics may be started while awaiting the culture results. Because immunity develops after several infections, strep throat is most common in children and decreases in frequency with --MORE--

advancing age. It is unusual to see rheumatic fever or kidney complications for the first time after age 25. If you have a runny nose, hoarseness, cough, or muscle aches and pains, it is very unlikely to be strep. Most of the time, if you have a strep infection, pus will be visible in the back of the throat when you look in the throat with good light. If it's not strep throat, home treatment is as effective as any.

SEE PHYSICIAN TODAY.

WHAT TO EXPECT AT THE DOCTOR'S OFFICE

Thorough examination of ears, nose, and throat. Usually, a throat culture will be obtained. In occasional instances the culture will be omitted because of cost or a need to begin therapy immediately.

FIGURE I-4 Shown below is a portion of the House Medical Guide on The Source for treating a simple sore throat. We have retrieved this information using an Apple II Computer, a DC Hayes Micromodem II and the Data Capture program.

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Welcome to 550 pt Adventure!! Say "NEWS" to get up-to-date game details as of 03/26/82.

Would you like instructions?

y

Somewhere nearby is Colossal Cave, where others have found fortunes in treasure and gold, though it is rumored that some who enter are never seen again. Magic is said to work in the cave. I will be your eyes and hands. Direct me with commands of 1 or 2 words.

You are standing at the end of a road before a small brick building. Around you is a forest. A small stream flows out of the building and down a gully.

? go in house

You are inside a building, a well house for a large spring.

There are some keys on the ground here.

There is a shiny brass lamp nearby.

There is food here.

There is a bottle of water here.

? take food

Ok.

? take water

You have nothing in which to carry it.

? take lamp

Ok.

? take keys

Ok.

? drink water

You have taken a drink from the stream. The water tastes strongly of minerals, but is not unpleasant. It is extremely cold.

? leave house

You are standing at the end of a road before a small brick building. Around you is a forest. A small stream flows out of the building and down a gully.

? go forest

You are in open forest, with a deep valley to one side.

? go valley

You are in a valley in the forest beside a stream tumbling along a rocky bed.

FIGURE I-5 An example of us playing Adventure on The Source. We used an Apple II Computer, a DC Hayes Micromodem and the Data Capture program to capture what we were doing during the game.

II The Window on the World

One of the most exciting uses of microcomputers and, unfortunately, one of the most underused, is communications with other computers over telephone lines. Here, your personal computer becomes what is known as a *dial-up* terminal: it uses the telephone to dial up another computer. With a microcomputer and a telephone you can obtain a wealth of information without leaving your home or office. You can get such varied information as:

- Current and historic market prices for securities and commodities
- Airline schedules
- Current and past headlines and news stories
- National and international weather
- Legal opinions and precedents
- Consumer price and buying guides
- Restaurant evaluations
- Business and economic forecasts
- Medical diagnostic information
- Sources and bibliographies for research work
- Theater and movie reviews

and much, much more.

You can read this information on a television or televisionlike screen attached to your computer, or you can print it on paper or analyze and manipulate it further using another tool called a *program*. Programs, or software, are your way of communicating with your computer, or hardware. Programs allow you to direct your personal computer to do those tasks required of it. For example, suppose you'd like to maintain a portfolio of your securities holdings. You buy a personal computer that can communicate with the Dow Jones and Company computer and automatically obtain for you the market prices of the securities in your portfolio each day. (Dow Jones keeps this information on a large computer generically known as a *mainframe* computer.)

All you can do, at this point, is communicate with Dow Jones. Now you need a program that actually sets up the communications, obtains the information you need from Dow Jones and brings the information into your computer (often called down-loading) for processing on your computer, so that the portfolio analysis can be performed for you and reports printed. The program could calculate, for example, such things as the total market value of your portfolio,

your unrealized profits and losses realized if you were to sell your securities holdings today, and your realized or actual profits and losses.

In addition to making all of this information available to you, your personal computer also could communicate with other computers to perform a myriad of other tasks. It could:

- a. Send messages back and forth (commonly called *electronic mail*)
- b. Transfer programs or software from computer to computer
- c. Use the power, speed, or size of a large mainframe or minicomputer to perform a task such as financial modeling, accounting functions, security analysis of a number of firms or industries, recreational game-playing

and once again . . . much, much more.

Computers have been able to do these tasks only recently. For example, in the late 1960s one of the authors of this book was the data processing manager of a large brokerage firm that needed to transmit information from a computer system in New York to a system in San Francisco. To do this, a consulting firm was engaged for \$90,000 to develop the needed programs and many thousands of dollars were spent on additional equipment for communications.

After 6 months of development, the system was operational; however, it continued to have intermittent problems. When a problem occurred, the program developer, the computer manufacturer, the manufacturer of the communications device, and the telephone company all avoided responsibility, blaming one another instead. The user of the equipment then had to diagnose the problem, and problem-solving always took longer than might be reasonably expected.

Compare that scenario with today. You can go to your local computer store and buy a personal computer system for under \$5,000. The personal computer system you buy could include a modem and an intelligent modem program. A *modem* is the hardware that allows your computer to communicate with other computers over telephone lines. The same day you buy your computer you can install it in your home or office by plugging the modem into your existing telephone jack. For the cost of a local telephone call you could then start sending your information to San Francisco where a similar system has been installed.

The point of this example is to highlight the tremendous technical advances which have taken place in a very short period of time. Problem-solving will continue to be your responsibility. However, it can be simplified. You will have more information than you ever had before to aid you in your decision-making processes. Having all of this information literally at your fingertips is affordable because of packaged hardware and software now available on the market.

We wish to emphasize the word *packaged*. Nowhere in this whole process will you have to learn how to program a computer. The programs have already been written and are on a computer-store shelf waiting for you to buy them. You will be introduced to enough technical jargon to make you feel comfortable discussing your needs, but not enough to make reading this book an intimidating experience. We will discuss only existing products, not ideas that you would have to personally translate into programs or have translated into programs for you by a data processing professional. You will learn of the variety of tools and information available to you now and how you might best use these.

III What Are Computer Communications?

CONCEPT

The concept of “dial-up” computer communications is relatively simple. A computer is connected to a telephone or telegraphic lines. The lines allow the computer to “call” another computer and send and receive information. This concept is no different from the concept of verbal telephone communications. In fact, computer communications have all of the conceptual elements of verbal communications. In both a person places a phone call. If verbal communications are required, a telephone instrument is used to dial the number. If computer communications are required, a computer is usually used to dial the number (although, in some cases, a telephone instrument is also used to dial). If there is no malfunctioning of the hardware involved in the communications, one of the following will occur:

1. There will be no answer.
2. The line will be busy.
3. A connection will be made to a wrong number.
4. A connection will be made to the correct number.

If a connection is made to the correct number, the parties on both ends identify themselves and exchange information. When finished, both parties will hang up, and the connection will be broken.

The important point here is that, conceptually voice and computer communications over telephone or telegraph lines are the same. How the connections are physically made is different. Nevertheless, if you accept computer communications in the same fashion that you accept human verbal communications—as an existing and workable process that you use almost every day—then you will not get yourself irretrievably bogged down in technical gobbledygook. The important questions for you are:

- a. Does data that you are interested in exist on a computer that you have access to?
- b. Do you have the need to communicate with another person or group of people on a computer basis? (This communication could be from a large computer to another large computer; or from a small computer or a microcomputer to a large computer or vice versa.)

Now we will discuss briefly the technical information you need to understand the new words you'll encounter when you use computer communications devices and programs. It is to your advantage to understand these terms, although understanding is not essential in order to use computer communications. Remember, one of the things that AT&T has done very well in the verbal telephone communications area is to free you from a need to thoroughly understand the technology being used.

To properly complete a telephone call, you only have to know how to push buttons or (in the case of a rotary dial) how to dial. If you know how to look up a telephone number and who to call in the event of a wrong number or equipment difficulty, so much the better. You do not have to know anything about baud rate, granules, compression of characters, translation of voice signal into other mediums etc., to fully use the telephone. If people had to understand these technical terms to use the telephone, they would make much fewer calls.

Using a computer does appear to be a bit more complex than the simple dialing of a telephone, primarily because you are confronted with technical terminology whether you need it or not. The programs you purchase in a computer store are written for the largest possible audience in some specific area; therefore a communications program may contain features that can be used by someone much more technically oriented than you are. Whether you plan to use these features or not, you are still confronted with the terminology. In the remaining portion of this chapter we will deal with this terminology briefly.

Those interested in more detail and an in-depth understanding of the technical aspects of telecommunications should consult James Martin's *Introduction to Teleprocessing* (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1972) and his subsequent volumes in the series. Although *Introduction to Teleprocessing* was written over 10 years ago and is therefore not up-to-date with the current computer equipment (particularly microcomputers), it remains the definitive reference in the area of telecommunications.

METHODOLOGY

As we said earlier, you don't need to be a technical expert to use computer communications; however, a discussion of the concept alone may not satisfy your curiosity about exactly how the communications happen. Here we will discuss in more detail what happens at the beginning and the end of any communications, the conversions that must take place along the way, the actual transmission, and the capturing of information.

Origins and Ends

A terminal is required on both ends of the communications. In order to control the communications, at least one of the terminals must be *intelligent* or *smart*. What is the difference between an intelligent or smart terminal and a dumb terminal?

These rather simplistic terms refer to the data processing capabilities of the device being used for communications. Throughout this text we have used the words “terminal” and “computer” almost interchangeably. A computer, however, when used for communications, is actually a type of terminal. It is a smart terminal if, after the communications are complete, the information is manipulated by a computer program; e.g., saved on a floppy diskette for later use or reuse, combined with information previously collected, or sorted, ranked, edited, and reported on in a fashion that is more meaningful to you.

Once you have collected all of your information from some external database maintained on another computer, you are no longer dependent on the source of the information for processing of this information. You do the processing yourself, locally, when you are ready to do it. You can also reprocess the information as many times as you wish without returning to the source of the information. You actually create your own database. This database is either a subset or a duplicate of the remote database and can be maintained wholly on your personal computer. The term *database* refers to any compilation of information that can be read by a computer.

What we normally call a terminal is usually a *dumb* terminal. A computer can also behave like a dumb terminal. A dumb terminal performs a singular task, such as connecting to a particular time-sharing service so that specific information offered by the time-sharing service can be accessed and examined on a televisionlike screen or more commonly, printed on a printer. Dumb terminals, especially those that only print, have been used by many people for a long time. We see these terminals throughout most larger organizations. They are normally obtained as part of a package purchased or leased from a time-sharing company. Another commonly used example of a dumb terminal is the device at your local bank that gives you, on demand, information about the balance in your account. You simply supply your password.

The difference between using a dumb or a smart terminal becomes obvious if you wish to manipulate the information you have gotten from the remote computer's database rather than just reading it. If you have a dumb terminal, the manipulation must take place on the remote system's computer during the time you are connected to the remote service. With a smart terminal you are able to manipulate the information on your computer at no additional cost, at a time convenient to you.

The line between a dumb and smart terminal is not quite as precise as presented here. For example, there are dumb terminals, such as the revolutionary IXO Corporation's IXO Telecomputer discussed later in the book, that have enough intelligence to retain such things as the commands that allow you to connect to various databases and to automatically send the commands over the telephone lines when required. These databases could include Dow Jones, The Source, CompuServe, or any of the multitude of services available for general use, many of which will be discussed later in this book.

As we said earlier, a microcomputer such as an Apple II, Apple IIe, IBM Personal Computer, Osborne I, Radio Shack's TRS-80 (Model's II, III, 4, 12 or 16) can function as a dumb terminal in its appearance to the remote computer. It generally appears as a Teletype would to the remote computer. It is an intelligent