COMMUNICATIONS
and NETWORKING

for the IBM PC

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PREFACE

This book is designed to introduce the communications novice to the data communications capabilities of the IBM Personal Computer. The development of the IBM Personal Computer is a significant event in the short history of microcomputers and the communications capabilities of the machine will make a major contribution to the revolution that is taking place in computer communications.

The purpose of this book is to introduce the reader to both the fundamentals and the applications of data communications on the IBM Personal Computer. The reasons for selecting data communications over other forms of data transfer are explored. The mechanics of data communications are discussed in sufficient detail to prepare the reader for discussions on communications hardware and software. Hardware and software discussions are included to give the reader a good background for the purchase and installation of both. These two topics are covered in general with explanations of capabilities and characteristics provided. Discussions of specific products available on the market are limited because they would become quickly outdated. The information presented should prepare the reader for the evaluation, selection, and use of both hardware and software as these products change and improve over the next few years.

Local area networks are also becoming popular with personal computers. Expensive hardware such as hard disks and letter quality printers can be shared by several microcomputers, thereby reducing the effective cost per work station for network configurations. This topic as it applies to the IBM Personal Computer is explored in both fundamental concept and practical application. This information should prove useful for the small business that needs network power but not the computing power of a mainframe system.

The future of communications is exciting and new. Applications of the technique are developing that will allow the user to reach out to information banks and to services never before available. Information that improves business performance and provides individual entertainment is available now and new horizons are developing rapidly. Some of these new horizons are presented.

On the practical side, problems sometimes arise during the initial stages of setting up data communications. Some typical problems and solutions to those problems are presented as questions and answers at the close of the book.

This material bridges the gap between the fundamentals of communications and the practical aspects of making it work for you. The material was derived from the authors' experience in teaching communications to IBM Personal Computer novices and provides a good starting point for other communication novices.

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Introduction to Data Communications

The introduction of the IBM Personal Computer has produced a great deal of excitement in the microcomputer world. One of the PC's most useful capabilities is data communications. To take advantage of that capability, however, requires that the user have some understanding of the techniques of communications. To help pave the way for an easy transition into the world of Personal Computer communications, this book provides facts and information on the subject. After a discussion of the roles and current applications of data communications, the book guides you through the technical aspects of communications, the hardware required to support communications, and the software required to make your PC communicate. This information has been designed to take the mystery out of IBM Personal Computer communications and to help you make educated decisions on the purchase and use of both communications hardware and software.

I. CURRENT ROLES OF COMMUNICATIONS

The two major categories of communications usage are business and personal, but there are many gray areas between these two major categories. Big businesses with mainframe computers are interested in communications because it allows them remote access to their centralized data bases, mainframe computing and information handling centers. Small businesses are interested in communications because it allows them to share expensive hardware between small computers and to access time-sharing information and business systems. Home-users are interested in communications because it allows them to obtain information, shop from home, and reach forms of computer entertainment not otherwise available to them.

There are also many communications buffs who are simply thrilled by the aspect of conversing or communicating with another computer or service system and will frequently do so whether or not they achieve anything worthwhile. This type of com-

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munication often results in useful facts and information moving from one part of the country to another. For example, a Personal Computer programmer in Dallas, Texas may produce a new sorting program and communicate the utility to a friend who in turn communicates it to a national electronic bulletin board where it is then communicated to thousands of Personal Computer users, all within a period of days. It would take two or three months for this same information to reach users through computer magazines and journals. Thus, a harmless pastime becomes a useful service in the business of communications.

II. ADVANTAGES OF ELECTRONIC DATA TRANSFER

The three primary advantages of electronic information transfer are that it can be done at any time of the day or night, it can be done at a rapid rate of speed, and because of the standardization of communication codes, it can be done between equipment made by different vendors. Complete transmission error checking is also possible. Text can be transmitted at 120 characters per second over most standard telephone lines which means that an entire 200 page book can be transmitted in approximately 40 minutes. This may sound like a great deal of transmission time, but when you stop to consider that the book can be completely reformatted or printed in a variety of styles on the receiving end without rekeying the text in, it may be well worth the time.

 Business situations often require rapid, accurate information transmission across town or country to stay one step ahead of the competition, and data communications helps make that possible. Express delivery and facsimile (telecopy) services are two other options available for information transfer, but these services have limitations. The express delivery services usually take at least 24 hours for delivery coast-to-coast and packages usually have to be sent on a scheduled basis. Telecopy is an immediate transfer of information, but the quality of the end product is not always satisfactory for business use and the process is time consuming. Sending large volumes of information by telecopy is impractical on both a cost and time consumption basis. There is also the option of transporting information physically on electronic disk or tape so that further processing can take place on the receiving end. Physical transfer of information, however, requires transport time and the transport medium is subject to electromagnetic, environmental, and physical handling damage. Incompatibility between disk storage formats used by the computers on the sending and receiving ends may also make physical transfer of information impractical.

   Hobbyists and home-users of microcomputers sometimes want or need up-to-the-minute information on stock prices, news on events that are taking place in the world, or information pertaining to their computers. Access through communications to time-sharing information sources or local electronic bulletin boards allows these users to obtain that information. This same category of users is also often interested in obtaining public domain software. Data communications allows them to transfer programs from time-sharing systems and personal computer host systems to their own disk storage units. Access to these public domain programs might not otherwise be possible unless

there is an active user group in the area willing to make the data communications transfers and then distribute the programs on public domain diskettes.

Electronic transfer is not, however, always the best method of getting data from one place to another. If time is not a critical constraint or if the information will not require further development on the receiving end, other methods of transfer may be ' more cost efficient. Also, physical transport of electronic media may be required due to copy protection provided with software.

There are many other considerations that must be made before you decide to go with electronic transfer of information. All those considerations are not presented in this text. Some common uses of Personal Computer communications are presented, however, to give your imagination a good starting point. The pros and cons of electronic transfer can be better assessed with a good understanding of data communications.

III. BUSINESS APPLICATIONS

One prevalent business application of computer communications is the collection of data from several sources during the compilation of a single larger set of data. For example, a host computer can be set up to receive portions of software from several authors; then those portions can be linked together to form a volume of text or a computer program. The development of this book is a good example of that kind of communication. As each section was completed by one author, it was transmitted to the other author for review. Each segment was preprocessed by an author, reviewed and modified by both authors, then post-processed for delivery to the publisher. Thus, portions of the book were created in an interactive off-line mode, then transmitted to another author for further off-line development. This procedure took advantage of the highly efficient interactive method of creating text using word processing and met the time constraints of getting copy to another author on a tight schedule.

Aside from the development of text and software using a team approach, there are many other advantages in the electronic transfer of data via the Personal Computer. The technique can also be used to put together expertise from different parts of the country and can allow work to be performed at home. Businesses are always looking for ways to reduce overhead costs, and combining remotely produced portions of a project as well as portions produced by participants who work at home could produce a deciding competitive edge for some companies. There are problems associated with this kind of development work, such as quality control of contributions, elimination of duplicated efforts, and the remote scheduling of tasks which will require special project management talents; but the offsetting advantages may make such development attractive.

IV. INFORMATION SERVICE APPLICATIONS

You probably receive at least one Personal Computer magazine or publication each month and find that some, if not all the information presented, is already out of date.

Because of the lead time required to compile and publish these periodicals, publishers are unable to provide you with up-to-the-minute changes that are taking place in the industry. To get this kind of information, you have to rely on word-of-mouth transfer of facts or tune in to a medium that changes as rapidly as the Personal Computer world changes. Other than local users groups, the best sources of such information are the electronic information services, sometimes called *information utilities*.

Electronic information sources take many forms, but they can be generally categorized as either profit-making businesses information systems or private non-profit *bulletin boards*. Some examples of business information services are *THE SOURCE*, *CompuServe*, the *Dow Jones News Retrieval Service*, and *NewsNet*. These services provide individuals and businesses with a wealth of information ranging from stock quotations to current news, and they can be accessed by dialing local telephone numbers in most major metropolitan areas. The new low cost long distance rates offered by *MCI* and *Sprint* also make these services attractive for users located outside major metropolitan areas.

The information utilities currently available actually function as *information brokers*. These services buy information from a variety of sources, store the information, and provide user access to the stored data. The sources of information are responsible for updating the data, and the information utilities are responsible for maintaining the storage and access hardware and software. Because of this division of responsibility, the user is assured of getting reliable access to well-maintained information. Summaries of the services provided by the major information utilities and the current costs of those services are provided in Tables 1-1, 1-2, 1-3, and 1-4.

The major advantage offered by these electronic information services is the *timeliness of the information* they provide. Stock quotations can be updated continuously as can other items such as the news and local area activities. Magazines and published periodicals cannot match such timeliness although television, radio, and newspapers can come close. These sources of information do not, however, allow you to do selective searching for information based on subject matter or key words, which is possible using the electronic alternatives.

For the IBM Personal Computer owner, both THE SOURCE and CompuServe have special areas set aside for IBM PC information exchange. By gaining access to these areas, you are apprised of the latest news and developments associated with the PC. You will also have access to tips and utilities provided by other PC owners. In addition, you will have access to public domain software, some of which is actually better than some of the commercially available packages that purportedly perform the same tasks. Because of the lack of quality control of the software placed in the files of these services, however, you may also find software there that does not perform as advertised by the authors. You or someone you know who has the expertise will have to test the software you obtain from these services to be sure it performs properly.

Finally, the major advantage these services provide is access to thousands of other Personal Computer owners, one of whom may have a solution to your most pressing problem. An uncanny phenomenon of the microcomputer world is the abundance of users who are more than happy to share solutions to problems just for the sake of

Table 1-1. THE SOURCE.

Current Usage Costs:	300 Baud	1200 Baud
Prime Time (7am–6pm)	$20.75/hr	$25.75/hr
Evenings/Weekends/Holidays	$ 7.75/hr	$10.75/hr
After Midnight	$ 5.75/hr	$ 8.75/hr
Minimum Cost of Service:		
Initial Fee	$100.00	
Monthly Fee	$ 10.00	

Sample of Services:

- UPI News Service—Keyword search capability lets you locate specific news or sports stories within minutes after UPI release.
- Electronic Mail—Messages or reports can be transmitted immediately to other subscribers anywhere in the country.
- Electronic Travel Service—Allows you to make airline and hotel reservations and charge them to a major credit card.
- The New York Times Consumer Library—Allows you access to the New York Times Consumer Data bases containing timely articles on a variety of current issues.
- Computer Search International—Allows a company to search for employees using the services of a network of executive recruitment firms located in major cities across the nation.
- Financial Services—Provides timely information on stocks, bonds, commodities, precious metals, futures, etc.
- Information on Demand—A reach organization which will send you hard copy reports on any available article throughout the free world with language translations when required
- Business Programming Power—BASIC, Fortran, Cobol, RPG11 and assembly language are available for you to write and run your own programs.
- Chat—Allows you to interact with other users who are on-line when you are.
- Consumer Aids—Information to help you solve energy problems or improve your health.

How To Start: Purchase the package from a local microcomputer dealer or call THE SOURCE at 800-336-3366.

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helping a desperate soul. If you have a problem and ask for suggested solutions in an open request (unprotected message to anyone who calls in) you are likely to get several suggested solutions within a short period of time. If your problem is legitimate and no one can come up with a suggested solution, the problem may become a major issue among IBM PC owners simply because of the visibility of the complaint. In any event, you are more likely to get sound suggestions from the myriad of service users than you are from some local retailers who do not maintain technical staffs to handle owner problems.

Table 1-2. CompuServe Information Service.

Current Usage Costs:	300 Baud	1200 Baud
Prime Time (8am–6pm)	$22.50/hr	$35.00/hr
Evenings and Weekends	$ 5.00/hr	$17.50/hr

Minimum Cost of Service:

Initial Fee	$19.95	
Minimum Monthly Fee	None	

Sample of Services:

- News, weather, and sports from major newspaper and international news services
- Financial information with updates and historical information on stocks, bonds, and mutual funds
- Entertainment—theater, book, movie, and restaurant reviews plus information on opera, symphony, ballet, dance, museums, and galleries
- Electronic Mail—you can create, edit, send, and receive messages from other users
- Home Information—government publications and articles from home magazines
- Personal Computing Services:

Software exchange	Line printer art gallery
Word processing	Programming languages
Business software	Educational software
Computer games	IBM Personal Computer area

- Citizens Band radio simulation
- National Bulletin Board system and special interest bulletin boards
- Feedback to CompuServe—comments, suggestions, and questions
- CompuServe System News on new or modified services

How To Start: Purchase a Videotex package (Catalog number 26-2224) from your local Radio Shack store.

V. LOCAL AREA INFORMATION EXCHANGE

Another category of communication that is proving to be popular with the IBM Personal Computer is *local area information exchange*. This includes both *public bulletin boards* and private personal computer *host systems* which are set up by individuals and users groups just for exchanging tips, software, and information about the Personal Computer.

To give you some perspective on the demand for this type of service, the Washington, D.C. area's Capital PC User Group bulletin board logged over 6400 calls during its

Table 1-3. Dow Jones News Retrieval Service.

Current Usage Costs*:	*300 and 1200 Baud*
Prime Time (6am–6pm)	$0.60/min–$1.20/min
Evenings/Weekends	$0.20/min–$0.90/min
Minimum Costs of Services:	
Initial Fee	$19.95–$95.00
Minimum Monthly Fee	None

Sample of Services:

- Financial News—as recent as 90 seconds or as old as 90 days; from the pages of the Wall Street Journal, Barron's, and the Dow Jones News Service.
- Current Market Quotes:

    1. Stocks and warrants, corporate bonds, and options updated continuously.
    2. Nasdag OTC stocks updated hourly.
    3. Selected U.S. Treasury Notes, bonds, and mutual funds updated daily.

- Detailed financial statistics including stock price, volume, and financial indicators are available for all New York and American Stock Exchange traded companies plus 800 over-the-counter traded companies.
- Wall Street Week—transcripts of the PBS television program discussing the latest economic developments.

How To Start: 1. Purchase a Videotex package (Catalog number 26-2224) from your local Radio Shack store.

2. Purchase the IBM Dow Jones Reporter package from any IBM Product Center or other IBM Personal Computer retail store.

*Each service shown in the sample of services has a different cost schedule.

first seven months of operation. The average call resulted in a connect time of 40 minutes during which the caller read messages and tips on various operational characteristics and anomalies associated with the PC or its peripherals. Programs and software patches were also downloaded. Of the 6400 calls received by the bulletin board, 45% were long distance calls from outside the Washington, D.C. area. Because of the lack of timely information available on the PC, people were willing to pay long distance telephone tolls to get such information.

Local area bulletin boards can be entertaining as well as informative. Some offer games that can be played by either single individuals or by simultaneous correspondence with other users. Some bulletin boards also provoke controversy by offering a forum for the discussion of such issues as morality, religion, and abortion. Others allow local users groups to post notices for upcoming meetings and products that will be available for purchase at the meeting. Many bulletin boards also allow callers to leave messages for other individual callers or to leave general nature messages such as comments on