COMPUTE!'s

TELECOMPUTING ON THE COMMODORE 64

Everything you need to know to start telecomputing on your 64—including special terminal software.

A **COMPUTE! Books** Publication

$12.95

COMPUTE!'s
TELECOMPUTING ON THE COMMODORE 64

COMPUTE!™ Publications, Inc. abc
One of the ABC Publishing Companies
Greensboro, North Carolina

The following article was originally published in *compute II. The Single Board COMPUTE!* magazine, copyright 1980, Small System Services, Inc.: "RS-232 Communications" (original title: "RS-232 Communications, Part 1," April/May, and "Part 2: RS-232 Communications," June/July).

The following article was originally published in *COMPUTE!* magazine, copyright 1981, Small System Services, Inc.: "How Data Transmission Works" (original title: "What Is a Modem, and Why Do I Need One? " September, and "What Is a Modem, and Why Do I Need One? Part II," October).

The following articles were originally published in *COMPUTE!* magazine, copyright 1982, Small System Services, Inc.: "Modem Applications" (original title: "MODEM Applications," March); "Sending Programs over the Phone" (original title: "Telecommunications: Sending Programs over the Phone," May); "All About ASCII" (original title: "Telecommunications: All About ASCII," September).

The following articles were originally published in *COMPUTE!* magazine, copyright 1983, COMPUTE! Publications, Inc.: "Telecommunications: How to Get Started (November); "Termulator for the 64" (November).

The following article was originally published in *COMPUTE!* magazine, copyright 1984, COMPUTE! Publications, Inc.: "Bulletin Board Basics" (November).

The following articles were originally published in *COMPUTE!* magazine, copyright 1985, COMPUTE! Publications, Inc.: "Smokey & the Modem, Part 8086" (original title: "Telecomputing Today: Smokey & The Modem, Part 8086," January); "Plus/Term" (original title: "Plus/Term for VIC & 64," February).

The following articles were originally published in *COMPUTE!'s Gazette*, copyright 1983, COMPUTE! Publications, Inc.: "A Nationwide Party Line" (original title: "Commodore's Nationwide Party Line," September); "Telecomputing Today" (September); "TeleTerm 64" (September); "Telecommuting: Dawn of the Electronic Cottage," December.

The following articles were originally published in *COMPUTE!'s Gazette*, copyright 1984, COMPUTE! Publications, Inc.: "Navigating the Networks" (original title: "Home Telecommunications," June); "Downloading" (original title: "Home Telecommunications: Downloading," August); "Uploading" (original title: "Home Telecommunications: Uploading," August); "Bulletin Board Fever" (November); "Indispensable Sysop" (November); "Understanding Modems" (November).

The following articles were originally published in *COMPUTE!'s Gazette*, copyright 1985, COMPUTE! Publications, Inc.: "Modems in the Home" (January); "Telegaming" (May).

The following article was originally published in *COMPUTE!'s Personal Telecomputing*, copyright 1984, COMPUTE! Publications, Inc.: "Taking the Plunge."

The following article was originally published in *COMPUTE!'s Telecomputing on the IBM*, copyright 1985, COMPUTE! Publications, Inc.: "Online Research Services."

The following article was originally published in *MacTalk: Telecomputing on the Macintosh*, copyright 1985, COMPUTE! Publications, Inc.: "The Telecomputing Lexicon."

Printed in the United States of America

10 9 8 7 6 5 4 3 2 1

ISBN 0-87455-009-2

COMPUTE! Publications, Inc., Post Office Box 5406, Greensboro, NC 27403, (919) 275-9809, is one of the ABC Publishing Companies and is not associated with any manufacturer of personal computers. Commodore 64 is a trademark of Commodore Electronics Limited.

Contents

Foreword

By adding a modem to your 64, you can communicate with other computers, large and small. Using phone lines as bridges, you can *upload* (send) and *download* (receive) text and programs, sharing with others who are also connected to the system.

COMPUTE!'s Telecomputing on the Commodore 64 introduces you to telecommunications. Starting out with simple discussions and a glossary of terms for beginners, the book shows you how telecomputing works, including discussions of ASCII and RS-232. There's also advice on using information services (like CompuServe) and bulletin board systems (smaller, special interest telecomputing services).

But that's not all. *COMPUTE!'s Telecomputing on the Commodore 64* includes three free terminal programs that you can type in and use on your 64. The most sophisticated of the terminal programs, "Plus/Term," even allows you to download, upload, load, and save files using a special buffer. If you prefer to purchase rather than type in the terminal programs, they can be ordered by using the coupon found in the back of this book.

In fact, *COMPUTE!'s Telecomputing on the Commodore 64* and a modem are all you need to get started with telecomputing on your 64.

1
Starting Out

1
Telecomputing Today

Tom R. Halfhill

Many futurists believe that someday telecomputing will be the primary use for home computers—an integral part of every modern household. Here's an introduction to what is happening in telecomputing now.

You've probably already heard the forecasts about home banking, home shopping, electronic newspapers and magazines, telegames, and online encyclopedias and databases. Actually, all of these services are available today, though perhaps not in all areas, or in an affordable or mature form. But times are changing fast.

All of our electronics/communications technologies seem to be merging, moving together toward a common center. Think about it: telephones, television, cable systems, satellite receivers, videocassette recorders, video discs, video motion and still cameras, home computers . . . everything is evolving toward some kind of *teletronic* supersystem that someday will fuse these now-separate parts into an integrated whole.

Will it really happen within our lifetimes? There are strong indications.

TV sets are starting to come equipped with cable tuners and extra jacks for home computers, videogames, and other accessories. Wide-ranging information services aimed at personal computer users already are accessible with a local phone call in every major city of the United States. Similar systems in Europe are even more advanced. Some cable TV networks and banks in the United States are test marketing interactive systems using low-cost home computers as terminals. Many of the latest personal computers to be introduced offer built-in phone modems as a standard feature. Some people, instead of commuting to the city, work at home with personal computers or remote terminals tied into their employer's computer over the phone lines. Video cameras and laser discs are replacing Super-8 movie cameras and LP turntables.

1 Starting Out

Soon, it seems, the entire household will function around this emerging video/computer/telecommunications super-system—what one futurist has dubbed the *electronic hearth.*

For certain, there are social, as well as technological, trends which must be considered. So we'll have to wait and see exactly how things develop. In the meantime, though, this exciting frontier is open to pioneers. It's similar to the groundbreaking days of personal computing five or six years ago.

Telecomputing today is still young. And you can help it grow. If you're new to the field of telecomputing, you'll quickly discover that it shares something unfortunate with personal computing in general—telecomputing consists of a few easily understood concepts obscured by thickets of thorny terminology.

We'll sort out the terminology elsewhere in this book (note the glossary that follows). First, let's review the basic concepts:

1. Two or more computers can be hooked up to each other with wires.
2. With the proper programming, virtually any two or more computers hooked up in this way can exchange virtually any kind of information.

That's it. Does it seem too simple? Believe it or not, practically everything else you'll ever read or hear about telecomputing consists of extensions (complications) of these two basic concepts. The wires which connect the computers together are usually ordinary telephone lines, just like the ones in your home. (But they don't have to be: it's possible to hook up two computers across a room or within a building using ordinary wires with the right plugs on the end.)

The programming is often the hard part. The computers may not be normally compatible with each other. However, you probably won't have to worry about this. Programs that cover all the standard situations you're likely to encounter are already readily available. These programs act as interpreters. They even make it possible for seemingly incompatible computers, such as Commodores, Ataris, Apples, IBMs and TRS-80s, to communicate as easily as (perhaps more easily than) United Nations diplomats.

A Closer Look

To communicate through ordinary telephone lines, a computer requires a device called a *modem* (rhymes with *load 'em),* which means *mo*dulator-*dem*odulator. When two or more computers are communicating over the phone, each computer requires its own modem at its end of the line. The modem is connected between the computer and the phone line, and it allows the computer to send and receive information to and from the other computer.

When you are sending, the modem takes the data in the form of electronic signals from the computer and converts it into audio tones. Then the modem sends the tones through the phone line. These tones, if you hear them, sound like very fast Morse code.

When you are receiving, the modem takes the audio tones sent by the other computer's modem and converts them back into the electronic signals that your computer can understand as data.

This process may sound familiar. That's because it's very similar to the way the computer saves programs and other data on the cassette recorder. During a SAVE, the computer's output is converted to audio tones which are sent to the recorder and recorded on tape. During a LOAD, the audio tones received from the recorder are converted back into the original information. A modem works the same way, except the tones and speed of transmission are different. And, of course, the information is being sent not to a nearby cassette recorder, but to another computer which can be as far away as the furthest telephone.

There are two general types of modems for personal computers: *acoustic* and *direct-connect.* Acoustic modems are easy to spot because they have two rubber cups which fit over the telephone handset's earpiece and mouthpiece. The rubber cups must fit tightly to keep outside room noises from interfering with the audio tones.

Direct-connect modems bypass the handset altogether and connect directly into the telephone. Commodore's VICmodem and Automodem are examples of this type. They are cartridges that plug into the rear of the computer; a cord connects them to the telephone.

Direct-connect modems are often preferred to acoustic modems because they are less vulnerable to noise interference. They are the best choice when the modem is operated in a less-than-quiet environment. Until recently, acoustic modems were more popular because of their lower cost. But new technology has made some direct-connect modems less costly than many acoustic models.

Equipped with a modem plugged into a telephone, a computer needs only one more thing to be ready for telecommunicating: the proper programming mentioned above.

Terminal Software

This program is usually referred to as *terminal software*. In effect, it turns your computer into a remote terminal of the distant computer. Your computer is more or less disabled as an independent computer and becomes a peripheral, or external device, of the other computer. Everything you type on your keyboard appears not only on your screen, but on the other computer's as well. And everything typed on the other computer's keyboard likewise appears on your screen.

Terminal software completes the communications link established by the hardware—the computers and the modems. It works with the modem to translate the data which is sent and received. If the two computers are normally incompatible with each other—say, if a Commodore is attempting to communicate with an Atari—the terminal program acts as an interpreter to resolve the differences.

With the right terminal software, you can communicate with almost any computer. This includes not only other personal computers, but much larger machines as well. A college student can program the university's mainframe or minicomputer from the dormitory room, using an inexpensive home computer and modem as a remote terminal. An employee can work at home, accessing the business's computer in the same way. This makes some of the great speed and power of mainframe computers available almost anywhere.

All terminal software is not programmed equally, however. Some terminal programs have features which allow you to do more than others.

One of the most powerful features is *upload/download* capability. This permits you to send and receive files. Files can be anything from written letters to programs.

For instance, let's say you want to share a new program you've written with a friend across town or across the country. You could mail the friend a cassette or disk. Or, if you both have modems and the proper terminal software, you could send it by phone. You would call up your friend, establish the telecomputing link by activating your modems, and *upload* (send) the program.

At the other end of the phone line, your friend's computer and modem would be *downloading* the file. The companion terms *upload* and *download* are like *overpass* and *underpass;* it depends upon your point of view. The sender uploads as the receiver downloads.

Usually, the terminal software loads the file off disk at the uploading end before sending it through the modem. At the downloading end, the file is then saved on disk also. It's possible to use a cassette recorder at one or both ends, but the relative slowness of cassettes becomes a big disadvantage, especially when a long-distance phone link is involved.

Exchanging files also requires lots of memory. Each computer must have enough memory to hold both the terminal program and the file. This should be no problem with the Commodore 64.

Note that even two computers which are normally incompatible can exchange files in this way. An Apple user could upload a message or a program to a Commodore user, for example. But remember, only the phone link has been standardized; the programs remain incompatible. Still, you might be able to modify the program to work, and it would save lots of typing.

What Else Can You Do with a Modem?

One popular modem activity is calling up a *bulletin board system* (BBS). A BBS is a computer with an autoanswer modem that offers some sort of service, either to anyone who calls, or to a select group of people who know the password.

Most bulletin boards are operated by user groups, individual hobbyists, computer shops, or other organizations. A computer is equipped with an autoanswer modem and is left on during certain hours, sometimes 24 hours a day. When you call, the modem automatically answers the phone and sends a steady tone. This signals you to activate your own modem, setting up the link.

Once online, the BBS usually displays a welcoming message and menu of choices on your screen. The choices depend on the BBS. It may be a local user group BBS that offers members the latest news and library programs for downloading. Or it could be a machine-specific BBS with news and programs for users of that particular computer. Some bulletin boards cater to other special interests, such as amateur radio or science fiction. Many allow you to leave messages for other callers to read. There are even dating services and X-rated bulletin boards.

Almost all of these bulletin boards are open to virtually anyone. A few, however, require passwords known only to members of a certain organization.

Besides these privately operated boards, there are also commercial information utilities which, in effect, are giant bulletin boards themselves. Instead of operating their systems with small personal computers, these utilities use vast banks of minicomputers and mainframes which allow hundreds of callers to be online at a time. They offer wide varieties of services to their subscribers, who pay an hourly connect fee.

Many of these utilities are specialized databases aimed at business people and professionals such as scientists and lawyers. They can be quite expensive—up to $300 an hour.

Two of the most popular telecomputing utilities for personal computer users are the CompuServe Information Service and The Source. Some others are the Dow Jones Information Service, Delphi (run by General Videotex Corporation), and the Dialog Information Service. Connect fees for these utilities start at about $6 an hour if you call in the evenings or on weekends and holidays. Prime time (business hours) generally costs much more.

If you live in a major metropolitan area within the United States, you can usually reach these utilities with a local phone call. The utility leases long-distance phone lines from each area to its central computers, and the phone charges are included in the hourly connect fee. In some smaller cities and rural areas, you'll have to reach the utility through a long-distance network such as Tymnet, whose charges (about $2 to $3 an hour) are often added to the hourly fee.

It would take a whole book to list the services offered by all the information utilities. There are encyclopedias, newspapers from all over the country, business news and stock re-

ports, Associated Press dispatches, the latest sports scores, marine and aviation weather reports, electronic mail, special interest groups, and even party lines and telegames (see related articles elsewhere in this book).

Some modems or terminal programs include a free subscription and some free connect time on one or more of the information utilities. This is an excellent way to find your way around and get acquainted with what's available.

Here are some hints for those who want to get started in telecomputing:

- When choosing a modem and terminal program, be certain that they will be compatible with each other and with your computer. Even if the salesperson assures you the combination will work, make sure you can return everything if it doesn't. (The VICmodem and Automodem come with terminal software for the Commodore 64 and VIC-20.)
- If you want such features as upload/download, check before you buy.
- Phone lines can be temperamental. The telephone system is a marvelous thing, but, remember, it's a nineteenth-century invention that was originally designed for voice transmission, not data communications. A good connection is essential for telecomputing. Interference which is unimportant for voice purposes can easily confuse a modem. Unfortunately, telephone companies can be difficult to deal with on these matters. If you suspect a phone line problem, bolster your case by verifying that your computer/modem/software combination works on another line.
- Sometimes you can solve an interference problem by moving the TV away from the modem and telephone. TV sets generate strong magnetic fields.
- If your computer is not near a telephone, you'll have to install an additional phone jack or use a phone extension cord. Try the extension cord first; it's cheaper. But if the additional wire causes interference problems, you may have to resort to another jack.

The Telecomputing Lexicon

Sheldon Leemon and Arlan R. Levitan

Here's a glossary of common telecomputing terms that should prove useful as you learn the ins and outs of telecommunications. Many of the terms are discussed in detail elsewhere in the book as well.

acoustic modem
This type of modem receives and transmits audio signals through a regular telephone handset. The handset is placed into a cradle, which has rubber cups to hold the mouthpiece and earpiece. Contrast with *direct-connect modem.*

answer/originate
See originate/answer.

ASCII (as-key)
American Standard Code for Information Interchange. Since computers understand only numbers, not letters or other characters, some standard code is required to convert the numbers to letters. ASCII is the code used for all personal computer communications. For example, in ASCII, the decimal number *65* stands for the letter *A*. There are 128 standard ASCII code values, ranging from 0 to 127, each of which is assigned a particular meaning.

asynchronous communications
Data communications in which the sender signals the receiver each time he or she starts or stops sending information.

autoanswer
This feature allows a modem to take the telephone off the hook when it rings and initiate communications with the caller.

autodial
Another modem feature which allows the computer to dial telephone numbers, either those that are typed on the keyboard or those sent automatically by a terminal program.

baud
A unit commonly used to indicate the speed of data transmission.

BBS
Bulletin Board System. Also referred to as *CBBS.*

Bell-compatible
A modem which uses audio tones that meet Bell Telephone standards. Thus, 300 bps modems which meet the Bell standard are said to be Bell 103–compatible, while 1200 bps modems are said to be Bell 212A–compatible.

bit
A binary digit. The smallest unit of information that a computer can use, corresponding to a 0 or a 1. In data transmissions, these correspond to either a high-pitched audio tone or a lower-pitched one.

bits per second (bps)
A unit for measuring the speed of data transmission.

buffer
A holding area within your computer's memory. In communications, a buffer is used to temporarily save data so that you can recover it after it's scrolled off the screen. Many terminal programs allow you to open and close buffers from the keyboard and to save their contents after your communications session, either to a disk file or to your printer.

carrier signal
An audio signal whose tone can be altered in order to carry data.

CBBS
Computer Bulletin Board System. *See also* BBS.

character
Any letter, number, punctuation mark, or special symbol transmitted during data communications.

character length
A communications terminal setting referring to the number of data bits which comprise each character sent. Seven data bits are required to transmit each character in the ASCII set, but in order to transmit the binary data that computers use, eight bits are required.

communications settings
A group of options which determine how two computers will communicate. These options are controlled by your terminal software, and include speed of transfer, parity, duplex, character length, and number of stop bits.

communications software
The computer program which allows your computer to send and receive data via a modem and the phone lines.

connect time
The amount of time you spend with your computer connected to a remote database. Commercial databases generally charge users based on the time connected.

control character
A nonprinting character that controls some aspect of the terminal.

data bits
The portion of all bits used to send a single character over a telecomputing link which actually holds data. Usually seven or eight bits.

direct-connect modem
A modem which plugs directly into a modular telephone jack. Contrast with *acoustic modem.*

download
To receive and store data sent by a remote computer for later use. Opposite of *upload.*

duplex mode
Indicates whether the remote computer echoes characters typed at the computer keyboard. *See also* full duplex *and* half duplex.

echoplex
Another term for *half-duplex mode.*

flow control
The process of throttling the rate of data transmission by a mutually agreed-upon method. Used if a receiving system is not capable of handling incoming data at full speed.

framing bits
Part of the bits used to send a single character of data over a telecomputing link. Framing bits delineate the beginning and end of each character.

full duplex.
Communications mode in which the remote computer echoes characters typed on the computer keyboard back onto the computer screen.

half duplex
Communications mode in which the remote computer does not echo characters typed on the computer keyboard back onto the screen. In half-duplex mode the terminal software or modem on the computer end of a telecomputing link handles display of keyboard entry on the screen.

handshaking
See flow control.

keyword *and* keyword search
The ability to specify retrieval of information by user-specified words. For example, requesting a list of only those articles having the word *computer* from an information service database.

mainframe
A large computer system used by commercial information service providers, schools, and businesses. A mainframe is usually capable of handling many telecomputing sessions at one time.

mark
The audible equivalent of a *1* on the phone line of a telecomputing link.

null modem
Cable used for file transfers between two computers in the same room. Since phone lines are not involved, this eliminates the need for a modem on each system.

originate/answer
In a telecomputing link, one modem is said to be in answer mode, the other in originate. Each mode uses predefined frequencies for receiving and sending data.

packet-switching networks
National telecommunications networks that let you dial computers in other areas of the country via a local phone call. Commonly used to access commercial information services.

parity
A method of error checking used to insure the integrity of individual characters of data transmitted. Typically odd, even, or none.

protocols
Rules used to facilitate exchange of data between two computers.

RS-232-C
The standard which defines electrical connections for implementing serial interfaces on computers. Also used to refer to connection between computer and modem.

scroll
The movement of incoming data or text on your computer's display. The most recent information appears on the bottom of the screen and moves upward a line at a time. The topmost lines eventually disappear from view.

serial interface
Converts the computer's internal form of data into a format suitable for transmission over a telecomputing link.

space
The audible equivalent of a *0* on the phone line of a telecomputing link.

start bits/stop bits
See framing bits.

sysop
System operator, or caretaker, of a BBS.

terminal
A device that displays data received from a remote computer. Also capable of sending data typed on its keyboard to the remote computer.

terminal emulation
A feature provided by some terminal programs that can behave like a specific brand of terminal (for instance, IBM, TeleVideo, and so on).

terminal program *or* terminal software
Allows a microcomputer to act as a terminal.

upload
To send data to a remote computer for later use. Opposite of *download.*

videotex
Loosely used to define transmission of textual data by information services. The classic definition requires that graphics be mixed with the text.

XON/XOFF A commonly used type of flow control.

Telecommuting

Dawn of the Electronic Cottage

Gregg Peele

The invention of the telephone a century ago opened a new age of remote communications, weaving the world together with a network of wires. Today, the invention of the microprocessor is revolutionizing our communications system. One of the spin-offs may be a return to the decentralized living of yesterday—people working at home on remote terminals or microcomputers instead of battling the morning and evening rush-hour traffic into the city. As this article shows, telecommuting is becoming a viable alternative.

Slowing the Pace

From the barn behind his rural Wisconsin home, Rohn Engh publishes a newsletter that goes out to hundreds of people all over the nation. Published both on paper and in an electronic edition, Engh's *The Photoletter* pairs photo editors for magazines and other publications with photographers. Without microcomputers, Engh might still be caught up in metropolitan hustle and bustle.

Based in Osceola, Wisconsin, Engh left a big city to live and work in his slower-paced rural setting. In rustic surroundings, he has built his business from a small beginning to a newsletter with more than 1700 subscribers, each paying $75 per year. He feels that working at home has been not only profitable, but also has helped him strengthen family ties with his children. "In a time when many don't have time to participate with their children, our sons had us to be there for them."

To handle the accounting for his subscribers, Rohn Engh uses a Radio Shack TRS-80 Model II computer. Recently, he put his newsletter on NewsNet, an electronic news and information service. Using his computer, he hopes to develop a network to connect thousands of photographers with his business.

Engh says the choice between pursuing a career in the big city or working out of his home in the country came down to a matter of opposite lifestyles: "I had to decide between making a living or making a life."

More and more people are making the same choice as Engh—to "telecommute" by computer from their homes instead of commuting by car or mass transit to the metropolis. Ironically, this computer-age phenomenon actually is a throwback to the decentralized work patterns of the preindustrial age.

In the eighteenth century, before the Industrial Revolution, so-called cottage industries were common in agricultural areas where farmers experienced seasonal unemployment. In the winters, they made ends meet by making consumer goods at home. Middlemen tried to coordinate this loosely organized network of home producers, supplying raw materials and equipment, and collecting and selling the finished goods.

As demand increased, and the number of domestic producers grew, supply, supervision, and distribution became more difficult. The widely scattered nature of this loose network, in an age before mass transportation, made it economically inefficient. During the Industrial Revolution it was replaced by the factory system—collecting workers under one roof. Industrialization, in turn, led to mass centralization and urbanization. Production became vastly more efficient, but new problems cropped up.

As most of us who lurch out of bed to an alarm clock and fight rush-hour traffic realize, modern society clings to the habit of collecting workers under one roof even though it doesn't always seem necessary. Think about your job. Could you do some or all of your work at home? What would you need in order to do so? Communications and information jobs, and jobs requiring thinking and creativity skills with very little capital equipment, could just as well be done at home as in a distant office.

The Electronic Cottage

We may soon see history repeating itself. The *electronic cottage*, a term borrowed from the eighteenth-century cottage industries, describes the computerized home workplace. Only this time, the problem of widely scattered workers is being solved with electronic communications.

Hundreds of thousands of employees at banks, insurance companies, and other businesses already are using computers or computer terminals at work. Recently, some businesses have started using remote terminals to link employees in their homes to the main office computer. These workers, dubbed

telecommuters by researcher John Niles, perform their duties without having to make the daily trip to and from the office. Telecommuting jobs vary from those which are clerical in nature (data entry, word processing) to those in professional and business categories (lawyers, stockbrokers, insurance agents, programmers). Then there are workers who are physically handicapped, or who need or prefer to work at home. These people find that telecommuting balances the necessity of earning a living with the advantages of working in their own dwellings.

The University of California at Berkeley's Melvyl Division of Library Automation is implementing a huge project designed to make the library's services available to home users. Employees working on this project have the option of working at home rather than at the university. Already, 200 terminals have been distributed throughout the school and in the project members' homes.

Mary Engle, systems analyst for the computing resources group, believes that employees with home terminals can use their time much more flexibly. "Having a terminal at home allows the employee to avoid the early-morning California traffic and still accomplish the same amount of work," she says.

Although the workers are separated by many miles, Engle says that communications are actually more efficient. Messages can be left for workers and supervisors without them ever having to come in contact with each other.

Telecommuting, however, raises many issues, and one of them could slow a trend away from central workplaces: working at home with computers is likely to alter many entrenched ideas about employer/employee relations. For instance, the absence of employees from the central workplace forces managers to devise new means of supervision. How does a boss know if an employee working at home is taking a 30-minute coffee break or chatting with the neighbor about the weather? Possible solutions include requiring employees to report to the office occasionally or basing pay on the amount of work completed.

One company experimenting with telecommuting, Blue Cross and Blue Shield of South Carolina, assigns work in its Cottage Keyer program according to employee seniority. Only those employees who have proven themselves dependable may work at home.

Other large companies experimenting with telecommuting include Control Data Corporation and the Aetna Insurance Company. Seattle Public Health Hospital employs eight to ten telecommuters involved in medical research and application programming. Larry Rothenburg, operations director at the hospital, believes telecommuting is becoming more and more popular. "People do it all the time. Here, it's so common it's not a big deal." Hospital researchers use home terminals to compile information for their research projects. Nonadministrative employees use terminals to help meet deadlines and complete work after regular hours.

Some professional people are using home-based computers to set up their own businesses, preferring the privacy and friendly atmosphere of the home to the frenetic pace of the city. James Ward, once managing director in charge of bond trading at Dillon Read and Co., a securities firm in downtown New York, is now using a computer at home to sell corporate bonds and securities. Computer technology has given him the tools to keep track of both the rise and fall of securities prices and his growing clientele.

Both Sides Now

As telecommuting spreads, some of its more subtle consequences will become increasingly clear. Besides transforming the traditional workplace, it could also dramatically change the role of the home in postindustrial society. There are inherent drawbacks and benefits, depending on your point of view. Here are some possible advantages and disadvantages of telecommuting:

More efficient use of the potential workforce. Lots of human resources are going to waste these days because it costs money to hold a job. Telecommuting can reduce some of these costs. For example, many families today need two incomes, but sometimes both spouses cannot work full-time jobs because it requires buying a second car and/or paying for professional day care for the children. If one spouse were a telecommuter, a second car might be unnecessary. Other work-related expenses also could be avoided—gasoline and maintenance for the second car, a new wardrobe of business clothes, lunches downtown, and so on. Day care expenses also might be avoided, since the telecommuting spouse could care

for the children at home (admittedly, this could be a disadvantage, depending on the kids).

Lower costs for employers. The cost of adding new employees is usually less if the employees are telecommuters. In terms of equipment, the company would have to install a remote terminal or microcomputer and perhaps a desk and additional telephone line in the employee's home. This equipment would be necessary even if the employee worked at the central office. The company saves money by not having to provide office space. Consider how much money a business would save if it could expand operations without having to lease or build new offices on expensive downtown or suburban commercial property. Plus, it's that much less space to heat and cool.

On the other hand, some of these costs are shifted to the employee. Room that could otherwise be used for living space must be devoted to work space. People who turn down the heat or air conditioning when the house is empty during the day would have to maintain it at more comfortable (and more expensive) levels. However, it's possible that some of these expenses could be written off on income taxes.

Changing social contacts. Before the industrial age, most people's social contacts were based on proximity—out of necessity, their friends were their neighbors. Today, for the office-bound, the workplace is the most important source of social contact. If people work at home all day, perhaps alone, they might feel isolated. Since most of the dynamics of human relations are from interactions with others, telecommuters may lack the social stimulation that office employees enjoy. They might even be forced to make friends with their neighbors. Of course, if other family members were at home during the day, the family unit might grow stronger. And someday part of the youngsters' education might involve staying at home and using *their* terminals.

More relaxed atmosphere, enhancing creativity and productivity. Some companies see telecommuting as a means of making best use of employee creativity. "Many companies want their engineers to take advantage of creative ideas that they may have at home," says Chris Leach of Network Products in Raleigh, North Carolina, a specialized telecommunications networking firm. "If an engineer comes up at midnight with a brilliant idea that may save the company

money, companies want to be able to take full advantage of that idea at its conception."

Part-time versus full-time employment. Some companies might find it more efficient to hire part-time telecommuters, perhaps on a contract basis, instead of extra full-time staff. Again, the company saves money by avoiding the need for additional office space; the company pays less for salaries and benefits, including health plans and pensions; and more part-time jobs are opened up for people who cannot work full-time. Of course, the part-time employees lose out on benefits, including health plans and pensions; and fewer full-time jobs are opened up for people who need them. These opposing interests are not unique to telecommuting, but they may be exaggerated by telecommuting if it makes part-time hiring more attractive to employers than full-time hiring.

In addition to the above effects—which are more immediate and immediately obvious—widespread telecommuting could have significant impacts in other ways as well. Futurist Alvin Toffler discusses some of the fascinating possibilities in his landmark book *The Third Wave.* Telecommuting on a very large scale could reverse the trend toward centralization that started with the Industrial Revolution. In a postindustrial, decentralized society where workers are connected by telecommunications instead of transportation systems, there may be relief from such problems as decaying cities, overburdened urban services, traffic jams, energy shortages, pollution, and concentrations of overpopulation.

In the eighteenth century, working at home provided the best of both worlds—the opportunity to be near one's family and to gain the financial security of regular income. Today's telecommuters have that same opportunity, plus the exciting chance to be pioneers—awakening in their electronic cottages to the dawn of telecommuting.

Telecommunications

How to Get Started

Kathy Yakal

More and more people are using their personal computers to communicate with bulletin board systems, information services, mainframe computers, and other personal computers. How do you get started in telecommunications? What kind of software do you need? Here's an overview.

Telecommunications has been big news lately. People are breaking into university systems and bank account files. They're even doing what some people said couldn't be done after *War Games* came out: making some sort of contact with computers that monitor and control this country's defense system.

Translating Foreign Signals

In telecommunications, the information being sent from one computer to another travels over the telephone lines. Though this is the most efficient method available now, there is a problem: telephones and computers are based on different technologies. Phone systems are designed to filter out the very clicks and pops that computers use to communicate.

This is why you need a modem (*mo*dulator-*dem*odulator). This device modulates the computer's digital signals into analog signals, so the phone lines can carry them, and then demodulates them back into digital, so the computer on the other end can receive them. The modem serves as a translator.

There are two types of modems commonly used with personal computers. *Acoustic modems* have a set of soft rubber cups into which you insert the phone's handset. One cup contains a speaker, which generates audio tones, the other a microphone, which receives tones from the other modem.

Direct-connect modems plug directly into the telephone through a modular phone jack. Some, like the VICmodem and Automodem, are cartridges that are plugged directly into a port on the computer. Others are stand-alone units about the size and shape of an eight-track cartridge tape which can be placed directly beneath the phone and plugged in. Some of these have a feature which allows you to switch from phone

functions to modem functions. This spares you from having to keep connecting and disconnecting the modem when you want to use the phone to make a call.

Acoustic modems are generally less expensive, but direct-connect modems usually offer a better connection, since the sound frequencies necessary for telecommunications are generated directly on the phone lines. Extraneous room noises can interfere when you're using an acoustic modem if the phone handset is not sealed very tightly in the cups. Put simply, as the price of direct-connect modems continues to plummet, acoustic modems will probably become less important.

Some computers come with a built-in modem. The Radio Shack TRS-80 Model 100 and 200 Portable Computers and the NEC PC-8401A are examples. The modem functions and terminal software are contained inside the computer; all you need is a cable to start telecomputing.

Dumb Peripherals

If you turn your personal computer into a terminal when using a modem, how can it accomplish something as complicated as transmitting data to another terminal around the block or around the world? Your computer must be able to send and interpret bits in the pattern you want, or you'll just be sending and receiving nonsense. This is why you need special software for telecommunications.

Some terminal software comes on cassette, some on disk, and some in cartridge form. In fact, there are three terminal programs in this book which you can type in and run on your computer.

Matching Up

Also, a modem must be properly aligned with another modem before information transmission is possible. Both modems must be matched in several ways.

Data transfer rate (often called the *baud rate*) is the number of bits being sent every second. This can vary from 110, which is what the old Teletypes use, up to 9600. The faster the rate, the lower your phone bills. But sending information as fast as 9600 bits per second really tests the capabilities of the telephone system. In order to establish communications, you need to know the transfer rate at which the system you are calling is operating so that you can set your terminal software to the same rate.

Another factor is *duplexing*. Full duplex means being able to send and receive data at the same time. Half duplex allows for only one-way communication. If this is not matched correctly to the system with which you are communicating, you may see double characters on your screen or none at all.

Some terminal software allows you to *upload* and *download* programs. Say, you have a friend in another part of the country who just programmed a great game and wants to share it with you, but doesn't have a printer. If you both have the same kind of computer, and an appropriate terminal program, that program can be uploaded (sent) to you. What you will be downloading is ASCII code (numbers which represent all possible screen characters). Each character is received one at a time. Not all terminal software has this capability; make sure that yours does if you want to be able to upload and download to and from bulletin board systems, information services, or other personal computers.

The World of Telecomputing

Once you have the correct hardware and software for telecommunications, there is a great deal of information that you can access:

News and information services. CompuServe and The Source are two examples. Once you have purchased a subscription, you can call, type in your secret ID number or password, and have all kinds of information delivered to you immediately—news, sports, stock market reports. You can set up your own *electronic mailbox* so that messages can be left for you. CompuServe even has its own version of CB radio: You can get online with other people using the system and have a conversation.

Bulletin board systems. Offering some of the features of the major information services, there are hundreds of bulletin board systems set up in North America. Some of them are free, while some require a membership fee. Most of them are designed to bring together people with common interests: owners of specific types of computers who want to share programs and help solve hardware or software problems, people involved in ham radio, film buffs—even people who want to find a date.

Personal business. It may soon be possible to attend to most of your personal needs with your personal computer.

Periphonics, an Exxon affiliate, has developed an interface that permits a bank to link up with almost any personal computer for individual bank transactions. Shopping by mail is possible through the Burbank-based Fantasy Plaza. Expect to see more services like these springing up.

Computer programs over the radio. It is possible to download computer programs from your radio. The Micro-peripheral Corporation has even developed a modem designed for reception of computer data from commercial radio stations. Though this is not a widespread use right now, radio stations and cable operations around the country may soon be following the lead of stations like KMPS in Seattle, which has been downloading computer programs by radio since March.

News and Information Services

Here are addresses and phone numbers for some of the major news and information services. New York Zoetrope publishes *The Directory of On-Line Databases;* to order a copy, send $29.95 plus $1.50 for shipping and handling to New York Zoetrope, 80 East 11th Street, Suite 516, New York, NY 10003.

CompuServe
5000 Arlington Centre Boulevard
P. O. Box 20212
Columbus, OH 43220
Customer Service: (800) 848-8199
or (614) 457-0802

Dow Jones Information Services
P. O. Box 300
Princeton, NJ 08540
Customer Service: (800) 257-5114
or (609) 452-1511

The Source
1616 Anderson Road
McLean, VA 22102
Customer Service: (800) 336-3366
(800) 572-2070 in Virginia
(703) 821-6666 outside the continental U.S.

Telenet
(GTE Communications)
12490 Sunrise Valley Drive
Reston, VA 22096
Customer Service: (800) 336-0437
(703) 689-6400 outside the continental U.S.

2 Inside Modems

2
Understanding Modems

Sharon Darling

Telecommunicating with other users, databases, information networks, bulletin boards, and buying services opens up a fascinating world of possibilities. All you need is a modem, but there's a variety to choose from, with a wide range of prices and features. Here's a look at what's available for Commodore users.

Talking to other computers, whether they're across town or across the world, is easy. All it takes is a computer, a telephone, a *modem,* and a *terminal software program.*

A modem simply translates the numeric digital data from your computer into analog signals (which sound like high-pitched whistles) that can be carried by your telephone. Another modem then reverses the conversion at the receiving end. Terminal software is the program that tells your computer *how* to talk with other computers.

Although modems are primarily signal converters and translators, there are numerous features which bear individual consideration. Modems range in capabilities from the quite simple to the complex. Before buying one, you must decide which features are important to you, and how much you're willing to spend for those extras.

Compatibility is the first thing to be concerned with when modem shopping. The modem you buy must be capable of working on your computer.

That's a little trickier than it sounds, where the Commodore 64 is concerned. While many modems are equipped with RS-232 interfaces, and your Commodore computer has an RS-232 port on the back, it's not as simple as plugging it in.

The Commodore RS-232 port is not compatible with the industry-standard RS-232, so unless a modem is designed to work specifically with the 64, you'll need an RS-232 adapter (available from Commodore) to make it work.

Choosing a Modem

Your next consideration should be what kind of phone system you have. On some modems, special features such as automatic dialing will work only with tone-dial telephones, while others will work with either pulse (rotary) or tone-dial models. Check before you buy to see what kind you need.

Connectors are available that convert your phone's signal to one that will work with the modem you want to buy, should you have your heart set on a particular brand.

Price becomes a consideration when deciding whether you want a *direct-connect* or *acoustic* modem.

With acoustic modems, which are generally less expensive than direct-connect models, you place the handset of your telephone into soft rubber cups on the modem. One of the cups contains a speaker, which generates audio tones, while the other cup acts as a microphone to receive tones from the other modem.

As mentioned earlier in this book, you'll save money with this kind of modem; however you'll probably sacrifice some quality, since the connection generally is not as good as with a direct-connect modem. And room noises can interfere if the phone handset is not sealed tightly in the cups. However, you may wish to consider an acoustic modem if you and your computer frequently travel together. Many hotel phones are wired without the modular connectors necessary to use direct-connect modems.

Direct-connect modems plug directly into the telephone through a modular phone jack. Some direct-connect modems, such as the VICmodem and Automodem, are cartridges that plug into a port on the computer. Still other models are stand-alone units that can be placed directly underneath the phone and connected to the computer via the RS-232 port.

Any modem you buy will be capable of full, half, or both types of *duplexing*. With a half-duplex modem, only one computer can talk at a time, while full duplexing allows both the sender and receiver to transmit at the same time, much like a normal conversation. Full duplexing is pretty standard on most bulletin boards; when you type something, it goes over the phone lines and the receiving computer echoes it back to your TV screen or monitor.

When you access a bulletin board system, it will usually tell you what type of duplexing is needed, as well as the data transfer rate (usually called the *baud rate*), or speed at which you can transmit information.

Most of the modems in this buyer's guide have transfer rates from 0 to 300 bits per second (bps), which roughly translates to 0 to 30 characters per second. Some of the more expensive models have a rate of 1200 bps or more.

The *communication standard* of your modem also tells you the transfer rate. Those listed as Bell 103 allow information to be sent at 300 bps. Bell 202 and 212A standards allow for faster transmission rates.

Extras to consider for your modem are whether you want one that can automatically dial or answer the telephone, and whether the modem is capable of a *self-test* to make sure everything is hooked up and working properly.

One essential item, as we noted, is *terminal software.* Some modems come with their own software; if yours doesn't, you'll have to purchase a terminal program, or type one in from a manual or magazine. (For Commodore-specific terminal programs, see later sections in this book.)

The following chart gives specifications for many brands of modems for the 64 (and the VIC, for that matter), each priced under $300.

A Buyer's Guide to Modems

Modem	Manufacturer/ Distributor	Compatability	Interface Required	Communi-cation Standard	Coupling Method	Baud Rate
Westridge 64-20	Anchor Automation, Inc.	Commodore 64, VIC-20	no	Bell 103	direct connect	300
1650 Automodem	Commodore Business Machines	Commodore 64	no	Bell 103	direct connect	0–300
VICmodem	Commodore Business Machines	Commodore 64, VIC-20	no	Bell 103	direct connect	0–300
Smartmodem 300	Hayes Microcomputer Products, Inc.	RS-232	yes	Bell 103	direct connect	0–300
HESModem 1	Human Engineered Software	Commodore 64, VIC-20	no	Bell 103	direct connect	0–300
HESModem 2	Human Engineered Software	Commodore 64	no	Bell 103	direct connect	110–300
Clear Signal 300	Inmac	RS-232	yes	Bell 103	direct connect	300
Intec 300	Intec Corporation	RS-232	no	Bell 103	direct connect	0–300
MFJ-1237	MFJ Enterprises, Inc.	Commodore 64, VIC-20	no	Bell 103	direct connect	300
MFJ-1233	MFJ Enterprises, Inc.	RS-232	no	Bell 103	acoustic or direct connect	300
Microconnection R1A	The Micro peripheral Corp.	RS-232	no	Bell 103	direct connect	300
Microconnection Auto-Print	The Micro peripheral Corp.	RS-232	no	Bell 103	direct connect	300
ATV	The Micro peripheral Corp.	Commodore 64	no	Bell 103	direct connect	300
Cat	Novation, Inc.	RS-232	yes	Bell 103	acoustic	0–300
D-Cat	Novation, Inc.	RS-232	yes	Bell 103	direct connect	0–300
J-Cat	Novation, Inc.	RS-232	yes	Bell 103	direct connect	0–300
103 Smart-Cat	Novation, Inc.	RS-232	yes	Bell 103	direct connect	0–300 & 110
Operator 103	TNW Corporation	RS-232	yes	Bell 103	direct connect	0–300
UDS-103JLP	Universal Data Systems	RS-232	yes	Bell 103	direct connect	0–300
UDS-103O/ALP	Universal Data Systems	RS-232	yes	Bell 103	direct connect	0–300
Mitey Mo	USI Inc.	RS-232	no	Bell 103	direct connect	300

Duplexing	Auto-Originate	Auto-Answer	Self-Test	Carrier Detection Indicator	Power Supply	Cables/ Connectors Included?	Terminal Software Included?	Warranty	Price
full/half	yes	yes	no	light	host computer	yes	yes	2 years	$99
full/half	yes	yes	no	LED	host computer	plugs into computer	yes	90 days	$79
full	no	no	no	LED	host computer	plugs into computer	yes	90 days	$49
full/half	yes	yes	yes	LED	AC	no	no	2 years	$289
full/half	no	no	no	light	host computer	yes	yes	90 days	$74.95
full/half	yes	yes	no	onscreen	host computer	some	yes	90 days	$109.95
full	no	no	yes	LED	AC	some	no	1 year	$99
full/half	yes	yes	no	LED and onscreen	AC	yes	yes	1 year	$189
full	yes	yes	no	LED	host computer	yes	yes (program listing in manual)	1 year	$49.95
full	no	no	yes	LED	AC	no	no	1 year	$129.95
full/half	yes	yes	no	LED	AC	yes	yes	90 days	$199
full/half	yes	yes	no	LED	host computer	yes	yes	90 days	$179.95
full/half	yes	yes	no	LED	AC	yes	yes	90 days	$179.95
full/half	no	no	yes	LED	AC	yes	no	1 year	$189
full/half	no	no	yes	LED	AC	yes	no	1 year	$199
full	yes	yes	yes	LED	AC	yes	no	1 year	$149
full	yes	yes	yes	LED	AC	yes	no	1 year	$249
full/half	yes	yes	yes	beep	AC	some	no	2 years	$169
full	yes	no	no	light	telephone line	some	no	1 year	$165
full	no	no	no	light	telephone line	yes	no	1 year	$125
full/half	yes	yes	yes	onscreen	host computer	yes	yes	3 years	$99.95

Modem Manufacturers and Distributors

Listed below are the manufacturers and distributors of the modems included in this buyer's guide.

Anchor Automation, Inc.
6913 Valjean Avenue
Van Nuys, CA 91406

Commodore Business Machines
1200 Wilson Drive
West Chester, PA 19380

Hayes Microcomputer Products, Inc.
5923 Peachtree Industrial Boulevard
Norcross, GA 30092

Human Engineered Software
150 N. Hill Drive
Brisbane, CA 94005

Inmac
2465 Augustine Drive
Santa Clara, CA 95051

Intec Corporation
P. O. Box 5164
West Bloomfield, MI 48033

MFJ Enterprises, Inc.
921 Louisville Road
Starkville, MS 39759

The Microperipheral Corporation
2565 152nd Avenue N.E.
Redmond, WA 98052

Novation, Inc.
20409 Prairie Street
Chatsworth, CA 91311

TNW Corporation
3444 Hancock Street
San Diego, CA 92110

Universal Data Systems
5000 Bradford Drive
Huntsville, AL 35805

USI
71 Park Lane
Brisbane, CA 94005

Smokey and the Modem—Part 8086

Arlan R. Levitan

Hot rodding, fuel injection, turbocharging, and horsepower—America's fascination with power under the hood finds its place in the high-speed world of telecommunications.

I live in the greater Detroit area, a hotbed of muscle cars and micros. In this town it's hard to miss the fact that America's involvement with microcomputers shares a lot of overtones with its longstanding love affair with the automobile.

The image of T-shirted car enthusiasts discussing the displacement and horsepower of their chariot engines while Bruce Springsteen's "Born to Run" plays in the background comes readily to mind when you hear the name *Motown.* But in this and other towns, you're just as likely to find corporate and casual computer users congregating and speaking in reverent tones about the capacity of their hard disks and the cycle times of their central processing units.

Motor cars and micros. Both encourage a fascination with speed and power. And while General Motors, Ford, Chrysler, and American Motors are still fighting a pitched battle against foreign manufacturers for the hearts and minds of the car-buying public, IBM, Apple, Commodore, Tandy, and Atari are girding themselves for an expected onslaught of Japanese computers.

The marketing type who coined the term *power user* to describe personal computer owners who can't get enough memory or a fast enough CPU had a firm grip on the ego-related realities of the micro market. Reminding an avid power user that faster processors, massive mass storage, and megabyte memories don't necessarily let you write text or enter spreadsheet data twice as fast is about as fruitful as discussing the 55 mph speed limit with the owner of a 1967 Plymouth Road Runner running a Hemi-Head engine.

Souped-Up Modems

All this discussion of speed has a point. A number of people have asked me what kind of modem they should purchase. In particular, there seems to be a lot of interest in the new high-speed 2400 bits per second (bps) modems appearing on the scene.

The major factor which determines the price of a modem is the maximum speed at which it can send and receive data over the phone lines. A low-speed modem's top rate is 300 bps, equivalent to about 30 characters per second. These modems range in price from $50 to $280, depending on what other features are included. They're often referred to as *Bell 103-compatible* (Bell 103 is a phone company standard).

Bell 212-compatible modems can handle data transmissions at both 300 and 1200 bps. They used to cost $500 to $700, but recent developments in chip technology have allowed several manufacturers—notably Anchor Automation and Qubie Corporation—to break the $300 price barrier with full-featured 300/1200 bps modems. Industry projections indicate that by 1986, these medium-speed modems will dominate the consumer market and typically list for under $200.

The new kids on the block are the 2400 bps modems. Although they are twice as fast as 1200 bps units and operate on standard voice-grade phone lines, they also command a premium price ($800 to $1,500). Sometimes these 2400 bps modems are referred to as *CCITT (Consultative Committee on International Telephony and Telegraphy) V.22* units—by those who own the Telecommunications Edition of Trivial Pursuit. Some 2400 bps units are also capable of 1200 and 300 bps transmission.

The terms *high, medium,* and *low speed* refer to transmissions over regular (voice-grade) telephone lines, the kind you have in your home. True high-speed transmissions aren't practical on these lines. Instead, specially prepared *conditioned* lines are required by businesses which transmit data at rates from 9600 to 57,600 bps. Both the conditioned lines and the high-speed modems are expensive and are limited to point-to-point transmissions. The line is permanently installed between two locations and cannot be used to access the regular telephone network. Of course, conditioned lines are out of the question for most of us.

Judging a Modem by Its Baud

You'll often see the term *baud* when reading about transmission speeds. Modems will be advertised as 1200 baud or 2400 baud. But strictly speaking, this is an improper use of terminology. Baud (named after J. M. E. Baudot, a telecommunications pioneer) is used to describe the division of each second into tiny, discrete pieces (also called *signal modulation*) by a modem's electronic circuitry.

A 300 bps modem's signal is indeed modulated at 300 baud. Since each tiny division holds one bit of data, the effective transmission rate is calculated as 300 baud per second times one bit per baud, or 300 bits per second (bps).

Things take a different turn with 1200 bps modems. You might expect each second to be divided into 1200 pieces. This is not the case. A 1200 bps modem actually divides each second into 600 pieces. Using a technique called four-level phase-shift keying (psk for short), each piece can represent a string of two bits.

This isn't as complicated as it may seem. All it means is that by using a method that plays with the phase characteristics of the modem's signal, each baud can be in one of four binary phases, namely:

00 *or* 01 *or* 10 *or* 11

There you have it. Each baud can be in one of four phases, with each representing exactly two bits. Multiply 600 baud per second times two bits per baud and *voilà!* You get 1200 bits of information per second (1200 bps).

Even More Bits per Baud

Knowing this, it may come as no surprise to learn that 2400 bps modems also use a modulation rate of 600 baud. What is different is the method of phase-shift keying. A 2400 bps modem uses a method that yields 16-level phase-shift keying, so each piece or baud can represent a string of four bits with these possible combinations:

0000 0001 0010 0011
0100 0101 0110 0111
1000 1001 1010 1011
1100 1101 1110 1111

So, with a 2400 bps modem, each baud can be in one of 16 phases, with each representing exactly four bits. Multiply 600 baud per second times four bits per baud and we get (drumroll, please . . .) 2400 bits of information per second.

That's why you should avoid terms like *1200 baud* and *2400 baud* when describing modems. Both are actually 600 baud units which use clever schemes to pack more than one bit per baud. Use *bits per second (bps)* instead.

This information can really come in handy for small talk at user group parties; it's a lot more impressive to computer hobbyists than crushing a dozen aluminum beverage cans into your forehead.

Do You Need the Speed?

Under most transmission schemes in use today, it actually takes ten bits to send one character of data. Therefore, the approximate character transmission speeds of 300, 1200, and 2400 bps modems under optimal conditions are 30, 120, and 240 characters per second, respectively.

Is the extra cost of a medium- or high-speed modem a worthwhile investment for you? That depends on your telecomputing style.

Do you plan to make heavy use of commercial information services such as CompuServe, The Source, Delphi, or Dow Jones News/Retrieval? Since none of the commercial services offers 2400 bps service yet, spending big bucks on a 2400 bps modem is not a good bet. Why don't they offer 2400 bps service? Because there has to be a 2400 bps modem on both ends of the connection—yours and theirs. Since very few people own 2400 bps modems right now, information services wouldn't get much return on their investment in 2400 bps equipment while the price of the new technology is relatively high.

Besides, medium-speed 1200 bps units offer a very good price/performance value. However, you must balance the shorter connect times made possible by faster modems against any surcharges imposed on the higher transmission rates.

Here's a quick example. Suppose Steve is a frequent user of the Just Folks Information Service. Steve calls only during the evening (referred to as nonprime time by the commercial information services) and spends about five hours a month on Just Folks with his 300 bps modem. Assume that Just Folks' hourly charges are $7.75 an hour for 300 bps, nonprime-time

access; plus a $3.00 an hour surcharge for 1200 bps, nonprime-time access. Steve's yearly cost for accessing Just Folks at 300 bps is

$7.75/hour * 5 hours/month * 12 months/year = $465.00.

If Steve upgraded to a 1200 bps modem, he'd reduce his yearly cost to

$10.75/hour * 1.25 hours/month * 12 months/year = $161.25.

The money Steve saves in a year would pay for a brand-new 1200 bps modem!

The Point of Diminishing Returns

Admittedly, this is an ideal case. It assumes that armed with a 1200 bps modem, Steve will stay online only one quarter of the time that he would with his 300 bps unit. Depending on exactly what he's doing, the reduction may not be so dramatic, but under this rate structure, a 1200 bps modem looks extremely attractive.

Now let's suppose that Just Folks decides to bite the bullet and support 2400 bps. Assume that to recoup its investment in the new equipment, the service tacks on an $8.00 an hour surcharge for nonprime-time 2400 bps access. Steve's yearly bill would be

$15.75/hour * .625 hours/month * 12 months = $118.13.

Although upgrading from 300 to 1200 bps saved Steve about $300, the difference between 1200 and 2400 bps is only a little over $40 for the year! The key in this example is the additional surcharge for 2400 bps.

You can use this method to estimate your operating costs for accessing information services, computer-based bulletin board systems, or school computers. Just plug in the appropriate numbers for your intended use.

Hurry Up and Wait

The cost effectiveness of a medium- or high-speed modem also depends on how quickly the remote system responds to commands typed in from your computer. When the remote system is heavily loaded with users, slow response times are very common. In fact, if the system is very busy, a 1200 bps user can wait just as long as a 300 bps user for requests to be

processed, and data may be transmitted to you in spurts rather than as a continuous stream, lowering the effective transmission rate.

I've been logged onto some information services during the evening (8:00 p.m. to midnight eastern standard time) at 1200 bps and have clocked effective transfer rates below 300 bps. In these cases, there's no advantage to 1200 bps—it actually costs more than using a low-speed unit for the same amount of data. A 2400 bps modem would be even more expensive overkill.

If you're a night owl, you'll find the best effective transmission speeds on the commercial services between 1:00 a.m. and 7:00 a.m. EST.

Response time is usually no problem on bulletin board systems (BBSs). Since you are typically the only person using a BBS at any one time, the remote system can devote its full attention to you alone, so your transmission rate is preserved.

The Future of 2400 Bps

Does the lack of support for 2400 bps bode ill for the acceptance of the new high-speed modems? While it certainly doesn't help matters, there is some hope for life in the fast lane.

Many 2400 bps modem manufacturers see the thousands of popular BBS systems run by hobbyists as the key. Since a BBS needs only one modem, the investment is more manageable by the individual or club operating the system.

Several of these manufacturers are reported to be working with the system operators of a number of popular bulletin boards to start a seed program for 2400 bps modems. By special arrangement, 2400 bps modems will be made available to selected system operators at prices very close to that of 1200 bps modems.

Industry-wide support of such a project would be welcome indeed. If significant numbers of bulletin boards support 2400 bps, it will provide a real incentive for everyone else to acquire high-speed modems. Since BBSs typically do not charge for connect time, it would cost users nothing extra to access them at 2400 bps. The only charges are for long-distance phone calls, and those charges are based only on the duration of the call. The additional cost of a 2400 bps modem can be recovered fairly quickly.

As the numbers of 2400 bps users grow, one of the major commercial information services will move to offer 2400 bps service and its competitors will quickly follow. The greater the perceived size of the 2400 bps market, the lower the extra 2400 bps surcharges will be.

Taking the Plunge

So we come to where the rubber meets the road. Should you spend the extra dollars today on a 2400 bps modem?

The economic case is weak at best. The short-term potential savings are low, considering the limited support of 2400 bps at this time.

On the other hand, computing, like cars, is a personal experience for many people. Critics can drone on and on for years about why it's inappropriate for humans to relate to machines. But it doesn't change the fact that driving down the road in a convertible with the wind in your hair and finding the last bug in a program are both kicks. Using a 2400 bps modem on good old regular phone lines is a lot like driving a Shelby AC Cobra with a 289-cubic-inch V-8. There may not be many places you can run flat out, but it can be a heck of a lot of fun when you do.

Two advantages of a 2400 bps modem over a Shelby Cobra: It costs about $60,000 less and you'll never get a speeding ticket.

All About ASCII

Michael Day

ASCII is an acronym for American Standard Code for Information Interchange. More specifically, it is a definition of a code that is used in most computers to store and transmit information. Here's a quick look at what ASCII is and why it is so important.

Your computer works with information in *bits* of on/off conditions in its memory cells. This means that in order for it to work with numbers and letters, it must represent each letter or number as a distinct group of bits that are either 1 (which represents on) or 0 (which represents off). In telecommunications, the commonly used system of bit pattern definitions is called ASCII, an acronym for American Standard Code for Information Interchange. ASCII code represents each character or control code as seven bits, with which it is possible to represent 128 different characters. These 128 characters are broken down into 52 uppercase and lowercase letters (A–Z and a–z), ten numbers (0–9), 33 special characters (including space), and 33 control characters. Each of the seven-bit ASCII code combinations represents a unique character.

The Origin of ASCII

ASCII code was developed as a result of the interaction between the needs of the equipment and the needs of the operator. The ASCII code standard is simply there because it is the common element that permits most computers to talk to one another. This, of course, doesn't mean that all computers use the ASCII code standard.

A very early code system used on punched cards was a 10-bit code, later expanded to 12 bits, called the Hollerith code. BCD (Binary Coded Decimal) code was an outgrowth and simplification of the Hollerith code.

The BCD code used six bits to represent 64 possible code combinations. Later on, due to the needs of larger computer systems, IBM expanded the BCD code to eight bits and called it EBCDIC, for Expanded Binary Coded Decimal Interchange Code.

ASCII code was then developed by the American National Standards Institute (ANSI) to simplify code use—to

make the code easier for machines and people to use. The main improvement was to place all letters in sequential order so that it became easier for the computer to sort out information.

Commodore ASCII

Commodore—like most other computer makers—has its own character coding scheme, a variation of standard ASCII, sometimes referred to as PETASCII, since it was first developed for Commodore's original PET computer. The Commodore 64 has two complete character sets; one features only uppercase alphabetic characters along with a broad selection of special graphics shapes (often called the uppercase/graphics set), while the other features both upper- and lowercase alphabetic characters with a somewhat narrower selection of special graphics (often referred to as the lowercase/uppercase set). You can switch back and forth between character sets by pressing the SHIFT and Commodore logo keys simultaneously, or you can switch to the uppercase/graphics set with PRINT CHR$(142) and to the lowercase/uppercase set with PRINT CHR$(14).

The lowercase/uppercase set more closely resembles standard ASCII and is almost always used in 64 telecommunications, which is why you'll see a PRINT CHR$(14) in the BASIC terminal programs at the end of this book. Alphabetic characters, numerals, and punctuation are generally similar, although—significantly—the 64 has uppercase and lowercase letters switched from standard ASCII.

Also, we noted earlier that ASCII is a seven-bit code, whereas Commodore uses eight bits in its character codes. This means that Commodore ASCII can represent twice as many characters as standard ASCII—256, instead of 128. The additional 128 codes are used for the special graphics characters, function keys, and so forth.

Below are charts of both standard and Commodore ASCII codes for comparison.

Standard ASCII Codes

Dec	Hex		Meaning	Dec	Hex	Meaning
0	00	NUL	Null character	32	20	SPACE
1	01	SOH	Start heading	33	21	!
2	02	STX	Start text	34	22	"
3	03	ETX	End text	35	23	#
4	04	EOT	End transmission	36	24	$
5	05	ENQ	Enquiry	37	25	%
6	06	ACK	Acknowledge	38	26	&
7	07	BEL	Ring bell	39	27	'
8	08	BS	Backspace	40	28	(
9	09	HT	Horizontal tabulation	41	29	)
10	0A	LF	Linefeed	42	2A	*
11	0B	VT	Vertical tabulation	43	2B	+
12	0C	FF	Formfeed	44	2C	,
13	0D	CR	Carriage return	45	2D	-
14	0E	SO	Shift out	46	2E	.
15	0F	SI	Shift in	47	2F	/
16	10	DLE	Data link escape	48	30	0
17	11	DC1	Device control 1	49	31	1
18	12	DC2	Device control 2	50	32	2
19	13	DC3	Device control 3	51	33	3
20	14	DC4	Device control 4	52	34	4
21	15	NAK	Negative acknowledge	53	35	5
22	16	SYN	Synchronous idle	54	36	6
23	17	ETB	End transmission block	55	37	7
24	18	CAN	Cancel	56	38	8
25	19	EM	End medium	57	39	9
26	1A	SUB	Substitute	58	3A	:
27	1B	ESC	Escape	59	3B	;
28	1C	FS	File separator	60	3C	<
29	1D	GS	Group separator	61	3D	=
30	1E	RS	Record separator	62	3E	>
31	1F	US	Unit separator	63	3F	?

Dec	Hex	Meaning
64	40	@
65	41	A
66	42	B
67	43	C
68	44	D
69	45	E
70	46	F
71	47	G
72	48	H
73	49	I
74	4A	J
75	4B	K
76	4C	L
77	4D	M
78	4E	N
79	4F	O
80	50	P
81	51	Q
82	52	R
83	53	S
84	54	T
85	55	U
86	56	V
87	57	W
88	58	X
89	59	Y
90	5A	Z
91	5B	[
92	5C	\
93	5D	]
94	5E	^
95	5F	_

Dec	Hex	Meaning
96	60	`
97	61	a
98	62	b
99	63	c
100	64	d
101	65	e
102	66	f
103	67	g
104	68	h
105	69	i
106	6A	j
107	6B	k
108	6C	l
109	6D	m
110	6E	n
111	6F	o
112	70	p
113	71	q
114	72	r
115	73	s
116	74	t
117	75	u
118	76	v
119	77	w
120	78	x
121	79	y
122	7A	z
123	7B	{
124	7C	|
125	7D	}
126	7E	~
127	7F	DEL

Commodore ASCII Codes

Hex	Dec	Meaning	Hex	Dec	Meaning
05	5	WHITE	37	55	7
08	8	DISABLE SHIFT-COMMODORE	38	56	8
			39	57	9
09	9	ENABLE SHIFT-COMMODORE	3A	58	:
			3B	59	;
0D	13	RETURN	3C	60	<
0E	14	LOWERCASE	3D	61	=
11	17	CURSOR DOWN	3E	62	>
12	18	REVERSE VIDEO ON	3F	63	?
13	19	HOME	40	64	@
14	20	DELETE	41	65	A
1C	28	RED	42	66	B
1D	29	CURSOR RIGHT	43	67	C
1E	30	GREEN	44	68	D
1F	31	BLUE	45	69	E
20	32	SPACE	46	70	F
21	33	!	47	71	G
22	34	"	48	72	H
23	35	#	49	73	I
24	36	$	4A	74	J
25	37	%	4B	75	K
26	38	&	4C	76	L
27	39	'	4D	77	M
28	40	(	4E	78	N
29	41	)	4F	79	O
2A	42	*	50	80	P
2B	43	+	51	81	Q
2C	44	,	52	82	R
2D	45	–	53	83	S
2E	46	.	54	84	T
2F	47	/	55	85	U
30	48	0	56	86	V
31	49	1	57	87	W
32	50	2	58	88	X
33	51	3	59	89	Y
34	52	4	5A	90	Z
35	53	5	5B	91	[
36	54	6	5C	92	£

Hex	Dec	Meaning	Hex	Dec	Meaning
5D	93	]	85	133	f1
5E	94	↑	86	134	f3
5F	95	←	87	135	f5
60	96		88	136	f7
61	97	♠	89	137	f2
62	98		8A	138	f4
63	99		8B	139	f6
64	100		8C	140	f8
65	101		8D	141	SHIFT-RETURN
66	102		8E	142	UPPERCASE
67	103		90	143	BLACK
68	104		91	145	CURSOR UP
69	105		92	146	REVERSE VIDEO OFF
6A	106		93	147	CLEAR SCREEN
6B	107		94	148	INSERT
6C	108		95	149	BROWN
6D	109		96	150	LIGHT RED
6E	110		97	151	GRAY 1
6F	111		98	152	GRAY 2
70	112		99	153	LIGHT GREEN
71	113	●	9A	154	LIGHT BLUE
72	114		9B	155	GRAY 3
73	115	♥	9C	156	PURPLE
74	116		9D	157	CURSOR LEFT
75	117		9E	158	YELLOW
76	118		9F	159	CYAN
77	119		A0	160	SHIFT-SPACE
78	120	♣	A1	161	
79	121		A2	162	
7A	122	♦	A3	163	
7B	123		A4	164	
7C	124		A5	165	
7D	125		A6	166	
7E	126	π	A7	167	
7F	127		A8	168	
81	129	ORANGE	A9	169	

Hex	Dec	Meaning	Hex	Dec	Meaning
AA	170		CF	207	
AB	171		D0	208	
AC	172		D1	209	
AD	173		D2	210	
AE	174		D3	211	
AF	175		D4	212	
B0	176		D5	213	
B1	177		D6	214	
B2	178		D7	215	
B3	179		D8	216	
B4	180		D9	217	
B5	181		DA	218	
B6	182		DB	219	
B7	183		DC	220	
B8	184		DD	221	
B9	185		DE	222	
BA	186		DF	223	
BB	187		E0	224	SPACE
BC	188		E1	225	
BD	189		E2	226	
BE	190		E3	227	
BF	191		E4	228	
C0	192		E5	229	
C1	193		E6	230	
C2	194		E7	231	
C3	195		E8	232	
C4	196		E9	233	
C5	197		EA	234	
C6	198		EB	235	
C7	199		EC	236	
C8	200		ED	237	
C9	201		EE	238	
CA	202		EF	239	
CB	203		F0	240	
CC	204		F1	241	
CD	205		F2	242	
CE	206		F3	243	

Hex	Dec	Meaning
F4	244	
F5	245	
F6	246	
F7	247	
F8	248	
F9	249	
FA	250	
FB	251	
FC	252	
FD	253	
FE	254	
FF	255	

1. 0–4, 6–7, 10–12, 15–16, 21–27, 128, 130–132, and 143 have no effect.
2. 192–223 same as 96–127, 224–254 same as 160–190, 255 same as 126.

RS-232 Communications

Michael Day

Connecting computer equipment together is a major problem, particularly when the equipment is made by different manufacturers. Communications can be particularly confusing because of the many standards and protocols. This article explains the various levels of the RS-232 standard.

In the early days of computers, it became apparent that specific data communications guidelines needed to be established if there was to be any hope of getting equipment from different manufacturers to work together. Fortunately, the computer industry has a group, the Electronic Industries Association (EIA), whose function is to establish such standards. Of the several data communications proposals developed by the EIA, the one designated as RS-232 is currently used almost universally in microcomputer telecommunications. However, even this has been cause for confusion, as there are various levels of implementation within the standard.

There have been three revisions of the RS-232 standard—A, B, and C. RS-232-A and RS-232-B were both obsolete well before microcomputers became widely available. RS-232-C, the version now in use, specifies both the physical and electrical aspects of serial communications—the arrangement of wires and the meaning of particular voltage levels on those wires. The standard is quite flexible, providing for both synchronous communications (where timing signals are passed between the communicating computers) and asynchronous communications (where the computers are individually responsible for maintaining proper timing).

In order to establish a direction of flow for the various signals in the standard, two classes of communications devices are also defined: data terminal equipment (DTE) and data communications equipment (DCE). From a user's perspective, the computer with its terminal software is DTE and the modem is DCE. It's important to keep track of which is which, since this determines whether a particular RS-232 signal is an input or an output for a particular device.

Physically, the EIA RS-232-C standard calls for a 25-pin connector (known as DB-25). Each pin of the connector is assigned a particular function. The table below has the pin number, the circuit designation, mnemonic, and description for each signal in the RS-232-C interface. Unassigned pins may have different functions in each type of equipment, so check the technical manual for pin assignments of a particular device.

Pin Number	Designation	Mnemonic	Description
1	AA		Protective Ground
2	BA	TXD	Transmitted Data
3	BB	RXD	Received Data
4	CA	RTS	Request To Send
5	CB	CTS	Clear To Send
6	CC	DSR	Data Set Ready
7	AB	GND	Signal Ground
8	CF	DCD	Received Line Signal (Carrier) Detector
9	–		(Reserved for Data Set Testing)
10	–		(Reserved for Data Set Testing)
11			Unassigned
12	SCF		Secondary Received Line Signal Detector
13	SCB		Secondary Clear To Send
14	SBA		Secondary Transmitted Data
15	DB		Transmission Signal Element Timing
16	SBB		Secondary Received Data
17	DD		Receiver Signal Element Timing
18			Unassigned
19	SCA		Secondary Request To Send
20	CD	DTR	Data Terminal Ready
21	CG		Signal Quality Detector
22	CE	RI	Ring Indicator
23	CH/CI		Data Signal Rate Selector
24	DA		Transmit Signal Element Timing
25			Unassigned

Electrically, any one of the control or timing circuits is considered on when the voltage is more positive than +3

volts and off when the voltage is more negative than −3 volts. In the data transmission and reception circuits, a binary 1—called a *mark*—is represented by a voltage more negative than −3 volts, and a binary 0—called a *space*—is represented by a voltage more positive than +3 volts. The table below illustrates the signal function voltage relationships.

	Voltage	
	−3 to −25	**+3 to +25**
Signal condition	mark	space
Binary state	1	0
Control function	off	on

(In the unlikely event that you happen upon a piece of old equipment, RS-232-B is basically the same as RS-232-C except that the transmitted data and received data signal levels are inverted; that is, a mark is a positive level rather than a negative level.)

Terminal Terminology

The following is a list of the definitions of the RS-232-C signals in order of pin number.

Protective Ground (Pin 1). This ground is electrically connected to the equipment frame. It may be connected to external grounds as required.

Transmitted Data (Pin 2). This signal is generated by the transmitting terminal for transmission of data to the receiving terminal. The sending terminal should hold this line at a mark (1) state during the intervals between characters, and at all times when no data is being transmitted.

Received Data (Pin 3). The receiving data set interprets the signal on this line to determine the value being sent from the transmitting terminal. The Received Data line should be held at a mark (1) state at all times when the Received Line Signal Detector is on and for a brief interval following the on-to-off transition of the Request to Send signal to allow for the completion of transmission and the decay of line reflections.

Request to Send (Pin 4). This signal is used to prepare the modem for half-duplex data transmission. The on condition maintains the modem in the transmit mode, and the off condition maintains the modem in the receive mode. A transition from off to on tells the modem to enter the transmit state which turns on the carrier. The modem responds by taking such action as may be necessary and indicates completion of

such actions by turning on Clear to Send, thereby indicating to the terminal that data may be transferred on the Transmitted Data line.

A transition from on to off instructs the modem to complete the transmission of all data which was previously transferred on the Transmitted Data line and then switch to receive mode. The modem responds to this instruction by turning off Clear to Send when it is prepared to again respond to a subsequent Request to Send.

When Request to Send is turned off, it will not be turned on again until Clear to Send has been turned off by the modem.

It is permissible to turn on Request to Send at any time when Clear to Send is off, regardless of the condition of any other interchange circuit.

Clear to Send (Pin 5). Clear to Send is generated by the modem to indicate whether or not it is ready to transmit data. The off condition is an indication to the transmitting terminal that it should not transfer data on the Transmitted Data line. The on condition of Clear to Send is a response to Request to Send, delayed as necessary for the modem to establish communications with the remote device.

Where Request to Send is not implemented, Request to Send should be assumed to be on at all times and Clear to Send will respond accordingly.

Data Set Ready (Pin 6). This signal is used to indicate the status of the modem. *On* indicates that the modem is not in test (local or remote), talk (alternate voice), or dial mode (optional).

This circuit is used only to indicate the status of the modem at your end of the connection. The on condition should not be interpreted as either an indication that a communication channel has been established to a remote terminal or the status of any remote terminal.

Off will appear at all other times and will indicate that the modem is off or, in the case of an autoanswer modem, is disregarding signals appearing on any line other than Ring Indicator. The off condition will not impair the operation of Ring Indicator or Data Terminal Ready.

Signal Ground (Pin 7). This conductor establishes the common ground reference potential for all interchange signals except Protective Ground.

Received Line Signal Detector (Pin 8). This signal is turned on when the modem is receiving a signal which meets its suitability criteria. These criteria are established by the modem manufacturer.

The off condition indicates that no signal is being received or that the received signal is unsuitable for demodulation.

Data Set Testing (Pins 9 and 10). These pins are reserved for testing the equipment and are not used as a normal part of the interface.

Unassigned (Pin 11). This pin may be used by the manufacturer for any purpose desired.

Secondary Received Line Signal Detector (Pin 12). This signal is equivalent to the Received Line Signal Detector line except that it indicates the proper reception of the secondary channel line signal instead of indicating the proper reception of a primary channel received line signal.

Secondary Clear to Send (Pin 13). This signal is equivalent to Clear to Send, except that it indicates the availability of the secondary channel instead of the primary channel.

Secondary Transmitted Data (Pin 14). This signal is equivalent to Transmitted Data except that it is used to transmit via the secondary channel.

Transmission Signal Element Timing (Pin 15). Used in synchronous communications; signals on this circuit are used to provide the data terminal equipment with signal element timing information.

Secondary Received Data (Pin 16). This circuit is equivalent to Received Data except that it is used to receive data on the secondary channel.

Receiver Signal Element Timing (Pin 17). Used in synchronous communications; signals on this circuit are used to provide the terminal with received signal element timing information.

Unassigned (Pin 18). This pin may be used by the manufacturer for any purpose desired.

Secondary Request to Send (Pin 19). This signal is equivalent to Request to Send except that it requests the establishment of the secondary channel instead of the primary data channel.

Data Terminal Ready (Pin 20). This signal is used to control switching of the modem to the communication channel. The on condition indicates to the modem that the terminal (computer) is ready to establish a communications link.

Signal Quality Detector (Pin 21). Signals on this circuit are used to indicate whether or not there is a high probability of an error in the received data.

Ring Indicator (Pin 22). The on condition of this signal indicates that a ringing signal is being received on the communication channel.

Data Signal Rate Selector (Pin 23). Signals on this circuit are used to select between the two data signaling rates in the case of dual-rate synchronous data sets or the two ranges of data signaling rates in the case of dual-range asynchronous data sets.

Transmit Signal Element (Pin 24). Used in synchronous communications; signals on this circuit provide the transmitting data set with signal element timing information.

Unassigned (Pin 25). This pin may be used by the manufacturer for any purpose desired.

Making the Connection

If this sounds too complicated, don't worry. In personal computer communications, most of these lines aren't used. First, since almost all microcomputer telecommunications are asynchronous, all the lines associated with timing can be ignored. Also, there's almost never more than one communications circuit implemented, so the secondary circuit lines can be ignored. In fact, an RS-232 communications link can be successfully established using as few as three lines. The minimum level of RS-232 consists of:

Pin 2 TXD (Transmitted Data out)
Pin 3 RXD (Received Data in)
Pin 7 GND (Signal Ground)

The second level consists of the minimum level plus:

Pin 6 DSR (Data Set Ready)
Pin 8 DCD (Received Line Signal Detector)
Pin 20 DTR (Data Terminal Ready)

The third level consists of the other two levels plus:

Pin 4 RTS (Request To Send)
Pin 5 CTS (Clear To Send)
Pin 22 RI (Ring Indicator)

Pin 1 (Protective Ground) should be used at all levels; however, it is a safety feature and is not required for proper operation.

The first level is normally used with equipment tied directly to each other, such as when two computers are connected together. The second level is normally used where some degree of handshaking is required; it's often found on acoustic modems. The third level is used where a more detailed control of the information flow is required. This level will usually be found with autoanswer modems.

This is a generalization of what you will encounter and in no way implies that all equipment will follow these rules. Some equipment will need other special signals or will not use all the signals within a specific level.

As an example of how this works, let's consider a computer connected to a modem for full-duplex operation with the second level of interchange lines described above. In order for your computer (DTE) to transmit data to a modem (DCE), the computer's software turns on the Data Terminal Ready line. If the modem is on, it will indicate its presence to the computer by turning on the Data Set Ready line. When your modem detects a signal, called a carrier, from another modem on the other end of the connection, it turns on the Received Line Signal Detector line to let the computer know that a communications link has been established. The computer can now start transmitting the message (with 1's and 0's represented as marks and spaces) on the Transmitted Data line to its modem. Any incoming data arriving at the modem from the other end of the link will be passed to the computer on the Received Data line.

Although the EIA standard has been in effect for some time, some modem manufacturers do not conform to the standard in all cases. Before you spend a lot of frustrating time with unexpected results, check the specifications on each modem you are using to determine which signals are on each pin.

RS-232 on the Commodore 64

Having examined the standard for RS-232, you may be dismayed to learn that the Commodore 64 does not fully implement all the specifications. Is does provide all the lines mentioned above for the third level of the interface: Transmitted Data, Received Data, Signal Ground, Data Terminal Ready, Data Set Ready, Received Line Signal Detector, Ready to Send, Clear to Send, Ring Indicator, and Protective Ground. However, it provides these signals at pins of the user port

rather than at a standard DB-25 connector. More significantly, the voltage levels of the RS-232 signals are from 0 to +5 volts, rather than the negative to positive voltage swing called for in the standard.

For equipment such as Commodore's Automodem and VICmodem, designed to plug directly into the user port, this presents no problem. All necessary conversions are handled internally. However, you'll need an interface adapter which provides the proper connector and transforms the voltage levels if you want to use the 64's RS-232 with any standard RS-232 equipment—standard modems, for example. Commodore sells an adapter in cartridge form, designated the VIC-1011. Interface adapters for the 64 are also available from a number of other suppliers. These may have extra features, such as allowing you to switch the adapter from a DTE to a DCE arrangement.

How Data Transmission Works

Michael Day

It's easy enough to use modems and terminal software without knowing anything about how they work. But if you are curious, here is a short lesson.

In previous sections we've examined ASCII code, RS-232 communications, and modems. Here we'll look at how these all tie together.

Suppose you wanted to send the simple message "Hello" from your Commodore 64 via modem to a friend in a distant city, who perhaps owns some other type of computer. You'll need to speak in a language both computers can understand, so your terminal software will need to translate your message into its ASCII code equivalent:

	H	e	l	l	o
ASCII code	**72**	**101**	**108**	**108**	**111**
Binary	**1001001**	**1100101**	**1101010**	**1101010**	**1101111**

These ASCII codes are then passed to the computer's RS-232 interface for transmission to the modem. The RS-232 interface prepares each character according to the communications parameters you have specified. For example, you must choose a *word size*, which determines how many bits will be sent for each character. The 64 can handle word sizes of five to eight bits. Since ASCII requires seven bits, only seven- or eight-bit word sizes are commonly used. For our example, we'll pick seven-bit words.

Next, you must decide whether you will use a scheme to detect bit errors within the character being sent. Since the computer will recognize any signal it receives as either a 1 or a 0, it's impossible to detect immediately if the value being received for a particular bit is correct. Even if some interference causes a 0 to be received as a 1, the 1 is still a valid bit value.

An error can be detected by adding an additional piece of information to the character being transmitted. This is called *parity.* To calculate the value for the parity bit, the number of

1 bits in the character is added up. In the even parity system, if there are an even number of 1 bits, then a 0 bit is added to the group; otherwise, a 1 bit is added. In either case, the parity bit makes the total number of bits in the character *even*, hence the name *even parity.* In odd parity a 0 bit is added if there are an odd number of bits, and a 1 otherwise, to maintain an odd number of bits in the character.

At the other end of the line, the receiver adds up the bits and compares its answer with the type of parity that was specified. If there is a difference, it flags the receiving device that an error has occurred.

Use of parity is not mandatory. You can specify that no parity bit be added, or you can specify either mark parity or space parity. In those cases, the parity is not calculated; rather, the parity bit is simply always set to a known value—1 for mark parity or 0 for space parity. For our example, we'll choose even parity:

H	e	l	l	o
11001001	01100101	01101010	01101010	01101111

Next, *framing bits* are added to the character. Since the communication is asynchronous—not tied to any synchronizing clock frequency—there must be a way for the receiving unit to determine where each character starts and ends. A start bit, which is always a 0, is added before the first character sent. One or more stop bits, which are always 1, are added after the last character. For our example, we'll choose one stop bit. But here's a catch. The bits for a character are sent out least significant bit first. The way we have been writing the binary representation of the characters in the preceding examples, this means rightmost bit first, which is reverse of the order in which they have been shown. Thus, in order of transmission, and with start and stop bits added, the characters in our example message would have the following bit patterns:

H	e	l	l	o
0100100111	0101001101	0010101101	0010101101	0111101101

Finally, you must specify which—if any—of the RS-232 control lines will be used to regulate the transmission of data, a process known as *handshaking.* You can choose to ignore handshaking altogether and hope that the modem is ready when you start sending data, or you can use the more sophisticated approach of testing the lines and waiting until you find

that the modem is ready—indicated by the DSR (Data Set Ready) line—and that the modem has made connection with another modem on the other end of the communications link—indicated by the DCD (Received Line Signal Detector) line.

At last you're ready to send the message from your computer. If you read the discussion of RS-232 in the preceding article, you'll remember that a 0 on the Transmitted Data line is called a space and is represented as a voltage of +3 or more volts for standard RS-232 (5 volts at the 64's user port RS-232 connection), while a 1 bit is called a mark and is represented by a voltage of −3 or more volts for standard RS-232 (0 volts at the 64's user port RS-232 connection). If we represent the voltage level for a space as *S* and the voltage level for a mark as *M*, the bit patterns for the characters in our message produce the following:

SMSSMSSMMM SMSMSSMMSM SSMSMSMMSM SSMSMSMMSM SMMMMSMMSM

The duration of each voltage signal on the line will vary according to the data transfer rate specified. For 300 bits per second (bps), the voltage level for each bit will be maintained on the transmitted data line for 1/300 second. If no data bit is being transmitted, the line is maintained at a constant mark level. If we again represent the space and mark levels with *S* and *M*, the signal traveling down the Transmitted Data line to the modem can be represented as follows:

MMSMSSMSSMMMMMSMSMSSMMSMMMSSMSMSMMSMMMSSMSMSMMS MMMSMMMMSMMSM

The modem must translate this into a format that can be carried over the phone lines.

How a Modem Works

The telephone network was designed for analog voice transmission, not to transmit digital information from a terminal or a computer in its binary form. In technical jargon, the telephone network has a bandwidth of approximately 3000 hertz. In simple terms, this means that a signal on cannot swing from a high to a low state and back again more than 3000 times in a second. This is fine for voice transmission, since most of the tones in human speech fall well within this frequency limitation. However, digital signals in computer communications (represented as binary 1 and 0 bit values) can

switch much faster—a million or more times per second. The modems used on the telephone network must transform digital signals into a format which will fit within this band.

The modem operates by changing the digital signal presented to it into an audio signal that can be placed on the phone line. The type of modem determines the exact method by which the signal is converted and the frequencies that are used.

Bell 103 Modems

There are many different types of modems, with each type designed to perform its particular function most efficiently. However, only a few types are commonly used with home computers such as the Commodore 64. Since—until quite recently—any device connected to the phone lines had to meet strict phone company specifications, modems tend to be classified by the Bell standard they were designed to meet. Most inexpensive 300 bps modems, including Commodore's VIC-modem and Automodem, are designed to the Bell 103 standard.

The 103-type modems are designed to operate at transmission rates from 0 to 300 bps, with some of them capable of operating as high as 600 bps. A substantial increase in error rate should be expected at these higher speeds. The 103-type modems are capable of full-duplex operation. That is, they can simultaneously send and receive data. Since it is not possible to transmit two signals with the same frequencies at once and derive any intelligence from the received signal, the available signal bandwidth of the phone line must be divided into two bands (high band and low band) so that the signals present the minimum amount of interference with each other. The high band is referred to as the answer mode. This is because the modem being called, the one that answers the call, is usually placed in this mode. The low band is referred to as the originate mode, as the modem that originates the call usually uses this band. For 103-type modems, the frequencies used for transmitting and receiving binary 0 and 1 bits, also referred to as the space and mark frequencies, are as follows:

Mode	Transmit		Receive	
	0 (Space)	1 (Mark)	0 (Space)	1 (Mark)
Originate	1070 Hz	1270 Hz	2025 Hz	2225 Hz
Answer	2025 Hz	2225 Hz	1070 Hz	1270 Hz

Note that the modem in originate mode expects to receive signals at the frequencies transmitted by a modem in answer mode, and vice versa. The frequencies used were chosen to present the minimum amount of interference possible.

One source of difficulty when using the phone lines for data communications over long distances is the phone system's echo suppression. When calling long distance, signal delays as long as 180 milliseconds can be encountered within the continental United States, and even longer delays can be encountered outside the United States. These long delays can cause severe echoing which can be very disturbing to the caller. The phone company has provided a means of reducing this disturbance with a device called an echo suppressor. This reduces the signal that is going in the opposite direction of the loudest signal to diminish the echo to an acceptable level. This can affect proper modem operation. However, the phone company has recognized this problem and provided a way to disable the echo suppressors. This is done by providing a signal of 2010–2240 hertz for 100 milliseconds if no signal has occurred. As can be seen, the disable signal falls within the answer modem's transmit frequency range so that the echo suppressors are automatically disabled when the answer modem begins transmitting.

Other Modems

Unfortunately, the technique used in 103-type modems cannot be extended to higher speeds. Beyond 300 bps, the 0 and 1 signals must change too fast to use the assigned frequencies, which differ by only 200 hertz. One of the early types of modem to get around this problem was the Bell 202 style. This model provided for speeds up to 1200 bps, but could be used only in half duplex; data could be sent in only one direction at a time. Operation at 1200 bps was provided by using the full usable phone-line bandwidth for transmission instead of dividing it into two bands. The frequency shift between a 1 and a 0 was expanded to 1000 hertz. With the wide frequency difference between the two states, it was much easier to recognize when a change has occurred which allows the change to be made more quickly.

The 1200 bps modem that has replaced the Bell 202 is the Bell 212 type, which is currently soaring in popularity among home computer users. This modem circumvents the half-duplex

limitation of the Bell 202 modems while maintaining 1200 bps speed, and recent advances in microchip technology have made possible sharp reductions in its price. As a result, almost all 1200 bps communication is now done with 212-type modems.

Rather than using separate frequencies for 0 and 1, the 212-type modems use only one frequency for transmission in each direction. To achieve high speeds while still using frequencies the phone lines can handle, a characteristic of the frequency known as its phase is carefully manipulated. In this manner, four different states can be encoded and detected. These are used to represent the bit patterns 00, 01, 10, and 11, allowing data to be transmitted two bits at a time. (For more information, see the article entitled "Smokey and the Modem—Part 8086.")

3 Reaching Out

3
A Nationwide Party Line
The Commodore Special Interest Group

John Blackford

Personal computer users love to share ideas, and one way to get together is by telecomputing. By using computerized bulletin boards, users can "talk" with each other and leave messages by hooking their computers together over phone lines. Especially popular is a bulletin board sponsored by Commodore on the CompuServe Information Service. It lets Commodore users from all over the country join together in a modern version of the old-fashioned party line.

To get a feel for the Commodore Special Interest Group (SIG) bulletin board on CompuServe, I signed on for a few weekends with a Commodore 64 and VICmodem. Unfamiliar with CompuServe, I at first waded through a number of menus that list possible options on the information service. But using the menus to get around is sometimes like taking a slow boat to China—and since you pay by the hour on CompuServe, it saves both time and money to go directly to the section you want. Now when I sign on, I type GO CBM 963 (you can type go cbm to jump to the first page of the Commodore section of CompuServe) to jump straight to the Commodore SIG.

There are several options to choose from. You can record a message or read messages already on the board. Some people even leave an address and phone number so others can contact them directly. I left a message that I was writing about the bulletin board and would like to hear from other people.

Within an hour, a user had fired off an answer: "How seductive and addictive the SIGs (Special Interest Groups) and bulletin boards are . . . I'm developing friendships across the nation . . . ."

There's a fine sense of camaraderie on the boards, and users seem more than willing to help each other out with

problems. In addition, the bulletin board's system operator (*sysop*) will answer questions, too. You leave messages for the sysop on the Hotline section of the bulletin board. The operator responds by leaving another message, usually within 24 hours.

If anyone responds to your message, the system tells you. This permits long chains of discussion to grow on a particular topic. One user wants to know how to connect a certain type of printer to his Commodore 64, and over the course of a few days a miniseminar on printers develops, each message linked to the one before it. Sometimes these discussions remain between two individuals, but often a number of people from all over the country join the circle.

There are plenty of new Commodore 64 owners looking for help, and many of them are using the bulletin board to compare notes. They are talking about everything: hardware, software, and even whether to visit someone they met on the board. For those who can't wait for a reply, there's even the "realtime" Conference Area that's like a cross-country party line. People talk to each other through their keyboards and screens, forming a nationwide telecomputing community.

So how can you get online with the Commodore board? All you need is a modem and a subscription to CompuServe. You get both with the inexpensive VICmodem, which works with the Commodore 64.

A few hints:

First, plug the VICmodem into your computer while the power is off to avoid the possibility of damage. Then, power up and load the *VIC-TERM* software that comes with the VICmodem, or one of the terminal programs included in this book ("TeleTerm 64" or "Plus/Term"). All of these allow you to communicate with CompuServe, The Source, Delphi, other computers equipped with modems, and the scores of other remote bulletin board systems scattered around the continent.

Now, dial the CompuServe phone number. This is a local call in most metropolitan areas. In other places, you may have to tie into CompuServe through an intermediate long-distance network, such as Tymnet, which adds a surcharge. You can find out if CompuServe has a local number in your area by calling 1-800-848-8199.

When the CompuServe computer answers the phone, you'll hear a high-pitched tone. Unplug the coiled phone cord

from the handset (the part you talk into), and plug it into the socket at the back of the modem. Make sure your modem is set to "O" for originate. (If your coiled phone cord doesn't unplug, you'll need a telephone with modular jacks.)

Immediately type a CONTROL-C (by holding down the CTRL key while pressing C). VIC-*TERM* allows you to do the same thing by pressing the f1 special function key. The CompuServe computer should now request your user ID and password, allowing you to log on. The ID and password are part of the VICmodem package, along with an hour of free time on CompuServe. If you don't see the *User ID* prompt within a minute or two, recheck your connections and call again. If you still can't sign on, phone CompuServe's toll-free number for help.

If you've done everything correctly and made the connection, the next thing you'll see is CompuServe's main menu. The main menu gives CompuServe's primary options. Each option leads to further menus, so to reach your destination you follow what's called a "tree" of choices. The main menu is like the trunk, and each additional menu takes you to ever more distant branches.

The Commodore SIG bulletin board—as with all parts of CompuServe—can be reached through the menus (choose the Personal Computing option from the main menu and follow the instructions). Or, as mentioned before, you can jump right to the Commodore bulletin board with the GO CBM 963 command.

It's fun the first time on the SIG to page through the list, perusing every message regardless of category. But this does take time, since the information is coming in at only 300 bits per second (about 30 characters per second, slower than most people can read). Also, when CompuServe is busy, response time slows noticeably—despite the system's powerful mainframe computers, which run simultaneously to handle the load.

To speed things up, you need to learn a little more about the SIG. You can order manuals on the SIGs from CompuServe, and they are worth getting. But while you are online, it's easy to find your way through the system by using the instructions on file there, and by using the Help function. For a minicourse on the Commodore SIG, type G CMB 1 if you are already on the SIG, or GO CBM 1 when you first sign

onto CompuServe. You will see the main CBM menu, which includes the "Introduction to the SIG," a "Survival Kit" on using SIG commands, and the Hotline.

First, select option 1 from the menu for the Introduction. When you have a grasp of the basics, return to the menu and choose option 2, Survival Kit, which is another menu. Select option 3 from that menu for an explanation of the bulletin board. You can run through these sections in about half an hour, and you'll save many times that after only a session or two.

One of the first things you'll notice when using the system is that there are two sets of commands, one for the main area of CompuServe and another for the Commodore SIG. CompuServe prompts you to enter a command with an exclamation point (!), while the SIG prompts you by printing *Function:* on your screen. You don't need the CompuServe commands to use the bulletin board, other than the GO command to get to the SIG.

Once you are on the SIG, you can get additional help as you proceed by entering a question mark (?) at the *Function:* prompt. The system will then list options available to you at that point. You can also get specific information about commands by typing ? followed by the command—for example, ?R will tell you about the Retrieve command.

When you can move around the SIG easily, you're ready to streamline your technique. Instead of paging through the messages one by one, for example, you can search them selectively by typing SF for Search Forward. When the system prompts *Search Field:*, you respond with either F (From), T (To), or S (Subject). Every message begins with those three categories, so you'll be able to search every message. Next, the system prompts *Search String*, to which you respond by typing a word. CompuServe's computer then searches the category you choose, looking for the desired word.

When the computer finds a match, it shows you the heading in question and asks if you want to continue or reply. When the search is complete, you will have a chance to look at the entire message. A similar command is RS, Retrieve Selectively—but instead of getting only the headers, you'll get the entire message each time the computer finds a match. With these two commands, you can retrieve messages of in-

terest to you without having to waste a lot of time looking through the entire list.

The CompuServe subscription that comes with the VICmodem is only temporary, and you can use up your free hour of connect time pretty fast if you spend much time exploring the Commodore bulletin board and other CompuServe offerings.

When your free hour on CompuServe is used up, you can subscribe permanently at no extra charge. When you first log onto CompuServe, you'll be asked either to sign up permanently (option 1) or go directly to the main menu (option 2). Option 1 immediately gives you two more hours with your current password—at the normal charge of $6 per hour. After signing up, you'll get a new password and ID number in a couple of weeks.

At $6 an hour, you *can* run up a sizable bill if you lose track of time. But it's lots of fun—like having an electronic mailbox with hundreds of pen pals at your fingertips, plus a static-free CB radio with a range of 3000 miles.

Taking the Plunge

Don Stoner

Telecomputing often seems mysterious and confusing to the newcomer. Actually, telecomputing is quite simple and can be a lot of fun. This article will help you dive right in.

Glance at the table of contents of virtually any computer magazine and you will almost certainly find a product review or an article on telecomputing. There's a good reason for this: Telecomputing is one of the most exciting and most rapidly growing areas of personal computing.

Unfortunately, few articles show you how to get started. If you're a beginner, this article is written with you in mind.

The Buddy System

One method of learning about telecomputing is so simple that many seem to have overlooked it. For an introduction to this exciting area of personal computing, the newcomer should locate someone who has a telecomputing setup. The local computer store can be a good source of contacts and can probably help you find someone to help you get started.

Unless you live north of the Arctic Circle, there's probably someone in your area with a computer and a telephone interface. Get yourself an invitation to see how it works and how it's used. Most computer addicts are pleased to demonstrate their equipment. As a general rule, people with computers are friendly and outgoing, and in one visit you'll pick up many tips on telecomputing.

An equally obvious source of information is your local user group. A user group is a meeting of people who own a specific model of computer. They band together for mutual assistance and learning. You can determine if there is a group near you by watching for listings published in magazines devoted to your type of computer. For example, *COMPUTE!'s Gazette* prints lists of Commodore 64 user groups every few months.

Assuming there is a user group in your area, try to attend the meetings. Some of the members will probably be beginners like yourself, but there will also be experienced enthusiasts who know how to get the most out of a telecomputing

setup. A user group can also help you save money by steering you away from the less desirable products and guiding you toward those that work best.

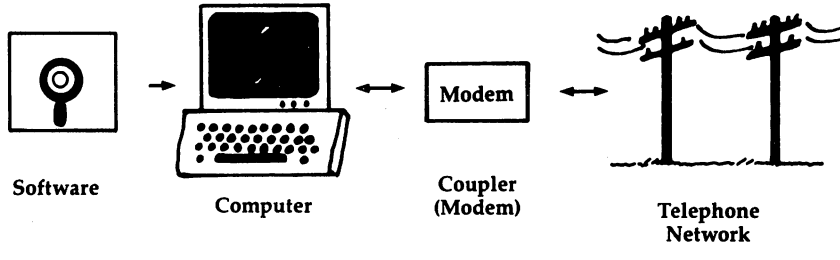
What You'll Need

Besides having access to a telephone, two principal items enable you to communicate over the phone line. The first is a device called a *modem,* which couples your computer with the telephone line. A modem is simply a device that gives your computer access to the telephone line.

The second item is often overlooked, ignored, or forgotten by the newcomer. This important ingredient is the software that makes your telecommunications setup perform properly. Like word processors, telecommunications software comes in all shapes and sizes. Chapter 5 of this book offers some terminal software you can type in.

Once you've taken the big step and purchased a modem, what do you do with it? Assume that you have been able to install the modem and that it is working properly. The next step is to go online. Figure 1 shows a typical installation.

Figure 1. A typical telecomputing installation involves a modem, computer, and communications software.



Modem communications with personal computers can be roughly divided into three broad areas. The first area is telecomputing directly between two users (figure 2). The second area is bulletin board communications, and the third is interaction with information utilities.

Figure 2. Communication between users is popular with newcomers.

Direct Communications

You can communicate from your keyboard directly to another person's screen, but this can become tiresome since many computer hobbyists are not particularly good typists. In other words, you can say the same thing more quickly on the telephone. This makes keyboard-to-screen telecomputing a novelty or, at best, a learning tool.

You can also transfer software over the phone line. This can be a lot of fun. Telephone transfers can be invaluable when two programmers are jointly developing software. They can pass the revised program back and forth until it is fine-tuned and bug-free. It's also particularly valuable where programs are to be transferred over long distances. But for the casual exchange of programs with your neighbor down the street, however, it's often faster to jump in the car and make the exchange in person.

What Are Bulletin Boards?

Bulletin boards have proliferated in the past few years. They allow anyone with a computer and a telephone interface to communicate with others by leaving messages on the system. The message can be either public or private, the latter having password protection. There are more than a thousand bulletin board systems in operation. Virtually every state in the union is represented. Quite a few are appearing overseas, too, particularly in Europe.

The bulletin board is analogous to the old timers' cracker barrel in the country store. It is a place to meet and exchange information. These computer message systems are also public forums for all types of discussion. In the course of preparing this book, quite a bit of time was spent on the local systems. During this period, there were messages about the space shuttle and the presidential candidates along with "editorials"

about many current controversial topics. Bulletin boards provide a sounding board for anyone who wishes to access them, and they represent a broad cross section of public opinion. Many times the opinions are not popular, and occasionally the subjects are distasteful. They are a unique manifestation of American individualism and are rarely dull.

A bulletin board system (BBS) develops when someone decides to dedicate a computer and phone line for public access. It is a phenomenon, since the owner usually receives no compensation for providing this service.

The bulletin board computer can be any type from a simple Timex/Sinclair 1000 on up. The most popular computers for BBSs are the Apple, Atari, Commodore 64, IBM, and TRS-80. The BBS uses a modem which is configured to automatically answer the telephone and inform the computer that someone is calling. This action starts the BBS program. When the user hangs up, the software automatically resets the program for the next caller.

The First Bulletin Boards

The first BBSs came online in 1978, when two members of CACHE (Chicago Area Computer Hobbyist Exchange), Ward Christensen and Randy Suess, decided to set up a computerized message machine. They called it a computerized bulletin board system and trademarked the acronym CBBS in conjunction with their software. The system allowed club members to communicate with each other by placing messages and want ads on the system.

Later, two fellows by the name of Craig Vaughn and Bill Blue created bulletin board software for the popular Apple computer. Bill Blue went on to develop a very user friendly BBS called the People's Message System (PMS). Bill Abney wrote the first (and most widely distributed) bulletin board software for the Radio Shack TRS-80, called Forum 80.

Why Use a Bulletin Board?

The reason you should practice telecomputing on a BBS is twofold: They are forgiving of user errors and they are free. There is no membership or access charge.

A few people enjoy finding ways to crash these systems. This means the caller tries to introduce faults that make the program fail and return to the BASIC READY prompt. They

can then list the program and obtain a free copy of some relatively expensive software. Some of the more violent types even erase disk files. Recently, the press has adopted the term *hacker* for these folks, confusing them with people who *hack* away at the keyboard learning BASIC and otherwise mastering the personal computer.

The authors of bulletin board programs spend considerable time trying to make their software virtually bulletproof. As a result, it is quite unlikely that you will hurt the bulletin board system if you make mistakes. Thus, you are reasonably free to experiment with the commands as you learn how to use the BBS.

In practice, you simply dial the system phone number and follow the instructions or answer the questions as they appear on the screen. What do you see when you call the BBS? Figure 3 is a rough flowchart illustrating a typical system.

The Menu

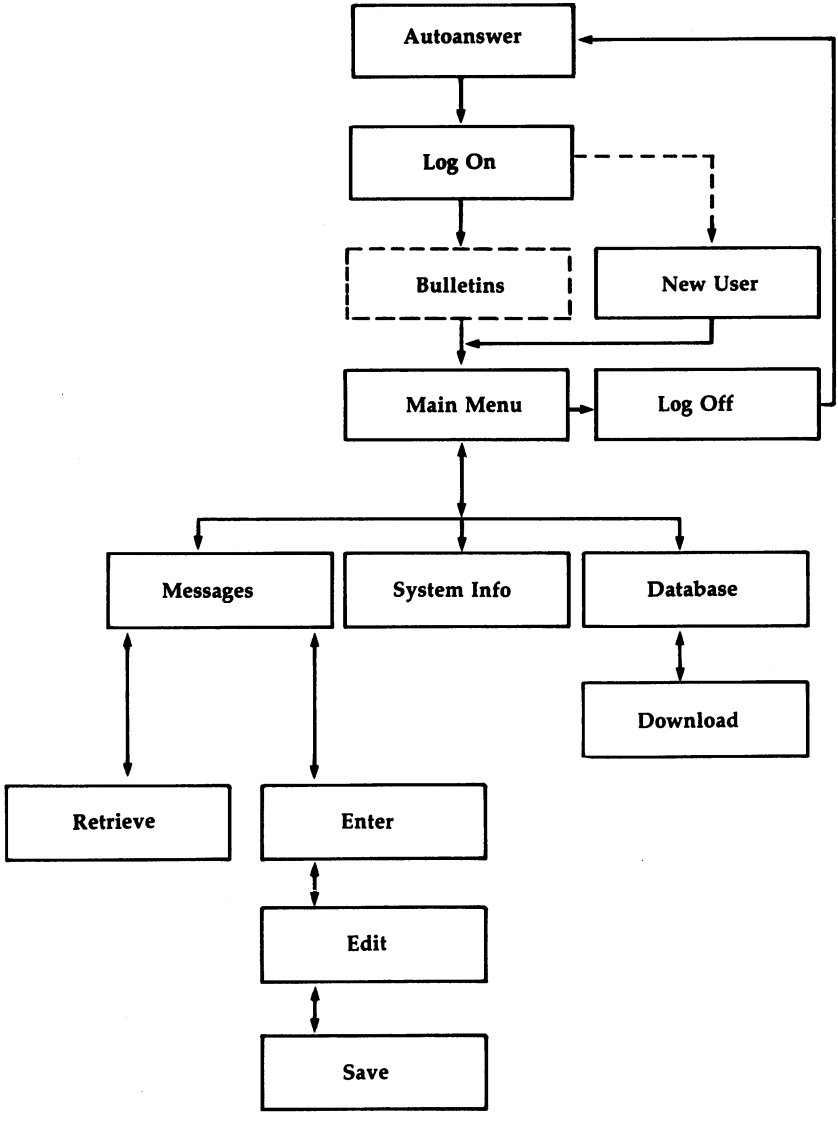
One nice feature of the various bulletin board systems is that they assume the person calling is a novice. To make things as straightforward as possible, most of the command functions of the BBS are described by a series of menus.

When you call a BBS, one of the first menus you'll see is the list of commands. From this display you can elect to read or scan messages, check for other system phone numbers, change your parameters (to get a linefeed after carriage return, for example), or even leave a message for someone else.

Once you have become accustomed to using the system, you can choose the expert mode. What's the difference between the novice and expert user modes? If you have previously printed out the various menus (or know them by heart), what is the point of displaying them over and over again on your screen? At 30 characters per second (cps), the usual speed of low-cost modems, you can spend quite a bit of time on the telephone line just looking at menus.

If you select the expert user mode, the repetitive transmission of menus is eliminated. Instead, you will simply see something like SELECTION? or COMMAND (A,B,C,D,E,F)?. Some bulletin boards even allow the entry of multiple commands at one time. The system assumes that you know what

Figure 3. Flowchart of a Typical Bulletin Board



the questions are and allows you to stack the answers, separated by a comma, colon, or some other specific character.

Don't be afraid to try the expert user mode. You can always get back to the novice menus. Even when you are in the expert user mode, most systems have a help command which will remind you what the commands are and what happens if you make a particular menu selection.

One of the most popular bulletin boards in the Pacific Northwest is SeaCom 80, a BBS that features what's called a *hot menu.* The software *(RAX IX)* is written for the TRS-80 and is one of the friendliest that you will encounter on any BBS.

The hot menu provides what may be the perfect compromise between beginner and expert user modes. You can elect to display the menus, but as soon as the option appears, you simply press the appropriate key. The menu display immediately stops, and the program branches off to the area that has been selected.

Bulletin board technology has advanced significantly since the early efforts of Suess and Christensen. Not only can you now read and leave messages, but you can also transfer software from a BBS to your computer. This is called *downloading* and is often more practical than transfers between users. This is because the bulletin board end of the system is fully automated. Some systems, such as SeaCom 80, permit you to *upload* software (send a program from your computer to their disk).

You'll find specialized BBSs devoted to aviation, photography, genealogy, and even computer matching and dating.

Bulletin boards tend to come and go. Putting up a BBS seems to be a great idea until the reality sets in a few days after it's online. Since the computer is tied up awaiting phone calls, the owner does not have access to it for other tasks. As a result, some systems have a very short life or are online evenings and weekends only. The latter is often the case with BBSs operated by computer stores.

One of the most up-to-date lists of bulletin boards was compiled and is maintained by Bill Blue. Most of the participating People's Message System (PMS) have this list of BBSs on their system. The list can also be found on CompuServe MAUG XA4 and The Source PUBLIC 112.

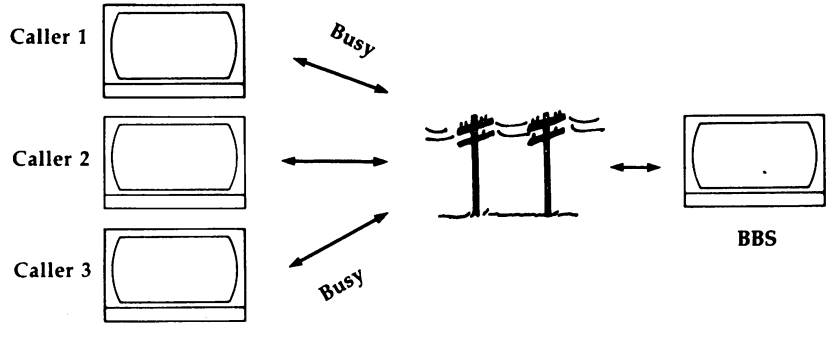
Commodore Talks to Atari?

Telecomputing systems are very democratic. For example, you need not own an Apple computer to check into an Apple BBS. They all speak a common language (the ASCII code) and you can easily communicate with other users no matter what type of computer you (or they) own.

Some BBSs may have 32-, 40-, 64-, or even 80-column lines. In other words, they will print a specific number of characters on your screen before sending a carriage return to start a new line. As an example, if you are using a Commodore 64 (40-column lines) and are communicating with a TRS-80 BBS (64-column lines), the characters will wrap around. This means you will see 40 characters on the first line and 24 characters on the second line. It can be confusing, but you can still read the information presented.

Bulletin boards do have one major shortcoming. Nearly all BBSs accommodate only one user at a time. If anyone else calls the BBS while it is being used, the result is a busy signal as illustrated in figure 4. The popular bulletin boards seem to be constantly busy.

Figure 4. Only one user at a time can access a bulletin board.



The Information Utilities

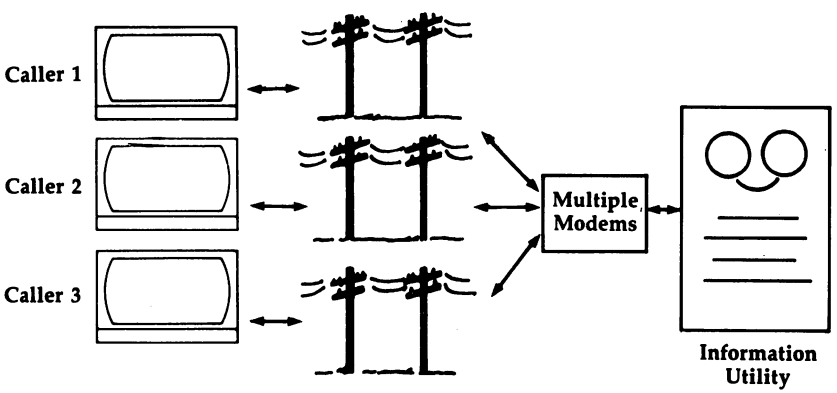
Multiple users *can* be handled by the information utilities (see figure 5). This is the third major area of telecomputing interest. Unlike bulletin boards, these systems are not free.

A number of organizations have set up national databases which can be accessed by telephone. These databases are

collections of information which are of value to various people. The area of telecomputer databases can be subdivided into two broad categories, and the one of general interest to most computer users is called *information utilities.*

Among the more popular utilities are names like CompuServe, Delphi, and The Source. One of the most popular features is a message system similar to those found on bulletin boards. However, when it is a national system and you are paying for the service, it is given the fancy name of *electronic mail.*

Figure 5. Information utilities are capable of handling many users at a time.



Numerous computer manufacturers have set up national user groups on the information utilities. You can check in and communicate with others like yourself all over the country. These user group systems also provide voluminous amounts of free software which you can transfer to your machine.

In order to access the information, the user pays a sign-up fee to the system operator. A user code and password are then assigned by the information utility. Whenever you check in, you are charged for the amount of time the system is accessed. The charges for access vary from system to system.

CompuServe Information Service. One of the most popular systems among owners of personal computers is CompuServe. This system is located in Columbus, Ohio. The company is owned by H&R Block, the income tax people.

During the day, the majority of their computer capacity is devoted to commercial activity and business accounts. But after 6:00 p.m., when the system would normally be loafing, their computers are redirected to handle the flood of personal computer owners who call in. To encourage this separation, CompuServe charges $12.50 per hour between 8:00 a.m. and 8:00 p.m. (prime time) and only $6.00 per hour at night and on weekends and holidays.

Most information utilities charge more per hour for high-speed access. They can accept input and respond at either 30 or 120 characters per second. The latter speed is available on more expensive modems, but the access charges are more expensive than for slow-speed input. CompuServe charges $15.00 per hour for prime-time operation at 120 characters per second, and $12.50 per hour at night.

Special Interest Groups. CompuServe has one of the largest numbers of special interest groups (SIGs) of any utility. Figure 6 gives a list of these SIGs.

Figure 6. Users of CompuServe Information Service will see a number of computer special interest groups (SIGs) listed on their screens.

Personal Computing SIGS

1	CP/M SIG	11	PowerSoft's
2	HUG (Heath)	12	Programmer's
3	MAUG (Apple)	13	CEM SIG
4	MNET-11 (H11)	14	Author Forum
5	MUSUS p-sys.	15	Commodore
6	RCA micros	16	Atari SIG
7	TRS80 COCO	17	IBM PC SIG
8	Panasonic	18	OSI SIG
9	MNET80 TRS80	19	Instructions
10	LSI Users	20	Descriptions

Input a number or key
<ENTER> for more choices
!
CompuServe Page PCS-100

Personal Computing SIGs

1 Microsoft Users Group
2 Telecommunications SIG
3 TRS-80 Model 100 SIG
4 Computer Art SIG

Many of these SIGs are simply computer owners who are banded together electronically. Only a few (such as the RCA and Commodore SIGs) are sponsored by the company making the computer. On these systems, one can actually send messages to (and receive messages directly from) the manufacturer.

If you would like more information on CompuServe, call (800) 848-8199.

The Source Telecomputing. Another excellent service is called The Source. This system, located in McLean, Virginia, was one of the first to cater to personal computer owners. It is operated by Source Telecomputing Corporation and is owned by The Reader's Digest Association, Inc. In the early stages, the system was rather difficult for the newcomer to use. With experience, The Source adopted menu structures similar to those found on bulletin boards, which made the system easier to use and much more popular.

Source Telecomputing failed to anticipate its tremendous user acceptance, and the system was quickly overloaded. In the early days, it could take as long as two or three minutes for their computers to act upon a user command. The problem has since been corrected with the addition of more computers having greater processing power.

If you are interested in obtaining information, contact The Source at (800) 336-3366.

Dow Jones News/Retrieval. Another popular system, which claims to have more users than any other information utility, is called Dow Jones News/Retrieval. This is the same company that publishes the *Wall Street Journal.* One of the most impressive aspects of this system is that many articles, which have appeared in *WSJ,* can be accessed via telephone through Dow Jones News/Retrieval. They claim that major stories affecting the financial community are online within 90 seconds.

Dow Jones is not very big on menus, but it does offer an incredible array of financial information. The most popular area is the online stock quotations. The service also offers historical records on stocks and bonds, in addition to investor information on virtually every company listed on the various exchanges. To make maximum use of the service, you must spend considerable time learning about the system before

going online. The charges can mount up quickly if you are not familiar with the DJNS system.

There are different charges on Dow Jones, depending on what type of information you are accessing. Generally speaking, the charges are more than those for CompuServe and The Source. However, the popularity of Dow Jones News/Retrieval seems to demonstrate that the information available is worth the price to a large group of people.

For more information on the Dow Jones News/Retrieval, call (800) 257-5114.

Bargain subscriptions. Here's a tip regarding two of the three information sources. You can go to your favorite Radio Shack store and join CompuServe and Dow Jones at the same time! Radio Shack sells a package that provides a membership and free trial hour on both services. The cost is $19.95 (plus local taxes) for the package. This may sound expensive, but it is quite a savings over the cost of direct sign-up fees. For example, if you sign up directly with CompuServe, the fee is $39.00 for that one service alone.

The package carries Radio Shack part number 26-2224. As soon as you open the cover of the heavy-duty binder, you will find a computer-generated sealed envelope. This contains your CompuServe identification number and a secret password. That is followed by a sheet with the complete listing of CompuServe access telephone numbers. However, as the company points out, their network is constantly expanding. A customer service number (800-848-8199 or 614-457-0802 inside Ohio) is provided so that you can get up-to-the-minute information on the best phone number to use in your area.

The binder also includes very well-written user guides to both the CompuServe system and the Dow Jones News/Retrieval. In later chapters, you'll see how to use the free hour on these services to learn how to access them and what you can expect to see on your screen.

You are billed by CompuServe in a number of ways. If you use a credit card, there is no service charge. You can also request to be billed directly. If your credit is approved, you are given a $300.00 credit limit. You are also charged $3.50 per month, presumably to cover the cost of bookkeeping and postage.

The method of signing up for Dow Jones is somewhat different. At the back of the binder is a contract called a User

Agreement. The document also has an imprinted control number. To sign up, you call Dow Jones toll-free at 800-257-5114 (609-452-1511 in New Jersey). This is also their customer service number, if you have any questions. The operators are extremely helpful and competent. Not only can they answer technical questions, but they understand financial matters and can help users solve access problems.

When you call DJNS, they will request your control number and will then assign you an ID number and password. They will also give you access to one free hour of system time.

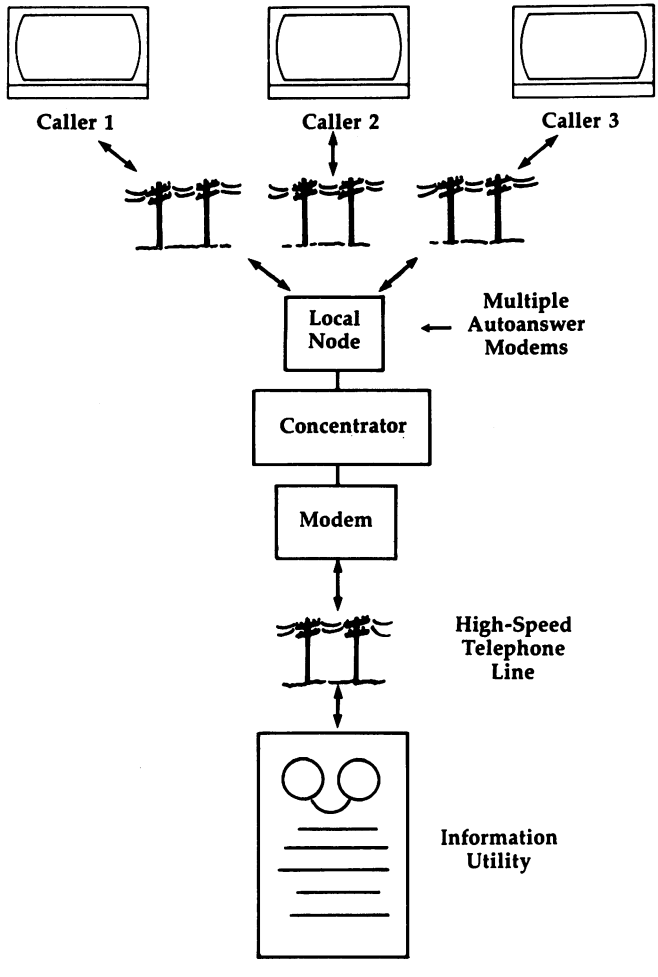
As you can see, each system has a different way of giving you your free hour. When the hour is up, you will be notified onscreen and can elect to sign up at that time and avoid the usual membership fee.

The Source memberships can be obtained at the major computer stores like the Byte Shop and Computerland. Major bookstores, like B. Dalton and Walden, also carry membership packages along with a detailed user guide. Unless you find a special deal (such as membership packaged with a modem), the membership fee is $100. The hourly access charge is somewhat higher than for CompuServe, since The Source does not have its own digital network and must pay access fees to Telenet (see below).

The packet networks. You may be wondering about the cost of calling Virginia, Ohio, California, and other places. Fortunately, all the services previously discussed can be accessed by calling a local telephone number (in cities of 50,000 or more population).

In addition to the regular telephone network, the nation is wired with a number of digital networks. Rather than carrying voices, these lines carry digital data. These systems are called *packet networks* and have been established by a number of companies called *value-added carriers.* The two largest companies are Telenet and Tymnet. CompuServe originally used independent packet carriers exclusively (The Source and Dow Jones still do), but is now in the process of setting up its own network. The local phone number for the network ties into a junction, called a *node.* CompuServe presently has nodes in more than a hundred cities. In smaller cities, they interconnect into the nodes of other networks. As a result, you may call their network directly or through Tymnet, depending on where you live. This is illustrated in figure 7.

Figure 7. Packet networks combine user transmissions in a device called a concentrator.

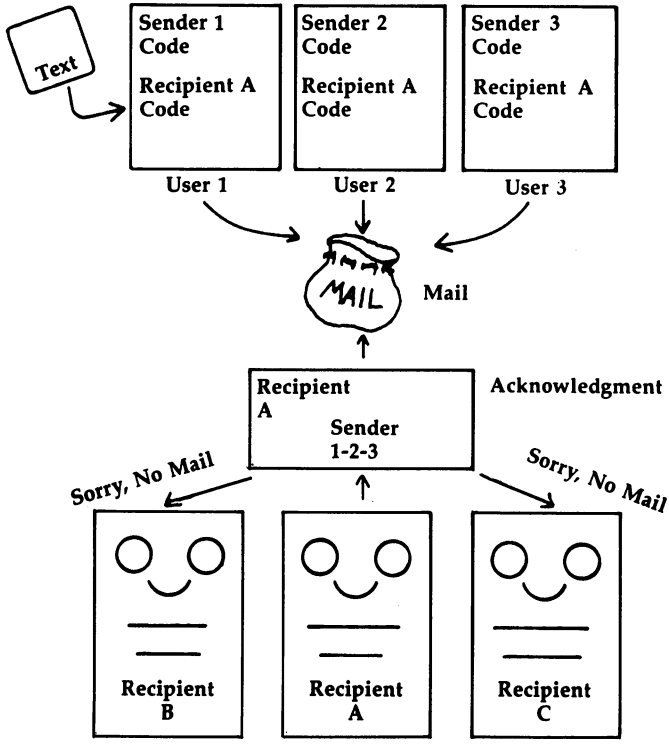


When you call one of these carriers, your transmission is put into a packet of information much like a letter is put into an envelope. The envelope also includes the destination address. This packet is combined with those of other users and sent into the network, which acts like a mailbag. The packet address is something like a postal zip code. The other

"stations" (these are the nodes mentioned earlier) constantly monitor the transmissions (mailbags) looking for packets (envelopes) which are addressed (zip coded) to them. When one is found, it is extracted from the "mailbag" and an acknowledgment (proof of receipt) is sent to the originating node.

The extracted packet is then sent to the local destination just like a letter, but much more rapidly. The reply from the destination computer is handled in exactly the same way, but in the reverse direction. This is illustrated in figure 8.

Figure 8. The packet network operates like a digital high-speed postal system.



The network transmissions (movement of the "mailbags") occur at very high speed. The information transfer rate between your computer and the local node will probably be at a rate of 30 characters per second. Most network transmissions are at 960 characters per second. Thus, 32 people can use a single "mailbag" simultaneously. If more circuits are required, more "mailbags" can be added.

This "packing" is what keeps the cost of using such a network so much lower than a long-distance voice call. In most cases, the carrier leases the transcontinental lines; needless to say, these dedicated high-speed telephone lines are expensive.

You can now see why there is a premium charge for 120 cps transmissions. If you use a telephone interface operating at this higher speed, you are using four 30-cps channels on the packet network. When the network is busy with digital traffic, this could mean a loss of revenue to the carrier.

While the technical standards on the various networks are almost identical, the method of checking into each one is different. If you hook up your modem and call the local numbers of several different networks, you will discover that the various information services seem to have a total lack of standardization. One of the greatest impediments to widespread use of telecomputing is the lack of standards. When you buy a speaker at the hi-fi store, it's not necessary to specify impedance, crossover frequencies, and the like. If you wire the speaker to an RCA-style phono connector, there is an excellent chance that it will simply plug into the back of your stereo. Unfortunately, such standardization has not yet come to telecomputing.

However, the packet carriers should be complimented on the outstanding performance of their systems. If you play the game their way and use their protocol, the packet systems work almost perfectly. Even though they shuffle characters back and forth at a rate of 960 characters per second, their system generates less than one error in one million characters.

Modems in the Home

Sharon Darling

With the advent of telecommunications services and online databases, computers can give you a "window to the world" from your home, offering hundreds of productivity and entertainment services.

If you own a Commodore 64 and a modem, perhaps you've considered subscribing to an online telecommunications service. Is it worth the investment? Let's imagine the following scenario.

It's 7:00 on a Thursday night. The library closed at 5:00, and Sammy Jordan has a school report due tomorrow on a subject he hasn't yet researched. Dad has been dabbling in the stock market, studying which stocks he'd like to buy. Now he's ready to plunge ahead, but can't place an order with a stockbroker until 9:00 Friday morning. And he's leaving on a business trip at 8:00 a.m. Mom meant to stop at the bank on her way home from the office, but left work too late to get there before the bank closed.

To top it all off, Sally's birthday is coming up, and her birthday present wish list contains an item not available in their hometown. The closest store that carries it is 50 miles away.

Such a situation could cause a lot of stress and worry. But not for our fictional family. They recently subscribed to an online telecommunications service for use with their Commodore 64. Now, they're going to put their investment to good use.

Sammy logs on first and gets the information he needs for his report from an online encyclopedia, then looks through a special interest group (SIG) database to get a few more facts. He downloads the data, prints it out, and starts writing his report. Next, Dad accesses the financial services section and places his stock order. He can now leave for his business trip without worrying. He knows the stockbroker will receive instructions as soon as the office opens and will immediately place his order. Dad will later receive confirmation of the purchase.

While he's online, Dad also checks the weather forecast for the city he's going to on his business trip. Since the report is calling for rain, he packs a raincoat and umbrella.

It's Mom's turn next. She visits the bank, which is a member of the telecommunications service, and transfers money from savings to checking. She also looks through merchandise available in the service's online shopping mall and orders a birthday present for Sally.

While this is only a fictional scenario, the services described are used every day by thousands of computer owners who log on right from their homes. Today, there are a growing number of companies offering well over a thousand different online services and databases which can make many routine household tasks more convenient—even fun.

Online services have come a long way in a relatively short period of time. Take, for example, CompuServe, the largest of all such home-based telecommunications systems, with 145,000 subscribers. Started as a time-sharing service for businesses, home computerists were first allowed access to the system in 1979.

At the time, it was a database for hobbyists says Paul Battaglia, a CompuServe spokesperson. A CB radio owners' interest group was one of the most popular services. There were under a thousand subscribers, and only about 25 different databases which could be accessed. By 1980, the number of subscribers had increased to about 5000. Today, there are more than 800 different databases, special interest groups, and services, covering almost every topic, from aviation to world news.

The Source, another popular system, has roughly 60,000 subscribers right now, and offers hundreds of databases in six major categories—business and finance, travel, games, consumer services, news and sports, and communications. Dow Jones has well over 120,000 subscribers. While most of its offerings are geared toward business users, there are several services which appeal to the home computerist, such as movie reviews, sports, and weather reports.

Banking at Home

If you've been looking for additional uses for your computer, joining an online service could be one of the most rewarding. Let's take a look at some of the options available.

Buying stocks, bonds, and other securities online is a relatively new concept for the services. It is currently available to subscribers of The Source and CompuServe, for example, through different brokerage firms.

You open an account with either Max Ule & Company, if you are a CompuServe subscriber, or Spear Securities, Inc., if you have joined The Source. The brokerage houses are members of these two major services. With CompuServe, you must also have access to its Executive Information Service. Security, accessibility, and guaranteed service are very important in any of these computerized systems. For example, subscribers must clear a number of security levels before placing their buy and sell orders. This makes the chances of illegal entry "minute," according to Richard A. Baker, CompuServe's director of corporate communications.

Besides buying stocks, other financial information is available on The Source and CompuServe, as well as Dow Jones News/Retrieval, one of the most respected business-oriented telecommunications networks.

Computerized banking, while still in its infancy, is a fast-growing service. CompuServe, Chemical Bank's Pronto Home Information and Banking System, and a few others let you do your banking from the comfort of your living room. Right now, CompuServe has agreements with three banks (Shawmut in Boston, United American Bank, Memphis, and Huntington National Bank, Columbus, Ohio). Baker says more banks will probably be added to the network later.

Chemical Bank's Pronto system, which can be used by Commodore 64 owners, topped 10,000 subscribers by summer 1984. It offers users the ability to pay bills, transfer funds, get balances, see electronic statements, track budgets, and balance checkbooks.

In addition, the bank has licensing agreements with eight other banks coast-to-coast. Another online system, Keyfax Interactive Information Service, based in Chicago, offers home banking, educational packages, databases, and financial options. A home shopping service is planned as well.

Electronic Shopping

There are many types of at-home shopping services available. Perhaps the best known is Comp-U-Card's Comp-U-Store, which is available on CompuServe, The Source, and Dow Jones.

Subscribers to these services pay an additional fee to belong to Comp-U-Store, which offers more than 60,000 items from national manufacturers and stores. Comp-U-Store also offers discounts of up to 40 percent on its merchandise.

Right now, Comp-U-Store has 16,000 online subscribers and 800,000 telephone subscribers who do not have access to a computer, says Lynn Booth, director of corporate communications for Comp-U-Card International. She says the popularity of the service is growing because "more and more people have home computers, and they find they don't have the time to spend browsing or comparison shopping, so they use a service like ours."

In the spring of 1984, CompuServe introduced the Electronic Shopping Mall, which offers goods from about 90 national merchandisers. Battaglia says that while the electronic mall is popular, "I don't think it's ever going to replace going out to the store and buying goods—there's a certain social function involved (in shopping), and I think this (the mall) is a convenience factor."

Use of such services should grow, though, he adds, as people get accustomed to shopping by computer. "Right now, it's a unique thing," Battaglia says, "and I think there are more products that are sold more readily over this kind of medium than other kinds of products.

"A designer dress, for example, would be difficult to sell to the public right now because they're not acclimated to making purchases with just that information at hand."

Shopping by computer should really take off, Battaglia says, when home computers are able to receive graphics sophisticated enough to show what a product looks like rather than giving a word description of the merchandise.

Online Answers to Electronic Mail

Whether it's financial information you need or material for a school paper or even the answer to a trivia question, you can probably get the facts you need from one of the online services. Sports news, encyclopedias, weather reports, news items from national and international wire services, movie reviews, and newspapers are all examples of information you can access with your computer.

And there are special interest groups of every type available as well, ranging from people who own specific kinds of computers, to pilots, to home canners.

If you're planning a trip, you can check the Official Airline Guide (OAG) to find the best ticket prices. Even making airline reservations from your home has become a simple procedure with your computer.

Another popular feature which ties directly into your home is electronic mail. According to a Source spokesperson, JoAnne Montgomery, The Source's electronic mail service "gets the most use from consumers and business." CompuServe's Battaglia also attests to the popularity of the service. Electronic mail is "hot" right now, for both consumers and business users, he says.

Unusual subject areas can be accessed. CompuServe, for instance, offers an advice columnist, Aunt Nettie, as well as information on PGA golfers, insurance, humor, and human sexuality.

On The Source, categories include collectibles, classified advertisements, teens, and schedules of the U.S. House of Representatives. Those services are but a sample of what's available. To list every subject category offered by the various services might take an entire book.

The Cost

Of course, it costs money to join any of the online services. A basic subscription will cost you roughly the same price as a piece of commercial software. The Source has reduced its subscription fee to $49.95. Getting online with CompuServe costs about $40.00, although many modem manufacturers offer a free subscription to CompuServe as part of the package.

Dow Jones has three different levels of membership, with prices ranging from $50 to $75. In addition, each service charges for the amount of time spent online. Some of the services, for example, sending an electronic mail letter, also require an extra fee.

In addition to the sign-up fee, most services charge an hourly rate for time spent on the service. It generally costs more during business hours, but in the evening, the rates may be as little as $6.00 an hour. And if you have to call long distance, the time is charged against your phone bill (many ser-

vices have local numbers you can call, so you can avoid paying long-distance bills). The telecommunications options available by home computer are expanding every day, and there are no signs of slowing down. Modems remain one of the most popular peripherals for Commodore 64 owners, a fact not lost on the major online systems. Will this expansion continue? CompuServe is already planning to increase its mainframe computer capacity by 90 percent over the next two years. And everyone else seems to be following suit.

Navigating the Networks

Robert Sims

With the number of databases available to the home computer operator increasing, it becomes more and more difficult to decide which ones suit your needs. Four networks, at least for now, seem to be best known by Commodore 64 owners.

Of all the information utilities and databases available to home computerists, four are best known to Commodore computer owners: Dow Jones News/Retrieval, Delphi, CompuServe Information Service, and the Commodore Information Network (accessed through CompuServe).

Commodore 64 owners are usually introduced to information services when they buy a modem and find that the package contains offers of free memberships or reduced membership fees to networks.

With a modem and these bargain memberships, a user has access to an incredible array of information and services. Also, you only pay for what you get. There are no minimum use requirements, so if you need to be online for only 30 minutes a month, that's all you pay for. (There *is* a $4.00 monthly charge if you choose direct billing instead of using a credit card.)

From Stocks to Poetry

Dow Jones is oriented almost exclusively to business and finance. With such services as the *Wall Street Journal* online, and current stock quotes, it is the leader in business services.

Delphi offers the fewest services because it's new. But its newness has advantages. It's not crowded with established services, so there are plenty of opportunities for entrepreneurs to enter the home telecommunications market under its network umbrella. And, since newer services tend to be more experimental and innovative, the more adventurous computer users are likely to find something of interest and value on Delphi. For example, Delphi has a feature called Writer's Corner, where authors can publish their works and receive royalties when other users read them. Also, Delphi maintains a much more informal atmosphere, both in its menus and home computing services.

CompuServe offers the advantage of size, with the widest available range of business and home services. In addition, it has a whole library of documentation at reasonable prices. And CompuServe sells *Vidtex* terminal software tailored for the special capabilities of most computers.

Special Interest Groups

CompuServe members can access Commodore's Information Network without extra charge. Operated by Commodore Business Machines, Inc., the network contains special interest groups (SIGs).

Each SIG comprises a bulletin board, conference lines, and several database access areas in which you can upload and download public domain programs. Commodore operates an online Computer Club and user group which is separate from the other SIG services. There is a $10 membership fee, for which you get a newsletter, a quarterly catalog for ordering computer supplies and software at a discount, and a club access area where you can upload and download special club programs.

Accessing the Networks

All the networks provide their subscribers with documentation on how to *log on* (connect to the network), with a toll-free 800 telephone number to call if users have problems making the connection. Access to Dow Jones and Delphi is provided through third-party *value-added carriers*. These companies maintain phone numbers in most metropolitan areas. Users call these local numbers and type in the special code sequence which the carrier uses to connect the caller to the network.

Dow Jones is accessed through the carriers Telenet, Tymnet, or Datapac (for Canadian subscribers). Delphi uses only Tymnet. To access CompuServe (and the Commodore network), you can use CompuServe's own telephone numbers, as well as Telenet, Tymnet, or Datapac.

Most networks include the carrier costs in their regular charges to users; however, if there is a CompuServe number available and you choose to use Telenet or Tymnet, you may be assessed a surcharge for using the alternative carrier.

Each of these numbers is a local call, even if you're in California calling a computer complex in Massachusetts. (If you live outside a metro area and must call long distance to a

carrier number in a nearby city, you are charged the long-distance rate to call that number.)

Facing the First Menu

All four networks are menu-driven and allow users to choose the services they want. Delphi, CompuServe, and Commodore also offer the option of verbose (complete) or brief menus. You can choose a menu with or without explanation of menu items and commands, or you can simply receive a prompt. Experienced users save time by switching to the abbreviated menus or prompts.

Dow Jones has a different procedure from the others in that it doesn't automatically send a menu when you log on. After your password is verified, you are prompted to ENTER QUERY. At this point you can go directly to any service, ask for an introductory menu, or go to the main menu. A new user would best benefit by typing //INTRO for the introductory menu. A welcome screen appears, then a menu like this:

PRESS	FOR
1	Closing Dow Jones Averages retained
2	Weekly economic update revised on Fridays
3	News/Retrieval operating hours expanded
4	Customer Service Information

Type 4 to get the basic information needed to use the network, change your password, and perform other record keeping chores. When that's completed, type //MENU to get the main menu:

TYPE	FOR
//CQ	Current Quotes
//DJ NEWS	Dow Jones News
//HQ	Historical Quotes
//UPDATE	Economical Update
//WSJ	Wall Street Journal Highlights online
//DSCLO	Disclosure II
//EARN	Corporate Earnings Estimator
//FTS	Free Text Search of Dow Jones News

FOR MORE CHOICES PRESS RETURN, FOR HELP, TYPE DATA BASE SYMBOL AND HELP. (EXAMPLE: //CQ HELP)

This is only the first page of the main menu; to see the rest, simply press RETURN. To select a database, type two slashes and the database code. Dow Jones provides a comprehensive manual (without extra charge) which contains all

the information and sample menus required to use the network.

Delphi's Guided Tour

Delphi provides a free manual to each member, and also offers an online guided tour to give the subscriber necessary information. Printed documentation consists only of general information and a quick-reference card of network commands.

During the guided tour, instructions are given on how to change your password, how to use several control characters to move around Delphi, how to set screen length and width, and how to choose either the brief or verbose prompts. Then the main menu is presented:

Main Menu:

Bulletin Boards	Library
Conference	Mail
Delphi-Oracle	News
Exit	Online Markets
Financial-Services	Profile
Games	Scheduler
Guided Tour	Travel
Help	Writers-Corner
Infomania	

MAIN> What do you want to do?

To go to any Delphi service, type the name from the menu. The service you select will then offer other menus from which you choose particular sections of the service.

CompuServe Uses Numbers

CompuServe's menu system is more complex, with numbered menu items and system page numbers. After you log on, the main menu appears:

CompuServe **Page CIS-1**
CompuServe Information Service

1 Home Services
2 Business and Financial
3 Personal Computing
4 Services for Professionals

5 User Information
6 Index

Enter your selection number, or H for more information.
!

The exclamation mark at the bottom of the menu is a special prompt, called a command prompt. A GO command typed at a command prompt sends you directly to any area of the network, bypassing the usual path through several menus.

The Information Menu

New users should choose item 5, User Information. This menu appears:

```
CompuServe                    Page CIS-4
USER INFORMATION
1  What's New
2  Command Summary & Usage Tips
3  Feedback to CompuServe
4  Order Products, Guides, etc.
5  Change Terminal Settings
6  Change Your Password
7  Billing: Your Charges, Rates
   Options, Making Changes
8  Logon Instructions & Numbers
9  Electronic Bounce Back
Last menu page. Key digit or M for previous menu.
!
```

If you're a new subscriber, you'll go to this menu often to refresh your memory about commands and prompts, to check on how much money you're spending, and to ask CompuServe questions about confusing aspects of network services.

Select item 5, Change Terminal Settings, to have CompuServe configure its output for your computer. For example, choose 22, 40, or 80 characters per screen line, or have the text displayed in all capitals or in uppercase and lowercase.

Changing Your Password

Select item 6 to change your password. You should do this at least once a week. A password is like a credit-card number. If other users find out what it is, they can use your account and you'll get the bill. So never type your password while online, except when logging on or changing it here.

Another important selection on this menu is item 4, used for ordering CompuServe's manuals.

The Commodore Network

After you've finished with these record-keeping chores, you may want to visit the Commodore network. The simplest way to get there is from the main menu. Let's suppose you have finished changing your password from the User Information menu (Page CIS-4). At the ! prompt, type M to get back to the main menu (Page CIS-1). When you see the main menu ! prompt, select item 3, Personal Computing, then press RETURN.

You'll receive the Personal Computing SIGs menu (Page PCS-50). At that prompt, type 15, the selection number for Commodore. You will receive the Commodore main menu, Page PCS-160. Use this menu to access any of the Commodore SIGs.

Another, more direct, route to the Commodore network is to type GO PCS-160 at any ! prompt. This goes directly to the main Commodore menu from anywhere in CompuServe. To go directly to the 64 SIG, enter GO PCS-156.

The Bulletin Board

The most popular services for beginners on the SIGs are the Bulletin Board and the Conference line. On the Bulletin Board are several hundred messages on a wide variety of subjects. Areas are set aside for general messages, messages from and to software and hardware vendors, and for Hotline questions to Commodore, which are then answered on the Bulletin Board.

Commodore provides online instructions and a simple line editor for users who want to leave messages.

Control Characters

There are several control characters which are helpful for typing in messages and other text. Most are common to all telecommunications; a few are used differently by different systems. Control characters usually show on the screen as an up arrow and a character. For example, CTRL-V, represented by ↑V, is sent by holding down the CTRL key and pressing V. The control characters cause the network software to interrupt what it's doing and take some other action. Some of the most frequently used:

↑ A Tells the host computer to stop transmitting at the end of the current line.

↑ O Aborts whatever is being transmitted and jumps to the next prompt. Used on Delphi, instead of CTRL-P.
↑ P Aborts whatever is being transmitted and jumps to the next prompt. You can use this to jump past the introductory bulletins on CompuServe.
↑ Q Tells the host computer to resume transmitting.
↑ R Displays the line you are currently typing (Delphi).
↑ S Tells the host computer to stop transmitting immediately.
↑ U Deletes the line you are currently typing.
↑ V Displays the current line you're typing (CompuServe).

The Conference Line

The Conference service (CO) is very popular, but it can be confusing until you learn the quirks and commands. Although formal conferences are held on CO, the name is misleading because most subscribers use CO as a kind of chat service, similar to a CB radio band.

When you select CO, you see a series of short bulletins on what's happening in CO in the near future. CO also offers some pointers on frequently used commands and outlines the etiquette to be used online. It's good practice to download these bulletins and command descriptions, and keep them handy while you're online.

Downloading

Let's look at two simple ways to download information. If your terminal software has a feature that dumps the screen contents to the printer, you can wait until your screen is nearly full, then press CTRL-A. Next, press the proper key to print the screen. When the transfer is completed, press CTRL-Q to resume transmission, press CTRL-A again when the screen is nearly full, dump it to the printer, and continue this process until all the information is printed.

The second method is a simple matter of opening the buffer in your terminal software before accessing the CO. (Consult your terminal software documentation for the proper procedure.) Everything that appears onscreen will also be stored in the buffer. When all the information has been transmitted, close the buffer. Depending on the capability of your software, save the information to disk while online or after logging off.

But before trying either of these methods, read your terminal software manual carefully. Any good program will include a feature that automatically sends the control characters, captures incoming data in a buffer, and stores it to disk.

Learning to Talk

After receiving this introductory CO information, you will find yourself on Conference Channel 30. If anyone else is online, messages like this will scroll up your screen:

(30,Blackfoot) I see what you mean. But can you use the cassette recorder...
(30,Blackfoot) and the disk drive at the same time? ga
(30,SamR.) Yes, no problem. ga
(30,Blackfoot) Thanks. I'll try it. ga

In this conversation between two users, the information in parentheses is the conference channel number and the user's name. Users have a choice of using the name listed in their CompuServe account or of using a handle (pseudonym), as most CB radio operators do. This option is also useful when two or more people share an account on the network. Each person can use his or her own name while online. At the prompt, type in your chosen name and hit RETURN.

Online Etiquette

Blackfoot has typed ellipses (three periods) in her first line. This means she has more to say. At the end of her second line, she has typed GA (Go Ahead). These codes are simple, but essential for users to know whether it's okay to send their comments without interrupting the current "speaker."

When several users are on CO, it's common to see several conversations carried on at the same time. When that happens, users tend to start a remark with the name of the person they're talking to, like this:

(30,Blackfoot) Sam R.=> I see what you mean.
But can you use a cassette...

Talking Back

The most confusing aspect of CO for beginners is in trying to type in their comments while other comments are scrolling up the screen. Whatever you type will appear mixed up with the incoming comments. For example, if you try to type

Hello, my name is Clyde

your screen might look like this:

He(30,Blackfoot)llo,Sam R.my =>I
seenawhat me isyou mean.Clyde

All this gibberish is only on *your* screen; other users can't see what you're typing until you hit RETURN.

There is no real remedy for this jumble. The best solution is to avoid looking at the screen while you're typing. If you get lost and can't remember what you typed last, type CTRL-V to redisplay your line, free of the gibberish. If you get hopelessly confused, type CTRL-U to erase the incomplete line. When you finish typing your comment (less than 80 characters), press RETURN and your message will be transmitted to the other users.

It doesn't take long to get the hang of this unorthodox communication method, and the reward of instant communication with other users is well worth the initial confusion.

Conference Commands

Another tricky area for beginners is the use of commands in the CO section. There are three modes of communication on Commodore's CO. The default mode is open communication; everyone can see everyone else's comments. The second mode is /TALK, for private conversations between two users. The third mode is /SCRamble, in which several users can have a private conversation.

To use these commands while in CO, type them on a line alone, then press RETURN. If you put any character, even a space, in front of the slash, it won't work. (It will be sent as a comment rather than a command.) If you find this confusing, just type a CTRL-U before typing the command. This will delete anything you may have typed by mistake. Then type the command and RETURN, and you should get the desired result.

Conferencing modes on Delphi are different from CompuServe. The default mode is private. To join a conversation you must /PAGE one of the members of a group and get the group scramble code. Then you must /JOIN the group. There is no open conferencing on Delphi, and the commands are different, but the results are the same.

A Few Quirks

Besides the special conditions on individual services, the networks have a few general quirks which can be confusing if you're not expecting them. The strangest is a tendency for the characters on your screen to suddenly stop scrolling for no apparent reason, then start up again. This happens because thousands of people are using the system at once, and sometimes it gets a second or two behind. This occasionally happens on all the networks, but is most noticeable during peak evening hours on CompuServe.

CompuServe has become so popular that it's in a constant race with its users, trying to expand its capacity to keep up with the growing numbers who log on every evening.

When the network falls behind, you may experience a delay in moving from one service to another.

No Dead Ends

Another problem for new users is the sense of wandering in a labyrinth. Many beginners worry needlessly about getting lost in the maze of menus, of wandering into a service that charges extra for access and running up a huge bill. Or, they worry about what happens if they accidentally hang up without properly logging off.

First, it's difficult, if not impossible, to get into an extra-charge area without knowing it. Many of the services require users to sign up separately from their network membership, and unauthorized access is not possible. There are services, such as the Academic American Encyclopedia (AAE), which can be accessed without prior arrangement. However, the AAE menu includes a notice that the service involves a $2.00 per hour surcharge.

There are no dead ends on the networks. Even if the network software crashes (a very rare occurrence), or if a user gets nothing but garbage scrolling up the screen, the option is always there to simply disconnect the modem from the phone line.

If a user disconnects from the network without properly logging off (either by mistake or if the connection is broken by a telephone line malfunction), CompuServe's software will wait for up to 7 minutes, then log the user off. During very busy periods, this may take up to 20 minutes. The user is charged for this time.

Modem Applications

Michael Day

Once you purchase a modem, just what do you do with it?

I am often asked the question "Why do I need a modem?" It is interesting that this question is asked rather than *"Do* I need a modem?" This indicates that the need for the modem is already felt.

Feeling the need for a modem comes about because of the large amount of information about telecommunications, both in magazines and in talking to other computer users. This leads to the belief that if you don't have a modem you're not using your computer to its fullest potential. Unfortunately, the reasoning for this belief is not readily apparent. Analysis of the information generally available on telecommunications shows why this is so. Most information is of a technical nature, which assumes that you already know why you do or do not need a modem, and you're simply after "how it works" information. The other type of information available is applications information. Again, this assumes that you already know *why* you need a modem and that you are simply looking for information on how to use it for a particular type of application.

Why is one of the hardest questions to answer. It can't be answered directly. When you ask *why,* what you are really saying is give me more information so that I can decide if I really need it. The information that is normally provided is referenced information with which you are familiar. One answer to "Why do I need a car?" might be "To get to and from work." This provides a base point that you can expand upon to gain the information needed to determine how the car would fit into your lifestyle. A response could be "But I can take the bus," with a return of "But what if you work odd hours when the bus doesn't run?" This generates the pros and cons necessary to make a final decision.

The problem that we have with the modem is the same problem that was experienced with the computer—a lack of readily discernible common reference points. In answer to why you need a computer, the easily determined reference points tended to be rather weak—for example, to balance your

checkbook or to keep records of your gas mileage. Since these jobs could be done far more cheaply with existing alternative methods, they hardly generated a decision in favor of the computer. The computer is slowly overcoming this problem by creating its own reference points. The computer does things that were not possible before (controlling heating and lighting to minimize utility bills) or does things with greater ease than ever before (writing letters or magazine articles) and even plays exciting new games. And as a side benefit, you can balance your checkbook, too.

The modem is going through the same stage of development. It is a device that has entirely new uses and concepts which are not currently realized.

Computerized Bulletin Boards

Originally, the question was easy to answer: the modem's purpose was operating a large mainframe computer from a remote location. If you needed to do this, you had to have a modem. If you did not have to, then you did not need a modem.

Now, however, use of the modem has been radically altered. With the advent of personal computers like the Commodore 64, computers are no longer giant machines that must be operated remotely. The computer itself can sit on our desktop.

If you are going to use the computer only to play games or balance your checkbook, you probably don't need a modem. If you want to communicate with other computer users, however, at some point you will need a modem.

One of the new uses is computerized bulletin boards. These are public access message systems which can be used by anyone to post messages or read those left by others. They tend to be messages that don't fit into normal modes of communication and include calls for help, general notices of information, advertisements, classifieds, and personal messages. Usually, there is no charge for the use of these systems; they are wholly supported through donations and out-of-pocket expenses by the owners.

Because the bulletin boards are privately supported, they are limited in the scope of services they can provide. For those who are willing to pay, there are more elaborate systems available. The best-known are CompuServe, The Source, and Dow Jones News/Retrieval. These systems provide a wider

range of services including message transfer, information retrieval (such as stock reports and news), conferencing, program storage and retrieval, and exchange of programs.

Often, there is a need to find more extensive or more technical information than the general service systems can provide. The technical information database systems can satisfy this need. These systems are usually oriented toward a particular subject area or group of areas. The technical database systems, by being very specific, can carry a much wider range of information on a subject than is possible on a general information system. Because this information is also the most expensive to obtain, these systems are the most expensive to use.

Multiuser Systems

Finally, we come to the original multiuser computer systems, timeshare computer systems. These systems are rented on a usage basis to anyone who needs a computer, but who, for some reason, does not have a computer available. These are generally used for overflow work, or temporary or occasional applications where it is not possible or practical to use one's own computer. The cost of using these systems varies widely depending on how usage is determined.

It is interesting that another application appears to be evolving now that the personal computer has come into being. This can best be understood by describing the need that has been generated.

If you want to say something to George who lives down the street, you could go to his house and speak to him directly, or you could call him up on the telephone and talk to him. In the first case, there was no *equipment* involved in talking to George—you went to his house. This is *direct* communications. In the second instance, you used the telephone to talk to him. Rather than expend the energy to go to George, you used a device which allowed you to talk to him without actually going to his house; thus, you were *communicating at a distance.*

If you and George both have a computer, and you wish to share programs you have written, you can do this in several ways. You could put a copy of the program on a cassette or floppy disk and give it to George to read into his computer.

This works fine if George has a similar computer and can read the tape or disk.

But if the two systems are not compatible, you'll have to find another way. One way is for you to simply provide George with a written copy of the program and let him type it into his system. This isn't too bad if the program isn't very long and is in human-readable form. This is the way most magazines provide programs because it's the surest way to cover a wide range of computers. But, as mentioned before, if the program is not in human-readable form or if it is excessively long, this method does not work very well.

Computers Talking to Computers

A frequently used method of communication is to connect computers *back to back*. This is a form of *direct communication*. It allows the computers to talk to each other, but it has the disadvantage of requiring both computers to be next to each other. It has also meant that the computer operator must be fully knowledgeable of the way the computer internals work as well as the programming needed to allow the two computers to talk to each other. This can be difficult for the general user and, in fact, has baffled quite a few experienced computer technicians.

The modem provides a common link that two computers can communicate through. Defining a standard of how the interconnection between the computers is to be accomplished eliminates the problem of how to hook the two computers together. What is occurring now is a definition of the method of communication between the computers. In the last few years, the number of communications programs (terminal programs) for the Commodore 64 has increased. Chapter 5 of this book includes three such programs, ranging from very simple to quite sophisticated.

Bulletin Board Basics

Gregg Peele

The actual transfer of data from one computer to another over telephone lines is an interesting, yet complex, procedure that is made transparent by your software and modem.

When you press a key to send a character from your computer to another system, you set in motion a series of events.

First, your terminal software—the program that tells your computer how to communicate with another computer—sends the character to a device called a UART, which stands for Universal Asynchronous Receiver Transmitter. (The Commodore 64 computer doesn't have a UART. Instead, it uses special built-in software to emulate a UART.) The UART breaks the eight-bit byte that makes up the character into a serial stream of eight sequential bits, then adds special bits to the character. Start and stop bits are added to signal the beginning and end of the byte (character) being sent, and the parity bit is altered to allow any transmission errors to be detected. There are a couple of different systems for this error checking, or parity checking. Like most other factors in telecommunications, the most important thing is not which type of parity you use (you don't have to use parity at all), but that both the sending and receiving systems agree to use the same type of parity.

From Digital to Analog

All the bits are then sent to the modem, which converts them from their digital form into analog tones which a telephone can transmit. A tone of a certain pitch represents a binary 0, and another tone represents a binary 1. Following the Bell 103 standard for modem protocol—the specific rules of the road for communications—both of these pitches are within a specific range determined by whether your modem is set to originate or answer a transmission. If you are linking to a bulletin board system (BBS), you should set your modem to originate. Bulletin board systems normally set their modems in answer

mode. Modems use one set of frequencies to listen and another set to talk. That's how a computer can use a single telephone line to both send and receive.

The receiving computer's modem translates the analog tones back into digital data, which the BBS program uses to control some function or print a character on the system operator's (sysop's) screen. If the two computer systems are in full-duplex mode, then the characters are echoed back to the sender from the receiver. These echoed characters are then printed on the sender's screen.

In half duplex, the characters sent are automatically printed on the sender's screen before being transmitted, but communication is only one-way; characters are not echoed. Full duplex is considered best since, with half duplex, there is no direct way to tell whether the other system is receiving you. Full duplex lets you know immediately if your connection is working correctly.

A Common Language

Just as communication between humans requires a common language, the language of computers must be agreed upon by both parties. ASCII (American Standard Code for Information Interchange) is a standard code representing each letter, number, and punctuation mark, plus a few common control keys. The Commodore 64 uses a modified version of ASCII. To access an ASCII BBS system with these computers, you must have a terminal program which translates the normal Commodore codes to ASCII.

Even with such a program, certain incompatibilities may exist between systems which use ASCII. For instance, BBS systems may offer an option for an extra linefeed with each return character. If your terminal program includes a linefeed (moves the cursor down a line) when you hit RETURN, you won't need the extra linefeed. Other characters may also cause problems. The delete character, for instance, which is usually CHR$(127), may be CHR$(20) or even another character on some systems. Let's hope your terminal program will allow you to alter the characters sent and received so that you can match the computer you're communicating with. If you have questions about the codes used with a particular system, leave a note for the sysop. Most sysops are technically proficient and are glad to help you make your system work with their BBS.

Transferring Data

Transferring programs and other files over the phone lines (uploading/downloading) is one of the most useful functions of BBS communications. This can be a complex procedure, often requiring a special terminal program designed specifically for a certain type of BBS. These programs are designed to compensate for noise in phone lines which may garble characters.

Often, to insure accuracy, a checksum is added to each block of transmitted data. The checksum indicates whether a bit has been scrambled during transmission. If an error occurs, the data is sent again. This process is repeated until the entire file is successfully transferred.

The two communicating computers handle all of this automatically. Such communication between two computers without human intervention is called handshaking. In this case, handshaking lets each computer know if the blocks of data were properly sent and received.

Since there are several different file transfer schemes, be sure that your particular program is compatible with the BBS you're calling. Again, the sysop can help you decide on the appropriate program to use with the BBS.

Bulletin Board Fever

Kathy Yakal

Get used to hearing busy signals: Telecommunications networks are tied up a lot these days. And bulletin board systems specifically designed for Commodore owners are popping up daily around the world. Here's a look at what's happening.

A modem is a rather unremarkable-looking piece of equipment. Plastic housing, maybe a couple of lights or switches, occasionally a wire or cable attached to one end. Nothing magical.

But when you connect it to your computer and dial certain phone numbers, remarkable things do happen. *Telecommunications networks* offer help with technical problems, up-to-date news, movie reviews, public domain software, shopping catalogs, and, sometimes, new friends.

CompuServe and The Source are probably two of the best-known national networks. They are *multiuser systems,* which can be used by more than one caller at a time. They charge a subscription fee and an hourly online charge. Most large cities (population of 50,000+) have a local number, so you can avoid long-distance charges.

Of course, you don't have to call an established telecommunications service to communicate with your modem. If you and a friend each have modems, you can call each other and "type" to each other, or send software, instead of talking. Though that can be fun for awhile, the novelty soon wears off (and the phone bills add up if it's long distance).

Another telecommunications alternative that's fast gaining popularity is the bulletin board system (BBS). Some of the original boards went online in the late seventies, and were run by computer user group members. They were used primarily for posting messages.

Over the past year, BBSs aimed specifically at Commodore owners have popped up all over the country—even in many foreign countries.

It's not hard to see why they call them electronic bulletin board systems. Think of what you most often see tacked up on regular bulletin boards. Notices of time and place for up-

coming meetings. Items wanted, or items available for sale or swap. Funny cartoons or articles clipped out of newspapers and magazines. People needing assistance of some sort.

That's the kind of interaction you'll find on Commodore bulletin boards. Only your interaction won't be limited to the bulletin board hanging at the Laundromat or on the office wall: You'll have access to people literally all over the world.

Calling a BBS

Let's walk through your first call to a BBS. Once you've received an answer and a terminal tone, and answered with your own, you'll probably see a message welcoming you. If nothing happens in the first ten seconds or so, try hitting the RETURN key a couple of times. Some systems require you to give them a couple of carriage returns to signal the software that someone is online.

After the welcome message and maybe a couple of bulletins from the system operator (sysop), you'll be asked for your name and the city and state you're calling from. You may also be required to make up a password you'll have to remember and use each time you call. This insures that no one can post fake messages using your name. Make sure you write down your password.

Because of the tremendous number of calls that BBSs get, and the tendency of some users to try to crash boards, you may get no further than this. Many Commodore bulletin boards have been forced to go private in the last year or two. If this is the case, you'll be given an address and/or telephone number to call to inquire about gaining access to the board. Some require modest membership fees; others just want more information about you.

In any case, have a piece of paper and pencil handy. Once the system's menus come rolling by, you may want to take notes, though most systems offer commands that let you stop the action for awhile. Watch for a message that says something like, "Hit S to pause. Once paused, hit S to restart, A to abort." Remember those commands. You'll want to use them once you've become familiar with a BBS to skip over the opening bulletins.

Commands

Command level is where things start happening. You reach this level when all the sign-on procedures and opening bulletins

are completed and the BBS software wants to know what you'd like to see.

It's a good idea to *download* a system's main menu and print out a copy of it (though you must have software that allows downloading to do that). You'll probably become familiar enough with the features that you use most often to remember the commands, but you may also be missing out on some other features.

Once you've chosen a command and entered it (usually just one or two letters), the system will give you instructions on how to proceed. For example, if you want to enter a message to an individual or for everyone to read, it will prompt you all the way through the process, then give you options to edit or abort the message if you've made a mistake. (If you're brand-new to the board, you may have restricted access—allowed to read messages but not leave any— until you sign up as a member.) Most bulletin board systems are user-friendly as long as you stay alert for command menus and prompts.

Try to complete your business as soon as possible. Bulletin boards are not multiuser systems: While you're online, everyone else trying to call is getting busy signals.

One of the commands you must remember is the one to log off. Most often, it's G (good-bye), Q (quit), or just OFF. If you disconnect your modem without first logging off the system, it will take longer for the next person to gain access. You may even wreak some havoc with the BBS software. Some bulletin boards will automatically log you off if there is no activity for 5 (or 10 or 15) minutes. If the board is very popular, the sysop may decide to limit calls to 30 minutes per person per day to prevent callers from monopolizing board time.

Leaving a Message

The two most common uses of Commodore bulletin board systems, say many sysops, are *electronic mail* and *program downloading*.

Users leave messages about all kinds of things: selling or trading equipment, advice on what kind of software to buy, questions about technical problems, opinions about movies and books and TV personalities, and even debate about political issues. Some of the debates get so heated, in fact, that the sysop will occasionally intervene and put an end to the discussion.

Besides the public forum that electronic mail provides for all to see, a lot of messages are sent privately on BBSs. (You're always given this option when entering a message.)

Some bulletin board systems store hundreds of *public domain* programs, software that is not copyrighted and can be shared freely. Users are encouraged to upload public domain programs or programs they have written themselves. Sysops will often put a limit on the number of programs you can download without having uploaded some already, just to keep the program disks full.

Other common features include:

Bulletins. News about the latest Commodore hardware and software products; information about user group meetings; miscellaneous industry news.

Expert mode. Lets you skip over new user information, explanations, and menus.

System usage log. Gives you a list of who has been using the system.

Summary of available messages. Lets you scan over message headings and read only the ones you want.

Other BBS numbers. Lists telephone numbers of other bulletin board systems. This is the most up-to-date way of finding other BBSs to call.

Chat mode. Allows you to "chat" online with the sysop (if he or she is available).

The Other End of the Line

You might wonder what's on the other end of the line when you call a bulletin board system. Occasionally, it's the back room of a computer store, but often, it's an individual's living room or bedroom. Usually, the sysop is a Commodore dealer or a user group member.

The hardware that runs the BBS may be no more complicated than your own setup. All you need to start a BBS are a computer, disk drive, monitor, autoanswer modem, BBS software—and a lot of time and patience. Sysops spend anywhere from 2 to 20 hours a week on board maintenance, doing things like answering mail, deleting outdated messages, updating bulletins, and modifying software.

Why do they do it? Toronto resident Steve Punter, author of the *WordPro* word processing package and one of the longest-running Commodore sysops, says he's always had a

fascination with communication. "Computers are another way of communicating," he says. "And being at the center of a communications network like a bulletin board is fascinating.

"People think that running a board is simple. They soon find out that it's a lot of work."

Another sysop, 14-year-old Matt Peterson, of San Francisco, found that out when someone crashed his board and destroyed his software. He's trying to reconstruct the program, feature by feature. It's slow going.

But it's better than a $100 phone bill every month, which is what prompted Peterson to start his own BBS. "I wanted to have people start calling me instead of having to call them," he says.

Many user groups start BBSs as a service to their members, instead of, or in addition to, a monthly newsletter. Some, like the Commodore Club of Augusta, Georgia, have equipment donated to them or get it at wholesale cost. Club president David Dumas says that having a bulletin board system simplified the task of distributing public domain software to club members.

Tim Renshaw, a Commodore dealer in Indianapolis, was simply intrigued by the idea of bulletin boards. He had been calling an Apple board in the area, then found out that Steve Punter had written a BBS program for Commodore computers. Renshaw's BBS went online August 11, 1982, and has been running ever since.

Sysops report a dramatic increase in activity on their bulletin board systems in the last year. Five calls a day have grown to 75. Message sections of the boards, which used to have months-old mail on them, now have to be cleaned out weekly. More women are calling. Public messages, which used to be all computer-related, have turned to all kinds of topics.

Such a jump has to be related, in part, to increased modem sales. Tim Renshaw thinks the movie *War Games* had a lot to do with that. "That movie opened up a whole new world for people who had computers and didn't know what modems are all about," he says.

But there's another reason, believes Renshaw. "In one light, it's kind of taken the place of CB radio. It's a chance for people to chat with each other and maintain a little bit of anonymity," he says.

Matt Peterson agrees. "You can say what you want without people knowing who you are."

The Indispensable Sysop

Kathy Yakal

For one sysop, starting a bulletin board system was a leisure-time hobby, an entertaining way to learn about computers. For another, it was an important factor in recovering from a decade of serious illness. Tony Ott and Bob Shannon tell contrasting stories about their histories as sysops and authors of BBS software.

A good way to learn something, it's often said, is to teach it to someone else. In order to explain a concept, you must understand it much more fully than if you were just trying to understand it yourself.

Tony Ott had such a theory when he decided to start a Commodore bulletin board system over two years ago. "By establishing a BBS, I thought I would triple my learning time about computers," he says. "The board has done that."

Ott, who travels frequently in his job as a management consultant, runs the BBS from his St. Louis home in his spare time. He has written several telecommunications-oriented programs which are in the public domain, and recently completed a software program for BBSs that runs on the Commodore 64. He plans to market that as well as set up a second board using it.

Ott went online in the pre-Commodore 64 days, when only PETs and VIC-20s were available. "Initially, one had to be somewhat wealthy to set up a Commodore system," he says. "CBMs were still selling at $1,795, 4040's and 8050's [disk drives] were $1,795, and the IEEE modem cost $395.

"Then you had to build your own autoanswer circuit, which was another $75–$100. That's a tidy sum, but it was really worth it. It's an amazing learning tool for someone who's really serious about it."

During the last year or so, it's become possible to start a BBS using only a Commodore 64, a 1541 disk drive, an autoanswer modem, and BBS software. "There are at least 50 BBS programs in the public domain, but they all have enormous problems," says Ott.

Which may be one reason why so many boards perish quickly. Several systems have gone online and disappeared, the victims of inadequate software, equipment failures, lack of funds to maintain two phone lines (one for the BBS, one for personal use), or pranksters bent on crashing boards. Ott uses Steve Punter's BBS software, modified for his own use.

The biggest problem with being a sysop, according to Ott, is lack of time. "It's an enormous responsibility," he says. "I get from 10 to 25 messages a day, addressed to me, people wanting help." And the only way he can get logged onto the BBS to answer those questions is by autodialing the system from another computer in his home.

Beyond that, he has received thousands of letters over the last several months, as well as a steady stream of phone calls. "There was a period there when my phone bill was running about $400 a month, just from returning calls to people who had questions," he says.

Why his BBS's activity picked up so dramatically in the fall of 1983 is a mystery to Tony Ott. "I kind of wish I could bring back the old days sometimes. It loses the personal touch when there are so many people," he says. Ott's board averages around 70 calls per day, with callers staying on for 10 to 20 minutes.

Though the personality of his BBS hasn't changed, the age of the callers has. "The old PET/CBM people—the ones that bought the old 8K PETs—still call, but they're in the minority today," he says. "Most of the activity is with youngsters."

Nor has Ott's role as sysop changed. "I'm still doing the same thing now as I was two years ago, providing a lot of information and answering a lot of questions.

"There's something mystical about this, and I don't know why. I think it's sort of a security blanket to a lot of people in small towns that call because they don't have a dealer in their town and there isn't even a K mart for a hundred miles. They know that if I don't know the answer, that someone I come into contact with over a week's period of time will know it."

For the present, Ott considers his work with bulletin boards and software a hobby, though it certainly could be a full-time job. "It's really a release from my high-pressure job," he says.

"Beyond that, the consistency of staying online and growing is a big thing. So many boards come and go. I'm just enthralled and fascinated by it now."

Electric Magazine

Halfway across the country from Tony Ott, Bob Shannon lives and works in a house on the beach near Fort Bragg, California, about 150 miles north of San Francisco. He's the sysop of Electric Magazine, a BBS designed in a magazine format. Callers can get updates on local news, read and leave messages, and read columns on a number of topics.

Shannon has sold his BBS software to almost 400 people, and keeps in close contact with his sysops through phone calls and a monthly newsletter. He charges $39.95 for the software, unless it's requested by someone who plans to use it for communications with the handicapped. His most recent donation went to a group in Israel, who plan to translate it into Hebrew and set up a BBS for the deaf.

"Because it's so much fun, I probably spend more time on upkeep of the board than most sysops do," says Shannon. "It's fun because of the contact with people, and because I'm making enough money to start my own little business."

Five years ago, Shannon wasn't even able to consider such things. Severely brain-damaged from an industrial accident in the late sixties, he was confined to his home for ten years.

Thanks to advances in psychiatric medication, Shannon started to recover a few years ago. He bought a Commodore 64 and began teaching himself to program. "I had read Toffler's *The Third Wave* about three years ago and remembered how he talked about new entrepreneurships with home computers," he says. Shannon began to wonder if he could do something with computers that was fulfilling and profitable.

He contacted the State Department of Rehabilitation, which told him about a program called PASS (Plan to Achieve Self-Support). By enrolling in it, he could still receive his Social Security disability pay for three years while trying to start a business.

Shannon had logged onto a number of bulletin board systems and was intrigued by the idea of writing his own. He wrote his own program in about two weeks and went online

using a Commodore 64, a 1541 disk drive (which has run perfectly ever since), and an autoanswer modem.

His BBS software has sold so well, he thinks, "because it's a 14K BASIC program, very easy to tailor. I think its simplicity is kind of a selling point. The board can develop the personality of the sysop. You could look at my boards running all over the country and they don't look at all like mine."

With the money he's made from the sale of his program, Shannon is in the process of setting up his own software store in Fort Bragg. But he has no plans to abandon the Electric Magazine or the daily contact he has with his sysops. "After so many years of disability, it's terribly enjoyable."

Telegaming

Kathy Yakal

Can't find a challenging chess partner? Looking for a better way to meet people than by leaving messages on electronic bulletin board systems? Telegaming is one of the fastest-growing applications of telecommunications. Here's how you can get involved.

It isn't a terrific party, but it's too early to go home. *Let's play a game,* someone suggests. But nobody can remember all the rules of contract bridge. The Monopoly set is missing too many pieces. Everyone has memorized most of the answers in the first edition of Trivial Pursuit. And some people are starting to yawn. *Well, maybe there's something on television.*

It's not easy to get a group of people to agree on which game to play, what the rules are, and how long to play. Telegaming—playing games over the phone lines via a personal computer and modem—doesn't solve the problems of indecision or tired players. But it offers new ways to play old games, thousands of potential challengers across the country, and computer games designed specifically for use on telecommunications networks.

Finding a Game

CompuServe and The Source are probably the two best-known networks that offer telegames. Recently, several new networks have gone online for the sole purpose of providing communication and recreation.

Long-distance gaming is not a new concept. People have been playing games by mail for years. One person takes a turn, records it, and sends it to his opponent, who does the same. A round of chess could take months.

Software developers are looking for ways to speed up that process, whereby you can link two personal computers via modem and play directly between them. No third party (like a telecommunications network) would be necessary. While this would allow you to play a game with your cousin in Cleveland in realtime, the long-distance charges could become rather costly if you happened to live in Nova Scotia.

Telecommunications networks allow you to find compatible game partners (through electronic mail, game forums, and

online conversations) and play a wide variety of games, ranging from simple board games like checkers to CompuServe's highly interactive, fast-paced MegaWars.

You must subscribe to the service to gain access to any of its features. Most charge a one-time new subscriber fee, hourly online charges, and, sometimes, additional charges for games. Once you've signed up and received a password, using the system is generally no more difficult than calling an electronic BBS.

A word of warning here: Be sure to read the documentation that comes with your membership packet. Menus and help commands within the system itself will guide you to and through the game functions, but being prepared will save you online charges.

The creators of these networks report something interesting: Consumers don't necessarily demand the same richness and depth of play they would normally expect of a videogame. The old favorites, when played with someone a thousand miles away, are just fine for now.

Further, telegaming seems to be reviving interest in games where popularity has waned. "Bridge players and coffee drinkers are about the same. All of us are dying off at the top end," says Terry Beam, director of marketing for PlayNET, a telecommunications network based in Troy, New York. "Both of those activities are associated with older people. It's a dying thing.

"But now there are a lot of people playing games they haven't for years because there is a new way to play it. They're finding a new excitement that wasn't there before. You can play a hand of bridge with someone in Sacramento, someone in Minneapolis, and someone in New York at the same time."

PlayNET

PlayNET began full operation in October 1984, after several months of market research. Unlike other major networks, PlayNET chose to make the software compatible only with the Commodore 64 because of its high household penetration.

Finding game partners once you've logged onto the system is accomplished through PlayNET's online conversation feature, similar to the CB simulator on CompuServe. Instead of switching channels, you move into different "rooms," trying to find someone who will set up a game with you. (Or, if

you like, you can just chat with people.) PlayNET's monthly calendar lists scheduled tournaments for interested competitors.

PlayNET asks a one-time registration fee of $39.95, $6.00 per month maintenance charge, and $2.00 per hour online billing. The system can be accessed either through a local Telenet number or direct dial to their New York number. Hours are 6:00 p.m. to 7:00 a.m. (eastern standard time), and 24 hours on weekends and holidays.

Games currently on PlayNET include traditional favorites like backgammon, chess, checkers, and hangman; games written especially for the Commodore 64 like Quad 64 and Sea Strike; and some not-so-familiar games like the ancient Oriental game, Go. PlayNET has been working with the American Go Association, which is pleased to be able to introduce this strategy game to a whole new audience.

"We created PlayNET to be fun and affordable telecommunications for everybody. That's what it's all about. People are looking for ways to communicate with each other long distance at a reasonable price, to entertain themselves, to utilize their personal computers."

If you're playing Monopoly and someone quits, the game is over, unless you want to divvy up that player's property and money among the other contestants. That's the way it is with most games.

PlayNET was designed to simulate real-life gaming situations as closely as possible. So if a player drops out, the mainframe computer that runs the system does not come in to finish the game. Nor is it available as an opponent at the start of a game. It's there to maintain the system. "We wanted PlayNET to be a system that the subscribers control," says Beam.

MegaWars

CompuServe, on the other hand, has allowed the option of playing against the computer since games were first offered on the system in August 1979. Variations of board, card, and sports games can be played against another person or the computer.

MegaWars was added to CompuServe's list of telegames in early 1982. Designed by the Kesmai Corporation, it's an

interactive fantasy game in which players create their own characters and battle to dictate the direction of the universe.

Rich Baker, director of corporate communications at CompuServe, warns that MegaWars is not for the casual game player. "The people that play MegaWars are extremely serious," he says. "The expertise level is very high."

Baker advises potential players to study the manual, ask questions of other players in CompuServe's games forum, and take it slowly by starting at the first of MegaWars' three levels.

"MegaWars gives people the chance to be someone else, like the commander of a star ship. It's different from the challenges you face going to work," says Baker. "And a lot of the fun is not so much the game, but the interaction."

Though MegaWars may be the most sophisticated telegame available up to now, interactive gaming has a long way to go, according to Baker. As modems support faster baud rates (300 baud is too slow to support sophisticated graphics) and the graphics capabilities of the machines themselves improve, the interactive nature of telegames will expand.

American People Link

American Home Network rang in 1985 by going online with its new telecommunications service, American People Link. Though it's billed primarily as a service for home computer owners to meet electronically, games should be available by the time you read this.

The Source and Delphi, two major telecommunications networks providing a variety of information and services, have also added games to their offerings. Besides traditional board games and card games, adventure and fantasy games are available.

Suffering from lack of funding, The Games Network did not make its planned 1984 debut. Its founders have not abandoned the project, though, and still hope to find financial backing.

If successful, The Games Network will offer a television-based games service. Subscribers would rent a special 64K microcomputer and download a variety of educational, arcade, and adventure games provided by commercial software companies.

Any game, whether played electronically or at the kitchen table, requires a lot of thought and strategy, and, sometimes, quick reflexes. And in either kind of gaming, the interaction

between players is often more important than the outcome of the game itself, says CompuServe's Baker.

Larry Dunlap, president of The Games Network, agrees. "The greatest game of all is some of the other aspects of telecommunications, ways for people to be in touch with each other through electronic mail and online conversations."

For further information, contact:

American People Link
American Home Network, Inc.
Arlington Ridge Office Center
3215 N. Frontage Road
Suite 1505
Arlington Heights, IL 60004
(800) 524-0100
Illinois residents call (312) 870-5200
Prime-time access: $9.95/hour (300 and 1200 baud)
Nonprime-time–300 baud: $4.78/hour (first three hours per month); $2.95/hour (fourth hour on)
Nonprime-time–1200 baud: $7.78/hour (first three hours per month); $5.95/hour (fourth hour on)

CompuServe
P. O. Box 20212
Columbus, OH 43220
(800) 848-8199
Registration fee: $39.95
Prime-time access: $12.50/hour (300 baud)
$15.00/hour (1200 baud)
Nonprime-time: $6.00/hour (300 baud)
$12.50/hour (1200 baud)
(6:00 p.m. to 5:00 a.m.)

Delphi
3 Blackstone Street
Cambridge, MA 02139
(800) 544-4005
Registration fee: $49.95
Prime-time access: $16.00/hour
Nonprime-time: $6.00/hour

PlayNET
200 Jordan Road
Suite 180
Troy, NY 12180
(800) PLAYNET
Registration fee: $39.95
Monthly maintenance: $8.00
Online charge: $2.75/hour

The Source
1616 Anderson Road
Mclean, VA 22102
(800) 336-3366
Virginia residents call (703) 821-6666
Registration fee: $49.95
Prime-time access: $20.75/hour ($5.00 hourly surcharge for 1200 baud)
Nonprime-time: $7.75/hour ($3.00 hourly surcharge for 1200 baud)

(Unless otherwise noted, prime-time access is 7:00 a.m. to 6:00 p.m. EST; nonprime-time is 6:00 p.m. to 7:00 a.m., 24 hours on weekends and holidays.)

Online Research Services

Sheldon Leemon and Arlan R. Levitan

Computers are the perfect tool for researchers. Storing and retrieving information are two of the things computers do best. It should come as no surprise, then, that giant online research databases have appeared. These databases catalog and index every type of written information imaginable—books, magazine articles, newspaper items, even papers presented in journals. There are databases devoted to every subject from astronomy to zoology, and everything in between.

Until lately, online research services have been expensive and difficult to access. For the most part, they've been used only by libraries, large corporations, and professional researchers. But the growing number of personal computers and telecommunications systems has pushed these databases to develop more consumer-oriented services.

Research databases help you find information. It's as simple as that. Let's say you're redecorating your computer room and want to find out what poster art is available from the U.S. Government Printing Office. Your session on a research database might go something like what follows. (The notes in boldface are only for explanatory purposes and did not actually appear on the screen during the session.)

In this sample session, the researcher entered the Government Publications database and asked to see how many entries had both the word *poster* and a status code of 04, meaning that the publication was currently available. The database responded that of the 13,277 entries for government publications currently available, 66 contained the word *poster*, 49 of which were also available. The researcher then asked the system to list all 49 poster descriptions (though only the first was reproduced here). The first entry turns out to be a set of three 8 × 11 inch posters of the space shuttle and crew, available for $1.25. The description also gives ordering information. The whole process (including listing all 49 posters to a disk

?b gove1 **Enter the government publications database.**
8/5/84 22:25:53 EST
Now in GOVERNMENT PUBLICATIONS (GOVE) Section
GPO Publications (GOVE1) database

?find av=04 and poster **Find all the entries containing the word *poster* and the status code *04* indicating current availability.**

	13277	AV=04
	66	POSTER
S2	49	AV=04 AND POSTER

?display s2/l/1-49 **Display the full text of all 49 entries.**

2/L/1 First entry8304202 NAS 1.43:P 29
Space Transportation System STS 8 (Poster Set)
National Aeronautics and Space Administration
1984: 3 posters, 8x11 in.
033-000-00908-9 UNIT: 4 DOLC: 06-28-84
Set $1.25 DOMESTIC $1.60 FOREIGN Discount PRICE-ESTABLISHED: 12-30-83 RELATED-DATA: Specialty Item;
Poster, Flat; Envelope. Weight: 2 oz.
IN STOCK—WAREHOUSE & RETAIL (PRICED) STATUS CODE: 04 STATUS
DATE: 06-28-84, NB025U4
Includes the following color photographs: Space Shuttle orbiter OV-102 (Challenger) Crew Members, HqL-137; STS-8 Night
Launch, HqL-138; and STS-8 Payload Flight Test Article and STS-8
INSAT Launch, HqL-139. Each of the posters has a brief description on the back. Item 830-H-06.
SERIES: 057NA 297ZA
Posters
Space Transportation System
Challenger Spacecraft
Space Shuttles
Orbital Flight

file) took about three minutes and cost about a dollar of connect time.

Even if your taste in art doesn't coincide with that of the federal government, the example illustrates how a research database lets you quickly locate a piece of information that otherwise might be buried among thousands of other pieces. And the example is a fairly simple one. These databases allow you to search for items by magazine, author, or even by date. Most allow wild-card options, which let you search for parts of words so that, for instance, one search turns up items including either the word *communications* or *communicating*. Such options allow you to pinpoint the most useful sources of information.

Granted, research-type databases are of greatest interest to students or to professionals like doctors, lawyers, psychologists, and educators. But they can also be useful to anyone who wants to find a certain government publication, magazine article, product review of electronic equipment or home appliance, a recipe which appeared months ago, or a reference from an online encyclopedia. Moreover, because they're constantly expanding their services (and even including some consumer services such as electronic mail and shopping), these research databases will become increasingly useful to all telecommunicators. This article reviews two of the consumer-research databases currently available, Dialog's Knowledge Index and BRS/After Dark.

Information Providers

It's important to remember just what service Knowledge Index and BRS/After Dark provide. Each contains a gigantic electronic index of citations to written information on a wide variety of topics. Materials covered include books, magazines, journals, newsletters, tabloids, conference proceedings, and technical and financial reports. Citations typically give the title of the book or article, journal or source of publication, page number, author, publication date, a brief summary, and a list of terms added by the indexer to describe the subject matter.

These databases offer a quick and easy way to locate published material. But they usually don't include the full text of these books and articles. You have to find that yourself. In many cases, a trip to the public library will be enough. Where this isn't possible, Knowledge Index allows copies to be or-

dered online for a $6.50 service fee, plus a copying fee of 20 cents per page. And there are already some databases which contain the full text of the indexed articles. More of these can be expected to appear in the future.

Most of the databases available from BRS/After Dark or Knowledge Index are generated by independent information providers. Many of these producers offer their own guides to using the database, as well as other information, free for the asking. Since this material is often more detailed and helpful than the documentation provided by the research services, it's worth taking the time to ask for it.

One final point about research databases. To use them effectively, you have to ask for information in very specific terms. Searching too broad a subject will simply turn up a mass of citations, perhaps only a handful of which are what you're looking for. It's important to do your thinking offline. Formulate your search strategy before you log on. Think of as many search questions as possible and try to anticipate unfavorable results. If your terminal program has a keyboard buffer for storing small text files or lets you transmit disk files, type out your questions ahead of time. If you get stumped, log off and regroup on your own time. Using these services requires some thought, and you'll be much better off if you aren't paying the system to wait while you think of what to do next.

Dialog's Knowledge Index

Dialog's Knowledge Index
Dialog Information Services, Inc.
3460 Hillview Avenue
Palo Alto, California 94304

Telephone Numbers
(800) 528-6050, ext. 415

Customer support available from 7:00 p.m. to 11:00 p.m. daily.

Dialog Information Services, Inc., began in 1969 as a system developed by the Lockheed Corporation to supply NASA with the means to store and retrieve technical documents dealing

with the space program. As the system expanded, it was offered commercially to the general public and has grown into the largest collection of online databases in the world. Its nearly 200 databases hold over 140 *billion* characters of information. These databases catalog almost every conceivable source of information on any given topic.

Though it has become more accessible recently, Dialog still cannot be considered a consumer service. It's expensive to use; access charges average $60–$75 an hour and can run as high as $5 a minute, depending on the database being searched. And the system is difficult enough to learn that the company offers two-day seminars to instruct new users in online search techniques.

In late 1982, however, Dialog decided to offer its services to consumers during nonbusiness hours at reduced rates. Knowledge Index, as this service is called, affords access to a selected group of 27 databases during evening hours and on weekends at a competitive price.

Subscription Charges, Rates, and Hours of Operation

Subscription charges. To sign up for Knowledge Index, you must contact Dialog directly. For a one-time charge of $35, Knowlege Index supplies you with an account number and password, a manual (and periodic updates), a quarterly newsletter, and two free hours of connect time (which must be used within a month of your first log-on).

Rates. With Knowledge Index, you pay online charges only for time actually used. There is no minimum monthly charge and no minimum connect time per session. Connect time for all databases is billed at the relatively low rate of $24 per hour (one-third to one-fourth the cost of Dialog's prime-time rates), and there's no surcharge for connection at 1200 bps. Telephone connection through the commercial telecommunications networks (Telenet, Tymnet, UNINET) is included in the hourly rate. Dialog is also starting its own data network, Dialnet, which will ultimately service 55 major U.S. cities and Great Britain. Current rates and a summary of your current billing information are available online.

Hours of operation. The service is available from 6:00 p.m. to 5:00 a.m. local time, Monday through Thursday; Friday from 6:00 p.m. to midnight; Saturday from 8:00 a.m. to midnight; and Sunday from 3:00 p.m. to 5:00 a.m.

Manuals and Documentation

The Knowledge Index *User's Workbook* gives a detailed explanation of how to use the system. It leads you through an explanation of the types of information found on the system, with examples, and takes you through several sample sessions, each showing the commands and the system's response. Three chapters, each containing a number of worksheet exercises, cover increasingly sophisticated search techniques.

Knowledge Index periodically sends manual updates as well as publishes the *Knowledge Index News*, a quarterly newsletter featuring announcements and tips about searching through the various databases. In addition, information about system changes is available online by typing BULLETIN after logging on.

Navigating Within the System

Knowledge Index has no menu structure. Once you log onto the system, you must type the command B (Begin), followed by the code name of the database you wish to access. Once within a database, you must use one of a few simple English-like system commands to FIND entries and DISPLAY results. Although the manual covers these commands in great detail, there are also online help files available which explain the system commands.

What's on the System

Knowledge Index contains an interesting collection of databases. It features several that cover medicine and drugs, microcomputers, and one or two in each of the areas of agriculture, business, education, engineering, mathematics, and psychology. It also includes several databases of general interest, such as Books in Print, major newspapers, popular magazines, and government publications. Though most of the databases contain only descriptions and abstracts, a recent addition, the Drug Information database, holds the full text of its articles. More full-text databases can probably be expected in the future. Also, Knowledge Index announced its intent to establish an electronic mail service in late 1984 that would tie in with other such services.

The following is a brief summary of the 25 databases currently available from Knowledge Index, grouped by subject.

The code name which must be entered with the B command appears in parentheses.

Agriculture

Agricola (AGRI1)

This database provides comprehensive information on all phases of agriculture as well as related fields. It includes material from U.S. and international magazines, government documents and publications, books, and pamphlets. Dating back to 1979, the index is updated monthly by the producer, the U.S. National Agricultural Library.

Books

Books in Print (BOOK1)

Books in Print is the online version of the reference guide published and updated monthly by the R. R. Bowker Company. It contains ordering information and subject matter descriptions for virtually every book currently in print in the United States as well as for books that will be available in the next six months. It also has information on out-of-print and out-of-stock titles as far back as 1979.

Business Information

ABI/INFORM (BUSI1)

Contains information on all aspects of business with an emphasis on general materials. ABI/INFORM includes material from over 500 U.S. and international business and management publications from 1971 to the present. It is produced and updated monthly by Data Courier, Inc.

Trade and Industry Index (BUSI2)

Covers business information relating to all major industries and trades. It indexes over 300 trade and industry publications, and selectively covers an additional 1200 publications from 1981 to the present.

Computers and Electronics

Computer Database (COMP4)

This database was designed to provide information to business and computer professionals with a wide range of hardware and software topics, including consumer product evaluations, technical data, and financial information about high-tech firms. It includes citations from over 500 journals

and books, covering almost every aspect of computer electronics from January 1983 to the present.

INSPEC (COMP1)

INSPEC, based on the printed reference works *Physics Abstracts, Computer and Control Abstracts,* and *Electrical and Electronic Abstracts,* covers the fields of computers, electronics, and physics. It includes materials from over 2300 journals as well as conference papers and dissertations from 1977 to the present.

.MENU—International Software Database (COMP2)

Indexes and describes commercially available micro- and minicomputer software. It provides information about system requirements, subject matter, and pricing for over 12,000 programs.

Microcomputer Index (COMP3)

A complete index, from 1981 to the present, for the more than 50 publications dedicated to microcomputers.

Corporate News

ICC British Company Directory (CORP2)

This directory provides listings for every limited-liability company in the United Kingdom.

Standard & Poor's News (CORP1)

Provides full-text coverage of corporate news about more than 10,000 U.S. corporations, gathered from such sources as reports to stockholders and regulatory agencies, press releases, and newpapers. Coverage goes back to 1979 and is updated weekly.

Education

ERIC (EDUC1)

ERIC provides a complete index and abstracts of the more than half a million educational materials collected by the Education Resources Information Center of the National Institute of Education. Complete from 1966 to the present.

Engineering

Engineering Literature Index (ENGI1)

This database is the online version of the *Engineering Index,* a comprehensive reference to the world's engineering and technological literature. It includes materials published from 1975 to the present.

Government Publications

GPO Publications Reference File (GOVE1)

Indexes the documents currently offered for sale by the U.S. Government Printing Office. It includes publications from all cabinet-level departments and other government agencies (over 29,000 items in all).

NTIS (GOVE2)

This database, produced by the National Technical Information Service of the U.S. Department of Commerce, indexes and summarizes over a million research and technical reports prepared or gathered by government agencies and their contractors.

Legal Information

Legal Resource Index (LEGA1)

Indexes articles, commentaries, reviews, and other materials on all law and law-related topics. Coverage includes more than 720 law journals and six legal newspapers from 1980 to the present. Provision is made for searching by case or statute name as well as by subject.

Magazines

Magazine Index (MAGA1)

Completely indexes over 400 popular American magazines from 1976 to the present.

Mathematics

Mathfile (MATH1)

Provides complete coverage of pure and applied mathematics, and selective coverage of publications on related fields such as computer science, econometrics, and statistics. Citations are included from approximately 1600 journals dating back to 1973.

Medicine

Biosis Previews (MEDI5, MEDI6, MEDI7)

The fields of biological and biomedical research are covered in three databases divided chronologically into the periods 1969–1976 (MEDI7), 1977–1980 (MEDI6), and 1980 to the present (MEDI5).

Drug Information Fulltext (MEDI8)

The Drug Information database contains the complete text of drug evaluations from the *American Hospital Formulary Service* and the *Handbook on Injectable Drugs,* both published by the American Society of Hospital Pharmacists.

International Pharmaceutical Abstracts (MEDI4)

References a wide range of pharmaceutical and related material, drawn from over 700 U.S. and international journals published from 1970 on.

Medline (MEDI1, MEDI1, MEDI3)

The Medline database offers extensive coverage of journal articles in the fields of medicine, dentistry, nursing, and health care. Its content corresponds to that of the print references *Index Medicus, Index to Dental Literature,* and *International Nursing Index.* The information is divided into three separate databases: MEDI1 (which covers the years 1966–1972), MEDI2 (1973–1979), and MEDI3 (1980 to the present).

News

National Newspaper Index (NEWS2)

Contains front-to-back-page indexing of the *Christian Science Monitor, Los Angeles Times, New York Times, Wall Street Journal,* and *Washington Post.* Information from these publications is available for the period 1979 to the present.

Newsearch (NEWS1)

Provides complete daily indexing of the current month's issues of the *Christian Science Monitor, Los Angeles Times, New York Times, Wall Street Journal,* and *Washington Post,* as well as the latest issues of over 1100 popular American magazines and journals. At the beginning of each month, the previous month's citations are transferred to Magazine Index and the National Newspaper Index.

Psychology

Mental Health Abstracts (PSYC2)

These abstracts cover journal articles on all aspects of mental health and mental illness from over 1500 journals published from 1969 to the present.

PsycINFO (PSYC1)

Corresponding to the printed *Psychological Abstracts,* this database covers the entire field of psychology and its related literature. It indexes and abstracts articles from over 1000 journals published from 1967 to the present.

BRS/After Dark

BRS/After Dark
Bibliographic Retrieval Service
1200 Route 7
Latham, New York 12110

Telephone Numbers
(800) 345-4277 in New York State, Canada, and Hawaii
(800) 833-4707 in the rest of continental United States
(518) 783-7251 in Alaska (call collect)

Customer support available Monday through Friday from 8:00 a.m. to 1:00 a.m., Saturdays from 8:00 a.m. to 5:00 p.m., and Sundays from 8:00 a.m. to 2:00 p.m.

Bibliographic Retrieval Service, one of Dialog's major competitors, also provides a consumer-oriented version of its research service. BRS contains fewer databases than Dialog, but its not-ready-for-prime-time counterpart, BRS/After Dark, gives consumers off-hours access to a high percentage of the regular databases. In fact, it actually offers almost twice as many databases as Knowledge Index.

Subscription Charges, Rates, and Hours of Operation

Subscription charges. Currently the only way to subscribe to After Dark is to contact BRS. For the fee of $35, you receive a user ID number and password, and the *User's Manual.*

Rates. There's a monthly minimum charge of $12 based on two hours of connect time. Even when you use a higher priced database, only $6 of each hour's fee goes toward the minimum. Therefore, you could run up a bill of $20 for an hour of service on one of the more expensive databases and still have to pay an additional $6 minimum charge if you didn't use any more time that month. The basic rate for con-

nect time is $6 an hour, which includes access through one of the communications networks (Telenet, UNINET, or Datapac). There is no surcharge for operation at 1200 bps. Most of the research databases also charge royalty fees, which can bring the cost of connect time to as high as $20 an hour.

Hours of operation. BRS/After Dark is available from 6:00 p.m. local time to 4:00 a.m. EST, Monday through Friday; on Saturday from 6:00 a.m. until 4:00 a.m. EST; and on Sunday from 6:00 a.m. to 2:00 p.m. and from 7:00 p.m. to 4:00 a.m. EST. (Note that the starting time for After Dark is based on your local time, but the closing time is based on eastern time.)

Although the monthly minimum is high enough to discourage the casual user, the hourly rates are low when compared with similar services. If you're a regular user of any of the databases contained on BRS/After Dark, you'll probably save money by signing up, particularly if your modem can operate at 1200 bps.

Manuals and Documentation

The *User's Manual* that comes with your BRS subscription is short and to the point. It contains a tutorial that takes you step by step from logging on to researching a topic to logging off. Each step is illustrated with sample display screens. Advice on how to structure a search and some advanced tips are also included. An appendix gives a brief description of each database and establishes the various search fields (such as article title, author's name, and subject) that can be used to locate an entry.

For up-to-date information on system changes, BRS provides an online newsletter. There's no provision for online help, but because of the size and simplicity of the system and the clarity of its prompts, none is really needed.

Navigating Within the System

After Dark is easy to move through, since it has only a main menu and a menu of database categories. These menus are really helpful only for new users. Fortunately, After Dark lets you answer several levels of menu prompts without waiting for the menus themselves to appear. It calls this feature *command stacking*, and it should be used whenever possible. For

example, to get directly to the database menu upon log-on, you would type 80;24;1, which answers the questions about screen width and length, and selects menu item number 1 on the main menu.

Once within a database, the only navigational commands you need to know are M to get back to the main menu, D to get back to the database menu, and O to log off.

What's on the System

BRS/After Dark offers quite a number of databases. Most of them concentrate on the fields of education, medicine, science, social sciences, and technology. Doctors, chemists, teachers, and psychologists can have a field day here. Some materials, however, are of more general interest, such as Abstrax 400, which catalogs 400 popular periodicals; Peterson's National College Databank, which gives easy access to information for choosing a college; Books in Print; and the Internal Revenue Service Publications databases, useful for anyone who pays taxes. Of special interest is the online version of the *Academic American Encyclopedia.* Though there are other versions of this reference work available on other systems, this one is outstanding in its ease of use, completeness, and responsiveness.

In addition to research databases, BRS is planning to add services to match the more consumer-oriented information services. It publishes an online user newsletter and presently offers access to MCI Mail. Online shopping services are planned for the near future.

The following is a brief summary of the 42 databases currently available from After Dark, grouped by subject. The label needed to access the database is shown in parentheses, and the connect fee charged appears after its name.

Sciences/Medicine

Agricola (CAIN)

$8.00/hour

This database provides comprehensive information on all phases of agriculture and related fields. Gathered by the National Agricultural Library, this information includes citations to material from U.S. and international magazines, government documents and publications, and books and pamphlets dating back to 1979.

American Chemical Society Journals Online (CFTX)
$20.00/hour

Offers the full text of over 30,000 articles appearing in 18 primary chemistry journals from 1980 to the present. Each entry contains abstracts as well as complete reference and footnote listings.

Biosis (BIOL and BIOB)
$13.00/hour

The fields of biological and biomedical research are covered in two databases which are divided into the periods 1970–1977 (BIOB) and 1978 to the present (BIOL).

Chemical Abstracts (CHEM and CHEB)
$15.00/hour

These two databases are the online version of the print reference *Chemical Abstracts,* and cover the literature published in all fields of chemistry. They may be searched by CAS registry number, patent number, and patent assignee as well as subject matter, author, and so on. The CHEB database includes the period 1970–1979, while CHEM covers 1980 to the present.

Data Processing and Information Science Contents (DISC)
$15.00/hour

DISC provides subject access to leading microcomputer journals from 1982 on, and offers a table-of-contents format that helps the user locate articles, features, reviews, and regular columns.

Health Planning and Administration (HLTH)
$10.00/hour

The HLTH database covers literature in the fields of health care planning, organization, and management.

INSPEC (INSP and INSB)
$12.00/hour

INSPEC, based on the printed reference works *Physics Abstracts, Computer and Control Abstracts,* and *Electrical and Electronic Abstracts,* covers the fields of physics, computers, and electronics. It includes materials from over 2300 journals as well as conference papers and dissertations from 1977 to the present (INSP). The back-file database, INSB, covers the period 1970–1977.

International Pharmaceutical Abstracts (IPAB)
$16.50/hour

References a wide range of pharmaceutical and related material, drawn from over 700 U.S. and international journals published from 1970 on.

IRCS Medical Science (IRCS)
$11.00/hour

Containing the full text of all articles published in the IRCS series on current medical and biomedical research experiments, methodologies, and findings, this database includes articles published from 1982 to the present.

Kirk-Othmer Encyclopedia of Chemical Technology (KIRK)
$20.00/hour

KIRK is the full-text online version of the third edition of the 25-volume *Kirk-Othmer Encyclopedia of Chemical Technology.* Lengthy abstracts are unique to the online version.

Mathematical Reviews Online (MATH)
$13.00/hour

Provides complete coverage of pure and applied mathematics, and selective coverage of publications on related fields such as computer science, econometrics, and statistics. It includes citations from approximately 1600 journals dating back to 1973.

Medline—Medlars Online (MESH, MS78,MS74,MS70)
$14.00/hour

The Medline database offers the most comprehensive coverage of journal articles in the fields of medicine, dentistry, nursing, and health care. Its content corresponds to the references *Index Medicus, Index to Dental Literature,* and *International Nursing Index.* It currently contains over 3,500,000 records. Actually four databases: MS70 (1966–1970), MS74 (1971–1974), MS78 (1975–1978), and MESH (1979 to the present).

National Technical Information Service (NTIS)
$8.00/hour

This database, produced by the National Technical Information Service of the U.S. Department of Commerce, indexes and summarizes over a million research and technical reports prepared or gathered by government agencies and their contractors.

Pre-Med (PREM)
$10.00/hour

This database, updated weekly, makes available the latest citations to literature from over 100 core medical journals within ten days of their receipt by major medical libraries. After three months, these citations are moved to the MESH file.

Robotics Information (RBOT)
$12.00/hour

Provides access to current literature covering all aspects of robotics from 1980 to the present.

Business/Financial

ABI/INFORM (INFO)
$15.00/hour

Contains information on all aspects of business, with an emphasis on general materials. ABI/INFORM includes material from over 500 U.S. and international business and management publications. Coverage from 1971 to the present.

Harvard Business Review/Online (HRBO)
$15.00/hour

HRBO provides the complete text of the *Harvard Business Review* from 1976 to the present, and abstracts of articles dating from 1971 to 1975. The latter will be retroactively converted to full text. The *Review* covers all phases of strategic business management.

Internal Revenue Service Publications (IRSP)
$10.00/hour

IRSP contains the full text of over 70 IRS publications, designed to help in preparation of tax returns.

Management Contents (MGMT)
$14.00/hour

Covers business topics related to management and the decision-making process. Coverage includes over 500 journals published since 1974 which address questions of administration, marketing, and personnel relations.

Patdata (PATS)
$6.00/hour

PATS includes abstracts and other detailed information for all utility patents issued by the U.S. Patents and Trademarks Office since 1971, and reissue patents issued since 1975.

Reference

ABSTRAX 400 (A400)
$14.00/hour

Provides online summaries of 400 popular periodicals in a variety of subject areas.

Academic American Encyclopedia (AAED)
$12.00/hour

This online edition contains the full text of the 30,000 articles, including tables, bibliographies, fact boxes, and cross-reference listings.

Books in Print (BBIP)
$14.00/hour

The online version of the authoritative reference guide published and updated monthly by the R. R. Bowker Company, it contains ordering information and subject descriptions for virtually every book in print in the United States as well as for books to be published in the next six months. It also offers information on out-of-print and out-of-stock titles published since 1979.

Online Microcomputer Software Guide and Directory (SOFT)
$20.00/hour

Indexes and describes commercially available micro- and minicomputer software. It provides information about system requirements, subject matter, and pricing for over 3000 programs.

Peterson's National College Databank (PETE)
$16.00/hour

This online college selection service offers full-text profiles of undergraduate colleges and universities in the U.S. and Canada, including information on size, location, enrollment patterns, financial aid, housing, and more.

Education

Bilingual Education Bibliographic Abstracts (BEBA)
$6.00/hour

Covers the field of bilingual/bicultural education and related topics, including second-language instruction and ethnic minority groups.

Education Resource Information Center (ERIC)
$6.00/hour

ERIC offers a complete index and abstract of the more than half a million educational materials collected by the Education Resources Information Center of the National Institute of Education from 1966 to the present.

Exceptional Child Education Resources (ECER)
$11.00/hour

This database covers materials dealing with the education of gifted, talented, and handicapped children.

Ontario Education Resources Information (ONED)
$11.00/hour

The ONED database includes research reports, curriculum guidelines, and other materials produced or sponsored by Ontario school boards and other agencies.

Resources in Computer Education (RICE)
$11.00/hour

Designed to provide educators with information on the state-of-the-art in educational computer applications. It evaluates commercial and noncommercial software.

School Practices Information File (SPIF)
$6.00/hour

SPIF describes educational practices, programs, tests, and materials currently in use. Gives grade level, target audience, evaluative and availability information.

Texas Education Computer Cooperative Database (TECC)
$12.00/hour

TECC contains teacher and student evaluations of educational software.

Social Sciences/Humanities

ABLEDATA (ABLE)
$12.00/hour

ABLEDATA contains detailed and current product information on rehabilitation and technical aids for the disabled, including educational, therapeutic, transportation, and vocational aids.

Family Resources (NFCR)
$12.00/hour

This database covers literature representing all aspects of family life.

Mental Measurements Yearbook (MMYD)
$20.00
Includes information and critical reviews as well as the full text of 1184 standardized tests.

National Rehabilitation Information Center (NRIC)
$6.00/hour
Covers the rehabilitation of the mentally and physically disabled.

Pre-Psych (PREP)
$6.00/hour
Contains only the most current materials on clinical psychology, of the same type as included in the PSYC database (see below).

PsycINFO (PSYC)
$14.30/hour
PSYC corresponds to the published *Psychological Abstracts,* and covers the entire field of psychology and its related literature. It indexes and abstracts articles from over 1000 journals published from 1967 to the present.

Public Affairs Information Service (PAIS)
$13.00/hour
PAIS provides broad coverage of the social sciences which affect public policy and the administration of government.

Religion Index (RELI)
$13.50/hour
Covers scholarly material on Bible studies, religion, and theology, and also includes related material on art, literature, and the social sciences.

Social SciSearch (SSCI and SSCB)
$20.00/hour
SSCI covers research in the social and behavioral sciences, and allows the user to trace a chain of citations forward or backward through time. The back-file database, SSCB, covers the period 1972–1976, while SSCI covers 1977 to the present.

Sociological Abstracts (SOCA)
$20.00/hour
This database provides abstracts not only in the field of sociology, but also in related disciplines such as family studies, feminist studies, and political science.

System Critiques and Comparisons

There is considerable overlap between the services provided by Knowledge Index and those available from BRS/After Dark. You should do some careful comparison before deciding whether either service suits your needs.

The first area to compare is the subject coverage. While there's significant overlap of databases, there are also differences. BRS/After Dark databases cover education and the social sciences in depth, and also contain chemistry abstracts, IRS publications, and a fine version of the *Academic American Encyclopedia.* Knowledge Index, however, has better coverage of computers and electronics, engineering, and legal research. While it does not have an encyclopedia, Knowledge Index does feature strong coverage of major daily newspapers and magazines. Both include comprehensive resources in medicine.

Although the search services of Knowledge Index and After Dark are generally similar, After Dark allows for greater specificity. For example, both systems offer the Books in Print database. Each entry in this database lists the title of the book, the author, the publisher, the date of publication, the type of binding, the price, some identifying publication numbers, the publication status, and the subject. While Knowledge Index allows you to narrow your search to works by a particular author, After Dark lets you use any of the categories as a search qualifier. Searching a particular field is a powerful tool that can save you time and money. The more specific you make your search, the more likely you are to find exactly what you're looking for. Using BRS/After Dark's capabilities, you can look for a book called *Computer Technology* by title without having to wade through a list of books that have the words *computer technology* in their subject heading.

BRS/After Dark may also be a little easier to use since it has a full set of prompts. It also lets you change your password online, a definite plus.

Another difference between the two is that (at least at the moment) Knowledge Index features only one full-text database, while BRS/After Dark has several. A good example of this is the Academic American Encyclopedia database, which contains the full text of over 30,000 articles, along with tables, bibliographies, fact boxes, and even cross references.

Of course, don't forget price. Knowledge Index charges $24 per hour of connect time, which is more than the most

expensive database offered by BRS/After Dark. This means that a database like Agricola, which costs $8 an hour on After Dark, or ERIC, at $6 an hour, is three or four times as expensive to use on Knowledge Index.

This advantage can be offset, however, by the $12 per month minimum charge imposed by BRS. If you're a regular user of research services, then, After Dark will probably save you money in the long run.

But if you only need these services from time to time, you should look into signing up for Knowledge Index. With a one-time fee of $35, it insures you access to a vast amount of information, should you ever need it. If you plan search questions (and, if possible, type them into a buffer in the computer) offline, you may need so little time as to make it more economical to pay only for the time you actually use rather than having to add a minimum fee to lower rates.

4 Uploading and Downloading

4
Downloading

Robert Sims

The capability to download programs over telephone lines may be the most important reason computer owners give for getting into telecomputing. And why not—there are scores of public domain programs just waiting to be transferred to your computer.

On the face of it, downloading is a simple procedure by which you receive data from a remote computer via modem and store it to disk or tape for later use.

That's the theory, anyway. The trouble with the theory is that downloading is simple the way wrestling an alligator is simple: All you have to do is hold its mouth shut and sit on its back—a simple, two-step procedure. But anyone who thinks it's easy has never wrestled an alligator fresh from the swamp.

To make downloading easy, you have to wrestle with *conversion* and *integration.*

In home telecommunications, most information is transmitted as ASCII (American Standard Code for Information Interchange) characters. As the name indicates, these character codes are a standard by which different brands of computers can communicate.

Transparent Conversions

When you are online, your computer (called the *terminal)* is connected to a remote computer (the *host).* The information transmitted between the two is converted at least twice. When the host sends information, it converts the data from the computer's internal code into ASCII, which it then transmits to your computer. Your terminal software converts ASCII into a Commodore variation called CBM ASCII (or PETASCII), which your 64 can process. When your computer sends data to the host, the process is reversed.

These conversions are *transparent,* which means they take place without any intervention on the part of the user.

Downloading, however, is not transparent; it requires that the user have a basic understanding of how and where data is stored on the host, how the data is processed by terminal software, and how the data is converted after it is downloaded.

Information on bulletin boards and information networks comes in three forms: files containing text, files containing program listings, and loose data. Loose data includes the bulletin board messages, menus and prompts, help files, and command descriptions which tell you how to use the system.

A Dead Volkswagen

The whole purpose of downloading is to retrieve such information for your own uses. Often, this means the data must be manipulated in some way, edited perhaps, or merged into another file. And this is where the wrestling match takes place.

To illustrate the problems that may arise, let's suppose that one afternoon my Volkswagen dies; the fuel pump just quits working. That night, I log onto the local bulletin board to read the messages and find one that contains detailed instructions on how to repair a Volkswagen fuel pump.

This is important information, and I desperately need a copy. But it's too long to copy by hand; I can't take the computer to the garage so I can read the instructions while I work on the car; and my landlord won't let me bring a Volkswagen into my apartment. Fortunately, my terminal program has download capability.

Capturing the Data

Most terminal software downloads data through the *capture buffer*. I type in the control sequence which opens the buffer (with my software, I hold down the Commodore key and press the O key). When the buffer is open, the terminal program notifies me by displaying an arrow or a BUFFER OPEN prompt. When I'm sure the buffer is open, I type in the bulletin board commands to have the Volkswagen message displayed again. When the host transmits the message, the terminal program displays it on the screen and stores it in the buffer.

While the buffer is open, I also download a message announcing the date of the next user group meeting. Then I close the buffer, save the contents to disk, and log off. (Some software saves the buffer to disk after you log off.)

Next, I load and run a word processing program, call up the message file from disk, make a note of the user group meeting in my appointment book, and erase everything except the Volkswagen repair tips. These I send to the printer. Now

I'm ready to take the printed instructions out to the garage and bring my Volkswagen back to life.

I'm ready, that is, if my word processor were able to read the message file created by the terminal program.

Word processors usually store text either in sequential files or program files. In order to edit downloaded files (and to prepare text files for uploading), the terminal software and the word processor must read and write the same type of file.

If your terminal program and word processor use disk storage, check your word processor's documentation. If it doesn't tell you the file type, there's a simple (and easy) way to find out. Create a file using your word processor and store it to disk. Then type NEW to clear BASIC memory, and load the disk directory (LOAD "$",8). LIST the directory and look to the right of the filename you created earlier. You will see PRG (program) or SEQ (sequential). That's the type of file your word processor uses.

If the word processor works with sequential files, you're in good shape, because all terminal programs with download capability will process sequential files.

Storing Text in Program Files

However, many word processors (including *WordPro 3 Plus* and *SpeedScript)* use program files because text can be stored and retrieved either with the LOAD and SAVE commands commonly used with BASIC programs, or the files can be OPENed for reading and writing as if they were sequential text files.

If the word processor generates program files, check your terminal software's documentation to see if it can store downloaded text as a program file. If it can, your terminal software and word processor probably are compatible.

Keep in mind that even if the disk file is called a program file, it still contains text. You cannot create a program file with a word processor, then load and run it as a program, because the file contains ASCII characters, not BASIC tokens.

One other conversion snafu is possible. Some word processors use unique control characters for indentation, centering, and the like. These control characters make sense to the word processor, but they may mean something entirely different to the terminal program. Also, some word processors store text as screen codes rather than as ASCII characters. If

your word processor and terminal program use the same file type, but you're still having problems editing downloaded files, you may need a program which can convert the downloaded files from CBM ASCII into the screen codes and unique control characters which the word processor can read.

Downloading Files

Bulletin boards and networks maintain databases, or access areas, where you will find three types of files: text (TXT), binary (BIN), and image (IMG) files.

The most common, and the type most often used by bulletin boards, is the text file. Here, as with disk program files containing text, the name is misleading. You might expect to find only words and sentences in a text file. Not so; some text files contain BASIC program listings. Less frequently, text files hold disassembled machine language listings.

If the file does contain text, it is downloaded and edited the same way as the Volkswagen repair tips were handled.

If a text file contains a program listing, however, you can't just download it and run it as is. It is not true BASIC, but rather a character-by-character ASCII representation of a BASIC listing. Before it can be loaded and run as a program, it must be converted from ASCII characters into tokenized BASIC form.

Your terminal software should include an auxiliary program which performs the conversion. This program will have a filename like FILE.PROG (sequential file to BASIC) or TXTBAS (text to BASIC).

Although the procedure differs slightly from one terminal to another, the general idea is to download the text file and store it to disk as a sequential file. Then load and run the conversion program. You will be asked the name of the sequential file to be converted and the name of the BASIC program to be created. The conversion program will then translate the text into tokenized BASIC and store it on disk.

Binary and Image Files

The second type of file you will see (in network databases rather than on bulletin boards) is the binary file (BIN). A binary file contains a program, either tokenized BASIC or machine language, which has been converted into ASCII characters. If you download a binary file, your screen will fill with a

progression of lines beginning with a colon, followed by a series of numbers and letters like the hexadecimal numbers you see when you use a machine language monitor to display your computer's memory contents.

As with text files, binary files must be converted, and your software should include an ASCII-to-binary conversion program.

The third type of file is called an image file. Image files are downloaded in the same format as binary files. In fact, the only real difference between the two is that image files contain unique error-detection codes used by CompuServe to provide its subscribers with error-free, direct-to-disk program downloading.

Several small software houses have adopted CompuServe's image file formats for their own terminal programs. For the computer user, this provided a degree of standardization which was applauded when first introduced. The ovation was cut short by progress, however, when CompuServe changed its formats, and image files created or converted by other software were no longer compatible.

CompuServe attempted to clear up some of the ensuing mess by going through the files in its databases and relabeling those now-obsolete image files as binary files. And the small software houses, for their part, began updating their programs to fit the new format.

Confusing Names and Formats

Some confusion still lingers, though. In the first place, many terminal programs still refer to binary files as image files in the sections of their documentation which deal with converting the files to binary form. And some terminal programs have been updated to convert according to the new format, while others still convert according to the old format.

In the best of all possible worlds, all this experimenting and detective work would be unnecessary. A user could buy a Brand X word processor and a Brand Y terminal program, and still get transparent conversions and file compatibility.

In the real world, the lack of standardization is not merely a matter of poor planning, or of hostility between hardware and software manufacturers. The patchwork of competing standards may be a source of frustration for home computer owners, but it's a source of profits for home computer

manufacturers. Our economy is based on competition; trade secrets and unique formats give a company a competitive edge.

A Step Toward Integration

Competition makes universal compatibility an unlikely prospect. But as home telecomputing becomes more popular, we will certainly see the second-best possible world: integrated software. The CompuServe Information Service has moved in this direction by marketing a sophisticated terminal package, *Vidtex,* which is integrated with CompuServe's network software. This means that *Vidtex* and CompuServe's software can interact transparently, providing such advanced features as error-free file transfers and automatic transfer of data from CompuServe directly to your disk drive (and all you have to do is supply a filename).

Vidtex is available from CompuServe or from Commodore Business Machines for the Commodore 64, with both disk and tape versions. The price is $39.95.

Terminal packages before *Vidtex* (and even some of its current competitors) were conglomerations, consisting of a terminal program supported by several auxiliary programs which were used offline to convert files. *Vidtex* makes it possible to perform most conversion and storage tasks online automatically, using a single program.

Using two sets of special-function keys, a user can download and store a file without logging off or losing any transmission from the host. You can interrupt an online session anytime to check the disk directory or to perform such disk housekeeping tasks as scratching files, copying files, or converting them from one form to another.

Before *Vidtex,* functions like these required extensive involvement of the user, and extensive technical knowledge. If a user wanted to download several files, for example, he or she would have to log off and convert each file as it was downloaded, then log back on and repeat the process.

Automatic Telecomputing

Vidtex has an autofile feature that allows the user to instruct the program to dial the host computer, log on, go directly to a database, download one or more files, store them to disk, and log off. After setting up the autofile, all the user has to do to

initiate this process is hold down the Commodore key and press J.

Vidtex will convert files to standard ASCII or CBM ASCII as they are transferred to disk. It also allows a user to choose whether data will be stored in a sequential or a program file.

If you're not already familiar with a terminal program, and your technical skills don't include a thorough grounding in file conversion, your safest bet is to use *Vidtex*, to download binary or image files from CompuServe's databases.

With *Vidtex*, most of the confusion will evaporate, and you'll also get color, graphics, and other special features made possible by the integrated relationship between *Vidtex* and CompuServe.

The only real shortcoming of this software is the lack of an offline word processor which would create and edit text files for uploading and downloading.

Integrated Bulletin Boards

The same level of integration and sophistication is just around the corner for bulletin board users.

There is a strong probability that sometime in the near future we'll see telecommunications packages which include a fully compatible bulletin board system (BBS), terminal program, and word processor, all produced by the same company.

There is growing support among BBS operators for more compatibility and cooperation between the hundreds of independent boards in the United States and Canada. Board sysops (system operators) are also talking about ways to share public domain programs and messages.

Ideally, all these factors will continue to simplify current downloading methods and to increase the amount of information available to the home computerist.

Uploading

Robert Sims

If you have been downloading programs from an information service or BBS, you know that most of the programs were made available by other subscribers. Why not become more than just a receiver—become a contributor. After all, if others hadn't uploaded their programs there would be little for you, or anyone else, to download.

Online databases were created to disseminate large amounts of information to a broad segment of the population. Before the advent of the computer, public and private libraries served this function.

Most commercial databases, in fact, still are organized along the same lines as a library. Material is published, collected, and collated, then it is cataloged, and made available for downloading. Tapping into the vast amount of information in databases, while undoubtedly valuable, is essentially a passive activity: Someone else has made available this data which you retrieve.

If you want to move from being a passive information receiver to being an active information provider, then, according to the established order, you must compose your message, find a publisher who agrees that the world needs to know, and get the work distributed to libraries and databases. Only then will the world get your message.

Direct Delivery

In the less structured domain of home telecommunications, the path from creator to user is more direct, and more immediate. If you have a home computer and a modem, all you need in order to tell the world is a short course on how to upload the message.

Whether your message is a private note to a friend, a checkbook balancing program, or the first chapter of your new novel, there are three ways to upload it.

The simplest, and slowest, way is to log onto a bulletin board or network and type the data in manually.

Another way is to prepare the data before going online, then load it into the terminal software's capture buffer and transmit it after you log on.

The third way is to prepare the data offline, and use the automatic upload feature of your terminal software to upload the file directly from disk.

By coincidence, these three methods are used to compose and send three forms of communication. If you want to tell everybody something, you can leave a message on a bulletin board. If your message is private, send it as electronic mail, which is just a private letter delivered electronically. These two forms are informal and temporary. A message will stay on a bulletin board for only a few days, and electronic mail usually is erased as soon as it is read.

To deliver a long program or a long text file which will be available to others on a more permanent basis, you upload it to special upload/download areas set aside on the networks and bulletin boards.

Online Word Processors

To allow you to compose a bulletin board message or electronic mail online, bulletin boards and networks have built-in word processing routines. Most bulletin boards have a line editor, which permits entry and editing of one message line at a time. The simplest line editor will allow you to edit only by deleting your mistakes and retyping the line. If you want to change word order or insert text, you must delete everything back to the point where you want to insert, then retype the rest of the message.

This limited word processing capability is a function of available memory and processing speed. Bulletin boards are usually run on home computers, and memory is at a premium. A full-featured word processor would take up too much of the RAM needed to hold the main bulletin board software.

The information networks such as CompuServe, Delphi, and The Source use banks of mainframe computers. Since memory is not a major limitation, the networks provide full-featured word processors which can be used to compose messages online.

Even though these word processors are much more sophisticated than line editors, it's still not possible to edit your text by simply moving the cursor around on the screen of your computer, inserting or deleting words at will. Because of the relatively slow transmission rates of 300 and 1200 bps (bits per second) involved in telecommunications, your

computer and the host cannot interact fast enough to allow editing text directly on the screen.

For that reason, online word processors require that you edit your message in pieces, without seeing the whole. Each editing operation, whether deleting a single letter or inserting a paragraph, is performed by sending a unique command in an exact syntax. The process is necessarily time-consuming and ungainly. The inexperienced user can call up help files which briefly describe these commands, but to become proficient, a user must buy the printed manuals.

Composing Offline

Because of these disadvantages, experienced users prefer to compose and edit their messages offline, then upload them after they log on.

The usual way to do this is to compose the message using a word processor. Then the message file is converted to a form which the terminal program and the host computer can process, and this upload file is stored on disk.

The upload file is loaded into the terminal software's capture buffer. Then, after logging on and accessing the online word processor, the user waits for the host's prompt to enter the message text, then uploads the file from the capture buffer instead of typing it in.

Uploading the Message Text

Generally, the online word processor will accept text a line at a time, and will send a special prompt character when it is ready to receive the next line. If your text file is sent all at once, the host will receive only one line, and the rest will be lost. For that reason, the file must be uploaded one line at a time.

Some terminal programs provide a function key which, when pressed, uploads one line of text. The user waits for the prompt character and pushes the key, repeating the process until the end of the file is reached.

Other terminal software does this automatically if the user knows which prompt character the host sends. The user doesn't have to put the upload file into the capture buffer; the terminal software will take it directly from the disk. The user selects one-line-at-a-time uploading, and the software asks for the host prompt character.

The user types in the prompt character, and the terminal software then takes over. Every time the host sends a character, the terminal software compares it with the prompt character provided by the user. If the characters are the same, the terminal software sends a line of text from the upload file. After the file has been uploaded, the terminal software returns program control to the user.

Uploading Programs

Uploading programs and text files into database areas where they will be downloaded by other users is more complicated than uploading messages.

First, the program must be converted to a format which can be uploaded (see previous article concerning downloading) and stored on disk.

Then, when the user is online and accesses the upload area of the bulletin board or network, the host will ask for information to be included in the database catalog. This may include file length, a brief description of the program's function, and some keywords which other users can search for to identify the file.

The user who is uploading may be asked to provide a filename by which the uploaded file will be stored on the host system.

All this information must be complete and correct in order for other users to locate, download, and make use of the uploaded program.

File Extensions

Often, the host will give the uploader a choice of file extensions, or suffixes appended to the filename proper. These extensions identify the format in which the file is stored. If the wrong extension is attached to a filename, it may make the file impossible to download.

For example, an extension of .BIN should mark a file as a program which has been converted to ASCII representations of hexadecimal numbers. It may be a BASIC program or a machine language program.

If an uploader mistakenly labels a program file with a .DOC or .TXT extension, a user who downloads this file will convert it as though it were text, and the end result will be useless garbage.

After the catalog is entered, the user will be prompted by the bulletin board or network as to the actual upload procedure. This can be one line at a time, or the entire file may be uploaded automatically.

Providing Documentation

Besides the basic catalog information for a file, a responsible uploader will provide documentation for any program he or she uploads.

This documentation should include detailed instructions for using the program and should be uploaded as a text file with a .TXT or .DOC extension. Its filename should be similar to the program's name so that downloaders can connect the two; reference to the program it documents should be included in the descriptive notes that go with the documentation file's catalog entry.

The documentation file can be a text file created with a word processor, or it can be generated as a program listing consisting entirely of REMark statements, converted, and uploaded as a program file with a .BIN or .IMG extension. Such a file can be downloaded, converted, and LISTed, allowing the end user to get a printout without using a word processor.

But however the documentation is handled, it is important that it accompany the uploaded program. Failure to document software before offering it to other users is a major problem in home telecommunications. There are thousands of programs in the public domain for the Commodore 64, free for the taking, but too often users obtain a program and then find to their dismay that the program contains no instructions.

Sending Programs over the Phone

Michael Day

One use for a modem is to transfer data between your own computer and another one. This mundane aspect of telecommunications can be one of the more interesting and rewarding uses of both the modem and your computer.

The usual method of getting a program into your computer is either to enter it by hand through your keyboard, or to obtain a disk or cassette with the desired program on it. This is fine if the program desired is readily available, but difficult if it is not. For instance, if your friend has a BASIC program that you want, the usual procedure is for him or her to copy it onto disk or cassette and give it to you. If it's not too large, you might get a printed copy. If you have a cassette and your friend has a disk, the usual response is not to bother. If both of you had a way to transfer the program over the phone, though, you could easily get the program. Another advantage of this method is that the program can be transferred to you instantly. With the modem all it takes is a phone call.

In order to make these calls, there must be some agreement as to how you will transfer information. The actual mechanics can be quite complex. An agreement about how to make the transfer is called a *communication format,* or *protocol.* Although there are certain basic requirements needed to make the transfer, there is no standard format for the actual details of the transfer.

Making a Link

The first thing that must be done is to establish the communications link. This happens when you call your friend, make the arrangement to do the transfer, and turn on the modems to begin the transfer. Next, the computers must synchronize themselves and, finally, make the actual transfer.

The data file to be transferred is broken into small pieces called *records.* The records generally consist of 128, 256, or 1024 characters (bytes). The record size depends on the protocol being used.

CP/M, one of the first popular operating systems, uses a 128-byte record size. For this reason many of the present systems, including the very popular XMODEM protocol used with the Commodore 64, also use 128 bytes.

A 128-byte record is a fairly reasonable size since, at 300 bits per second (bps) it takes a little over 4 seconds to transmit a record; 256 bytes would take over 8 seconds, and 1024 bytes would take over 30 seconds. The idea is to keep the transfer size down so that if an error does occur, not too much time is wasted retransmitting the record. On the other hand, it shouldn't be broken down into such small pieces that the overhead involved in handling the records significantly retards the transfer time.

Overhead time is the time it takes to acknowledge the receipt of the record. In a simple transfer program this would be a single character. Another part of the overhead that must be considered is the turnaround time of both the computer systems and the phone line. On a local call this generally averages out to about 3 or 4 character times (assuming 300 bps). On a long-distance call this can stretch out to 8 to 12 character times. (If the call is via satellite, it will be around 40 character times.)

Assuming the call is local, this means that the overhead would be about five characters. For 128-byte records this would be about 4 percent overhead. For 256-byte records it would be 2 percent, and for 1024-byte records it would be 0.5 percent. This has to be balanced against the expected error rate. The phone line has an average error rate of about one error in every 10,000 bytes of data that is transferred. If the phone line is weak or noisy, it can get much worse. With 1024-byte records, this means that about one of every ten records will be bad, (a 10 percent error rate), so the 0.5 percent transfer rate is lost in the 10 percent error rate. With 256-byte records, the error rate is down to 2.5 percent, and with 128-byte records it is 1.25 percent.

Assuming a 128-byte record format, and accounting for one error in a transfer of 10,240 bytes, the transfer time would be about 6 minutes. If the records were 256 bytes long, the transfer time would be about 5.9 minutes, and with 1024-byte records it would be about 6.5 minutes. It would seem that the 256-byte format would be the best choice, but another factor must be taken into account: the error-detection method used.

In the method used for the XMODEM system, it is very simple, and the more bytes it is required to check, the greater the chance that it will miss an error. Because of this, the 128-byte format is a better choice even though there is a small increase in the transfer time. If a better error-detection method were used, it would probably be better to use the 256-byte record format.

A Transfer Format

The structure of the record that is transferred varies from system to system as well. In fact, it is even less standardized than most other parts of the data transfer format.

Since there is no real standard for the record format, I will describe one of the more heavily used formats. This format got its start on CP/M-based systems and originally appeared in a program written by Ward Christensen called, appropriately enough, XMODEM. The first problem when dealing with CP/M is its refusal to acknowledge the existence of a modem. So, a transfer program must provide its own link to the modem.

To begin the transfer, the receiving computer sends an ASCII NAK (character code 21) signal every couple of seconds until the sending computer sends an ASCII ACK (character code 6). This is the synchronization part of the transfer. The original modem program assumed that the program was predefined at both ends, so once synchronization was achieved, the data was immediately sent.

The record format that is used consists of a *header*, the data, and finally a checksum character for error detection. The header consists of an ASCII SOH character (character code 1), followed by the current record number (starting with number 1) which is an eight-bit value. That is followed by the same number, but inverted. (That is, if record $01 is being sent, the second number sent will be $FE.) This is followed by the data itself for the next 128 bytes. Finally, one more character is sent which is the checksum.

The checksum is an eight-bit value that is the sum (without carry) of all the data bytes sent. The sending computer then waits for the receiving computer to acknowledge that it received the data. The receiving computer compares its own calculated checksum against the one that the sending computer sent and, if they match, it sends an ASCII ACK

character. If they don't match, it sends an ASCII NAK character, indicating that it didn't receive the data correctly. If the sending computer receives a NAK, it will send the record again. After ten tries if it is unable to send the record, it gives up and aborts the transfer. After all the records have been sent, a final ASCII EOT (character code 4) is sent indicating that the transmission is completed.

Some Problems

There are several problems with the format that is used, and some of the later versions attempted to correct for this. Unfortunately, this created a new problem since any change in the basic format meant it was incompatible with the old format. This tended to create a real mess, with patches used to allow for compatibility to the old programs. Discounting the versions which were simply adaptations for different modems, some of the differences included the addition of the program identifier so that the sending computer can tell the receiving computer the program name instead of requiring the operator at the receiving computer to specify it. There was also a change from the checksum format to a cyclic redundancy check format. The identifier has been implemented several ways, but the most popular version is also one of the strangest implementations.

After synchronization has been achieved, the currently popular program (MODEM7) sends the filename a character at a time. That is, it sends a character and then waits for an acknowledge (ASCII ACK) from the receiving computer. Then it sends the next character of the filename and repeats this until the entire filename has been sent. After that, it waits for the receiving computer to send the checksum of the filename and then compares the received checksum with its own internally calculated checksum. If they are equal, the sending computer sends an ASCII ACK character. The sending computer goes back and waits for resynchronization (waiting for an ASCII NAK character). At last, it starts receiving data normally after the resynchronization is achieved.

If there was a checksum error, the sending computer sends a bad name character which, for no particular reason, was defined as an ASCII *u* (character code 117), and goes back to allow resynchronization and retransmission of the name. After ten tries if the name cannot be sent, the transfer is aborted.

Improved Error Detection

The checksum method of error detection is not the most accurate means of detecting an error. A CRC (cyclic redundancy check) is a far better way to detect errors. The most common CRC is a 16-bit polynomial, defined as (X+1)*(X↑15+1). By starting with a value of zero in the CRC and passing all the received data through the CRC routine, when the final CRC received passes through the routine, the final result passes through the routine, and the final result will be zero (if no errors were encountered).

There is no single best way to transfer programs via a modem, but some methods are better than others.

Computing a Checksum

A checksum generates a sum of the data that is passed through it by adding (without any carry) each byte with the sum of the previous bytes. The checksum is initially set to zero, and the final result is sent to be compared with the independently computed checksum at the receiver computer. Since the checksum is an eight-bit value, only a single byte of data needs to be sent. It is quick and easy to perform this with a computer. The checksum method can reliably catch only single-bit errors. Although it does reasonably well with multibit errors, the percentages can rapidly drop to the realm of coin-toss odds.

To use the checksum program, enter it with the data in the accumulator. The result is saved in location CHKSUM for later use. The location CHKSUM should be cleared to zero at the start of sending the data stream.

```
CHKSUM  PHA
        PHP
        CLC
        ADC  CHKSUM
        STA  CHKSUM
        PLP
        PLA
        RTS
```

The CRC Method

A CRC method of error detection is far superior to the checksum. By using a 16-bit value for the sum instead of an 8-bit value, a much improved detection capability is achieved. By using a polynomial of the proper type, the 16-bit value can be

used far more effectively as well. The provided polynomial can detect errors of up to 17 bits.

Since the CRCSUM generated is a division remainder, a CRCSUMed data sequence can be verified by running the data through the CRC, and then running the previously obtained CRCSUM through the CRC. The resultant CRCSUM should be zero. When the CRCSUM itself is transmitted, it should not be run through the CRC as this would disrupt the result. Also, when checking the CRCSUM the most significant byte must be run through the CRC first, followed by the least significant byte.

To use this routine, enter with the byte to be CRCSUMed in the accumulator. The CRCSUM is automatically updated upon passing the data through this routine.

```
CRC   PHP
      PHA
      STX  XTEMP
      LDX  #$08
CRC1  ASL  A
      ADS  #$00
      STA  CRCTMP
      LDA  CRCSUM
      ASL  A
      STA  CRCSUM
      LDA  CRCSUM+1
      ROL  A
      STA  CRCSUM+1
      ROL  A
      EOR  CRCTMP
      LSR  A
      BCC  CRC2
      LDA  CRCSUM+1
      EOR  #$80
      STA  CRCSUM+1
      LDA  CRCSUM
      EOR  #$05
      STA  CRCSUM
CRC2  LDA  CRCTMP
      DEX
      BNE  CRC1
      LDX  XTEMP
      PLA
      PLP
      RTS
```

5 Terminal Software

5
TeleTerm 64
A Terminal Program for the Commodore 64

Gregg Peele

"TeleTerm 64" is a ready-to-type program which allows the Commodore 64 to be used as a remote terminal with other systems.

If you've ever seen a large computer system, you may be familiar with the word *terminal.* This refers to a device—usually a keyboard and screen—which is hooked up to a host computer. The terminal communicates with the host computer, sending and receiving data. With a modem and just a little programming, a Commodore 64 can be made to *emulate* (simulate) a terminal—providing low-cost communication with other computer systems.

The modem converts the computer's output into audible tones which are transmitted through telephone lines just like an ordinary phone call. The modem also interprets incoming tones from the other computer as they come through the phone lines—converting them back into the data which the computer can process. The modem thus acts as a two-way interpreter for communication, making it possible for information to travel between computers over standard telephone lines.

A modem cannot do all of this interpreting by itself, however. It needs help from a terminal program. There are many terminal programs on the market with all kinds of special features. The VICmodem even comes with one on cassette. When communicating with different computers, though, it's nice to have more than one terminal program to assure compatibility. If one terminal program doesn't work for some reason, you can try another. Or you can customize a program to work well in a certain situation.

The program included here—"TeleTerm 64"—was designed to be an easy-to-use terminal program for general-purpose telecomputing. It's also designed to be easily customized.

Using TeleTerm 64

Type in the program listing below and save it twice on tape or disk. Now switch off your computer, hook up the modem, and power up. Load and run TeleTerm 64. There will be a pause of about 25 seconds as the program sets itself up. When initialized, the program will display "terminal ready."

Now dial the distant computer with which you want to communicate. If you're using an acoustic modem, you'll hear a tone which signals that the other computer has answered the phone. With a direct-connect modem, such as the VICmodem, you may have to leave the telephone handset plugged in until you hear the tone and then quickly unplug the handset and connect the modem.

To get the host computer's attention, press the RETURN key a few times. Usually, this will elicit some kind of response from the host computer. Now you're online and ready to go.

Customizing TeleTerm 64

You may well discover that TeleTerm 64 needs no customizing at all and works fine as is. If not, perhaps some simple modifications will fix the problem.

To customize your terminal for use with a specific host computer, the special function keys or other keys can be redefined. You can assign them almost any function you want. This is easily done by changing the value of the array member which contains the CHR$ ("character string") value of that particular key.

A table of CHR$ values is found in Appendix F of the manual which came with the computer, the *Commodore 64 User's Guide*. In TeleTerm 64, the value for outgoing characters is represented by the variable O (the letter *O* for output, not the number *zero*). The value for incoming characters is represented by the variable I (I, for input). These variables are used to assign new functions to the keys.

For example, to make the f1 special function key send out the ASCII backspace code, we need a statement like this:

```
52 O(133)=8
```

In this case, the statement is already in TeleTerm 64, at line 52. The statement is easy to grasp. Remember: *O* represents *outgoing* characters. The number 133 represents the Commodore code for the f1 key, as listed on page 136 in the

manual. The number 8 is the standard ASCII code for backspace. Keep in mind that standard ASCII codes vary from Commodore ASCII, so the numbers in Appendix F cannot be used here. Instead, you will have to find an ASCII table in another manual or computer book; it is not included in the *User's Guide* or the *Commodore 64 Programmer's Reference Guide.* (However, a standard ASCII table *is* found on page 274 of the *VIC-20 Programmer's Reference Guide.*)

If you wish to receive characters and make a specific translation to Commodore codes, then use the I variable in a similar way. Here's how:

```
96 I(8)=157
```

This statement, also already included in TeleTerm 64, takes the incoming standard ASCII code for backspace (8) and changes it to the Commodore code for cursor left (157). Thus, when the Commodore 64 receives a character code from the host computer that stands for backspace, it will move the cursor to the left.

How TeleTerm 64 Works

In TeleTerm 64, first close device 2 (in case it was left open by a previous operation) and clear all variables. This is done in line 1. Next, use the OPEN statement to open the channel of device 2, and to set parity and baud rate. This is done in line 2 with the added parameters CHR$(6+32)+CHR$(32+64), which specify "no parity" and "300 baud." (See pages 349–353 in the *Commodore 64 Programmer's Reference Guide* for more information about parameters for the RS-232 port.)

Line 6 sets the screen and border colors. The next statements convert Commodore codes to standard ASCII. These codes are stored in an array (O, for output) for later use within the main loop of the program. After this array is complete, another array (I, for input) is formed by translating the ASCII codes to their equivalent Commodore codes.

With all our translations done, the words *terminal ready* appear on the screen, and the keyboard is set in upper/lowercase mode. The main loop of the program now commences. This loop uses the GET command to alternately check the keyboard (device 0) and the serial port where the modem is connected (device 2) to see if a character has been received. If no character has been received by one device, the program

checks the other. If any data is received, it is immediately printed on the screen. Since the loop is limited to only four lines, the program runs fast enough to handle incoming data at 300 baud.

TeleTerm 64

For mistake-proof program entry, be sure to use "The Automatic Proofreader," Appendix C.

```
1 CLOSE2                                          :rem 217
2 OPEN2,2,3,CHR$(6+32)+CHR$(32+64)                :rem 14
5 PRINT"{CLR}"                                    :rem 153
6 POKE53280,3:POKE53281,3                         :rem 145
7 PRINT"PLEASE WAIT 25 SECONDS...{DOWN}"          :rem 8
10 REM 64 TO ASCII                                :rem 187
20 DIMO(256)                                      :rem 121
30 FORX=0TO255STEP1                               :rem 187
35 O(X)=X                                         :rem 245
40 IFO(X)>64ANDO(X)<99THENO(X)=O(X)+32            :rem 248
50 IFO(X)>192ANDO(X)<219THENO(X)=O(X)-128         :rem 141
51 O(20)=127                                      :rem 63
52 O(133)=8                                       :rem 19
60 NEXTX                                          :rem 253
70 REM ASCII TO 64                                :rem 193
80 DIMI(256)                                      :rem 121
90 FORY=0TO256STEP1                               :rem 195
95 I(Y)=Y                                         :rem 247
96 I(8)=157                                       :rem 27
100 IFI(Y)>64ANDI(Y)<91THENI(Y)=I(Y)+128          :rem 63
110 IFI(Y)>96ANDI(Y)<123THENI(Y)=I(Y)-32          :rem 61
115 POKE646,6                                     :rem 200
130 NEXTY                                         :rem 44
210 PRINTCHR$(14);"TERMINAL READY"                :rem 39
300 GETO$:IFO$=""THEN400                          :rem 102
320 B=ASC(O$):O=O(B):O$=CHR$(O):PRINT#2,O$;
                                                  :rem 216
400 GET#2,I$:IFI$=""THEN300                       :rem 219
410 A=ASC(I$):I=I(A):I$=CHR$(I):PRINTI$;:GOTO300
                                                  :rem 55
450 END                                           :rem 112
```

Termulator for the 64

Gordon C. Lyman

"Termulator" is a speedy machine language program which allows your 64 to emulate a telecommunications terminal. It thus gives you an alternative if you find BASIC terminal programs too slow or if you cannot find suitable programs available commercially. You don't need to know machine language to type in and use this program. Termulator is limited to full-duplex operation.

After buying a Commodore 64 computer and a VICmodem, I soon discovered that the terminal program supplied with the VICmodem would not run on the 64. I tried using a terminal program written in BASIC, but found it too slow for my purposes. Also, I could not find a terminal program offered for sale for the 64, so I wrote "Termulator" (*term*inal em*ulator*), a machine language program which is quite simple in operation.

Basically, the program gets a character from the keyboard, sends the character via modem, receives a character from the modem, and finally displays it onscreen. This simple logic limits the program's ability to full-duplex operation; however, I have never required anything but full-duplex operation. The program utilizes RAM in the range $0900–$8500 as a receive buffer, storing the text displayed on the screen into memory. Termulator consists of three basic sections: initialization, main loop, and cursor subroutine. Let's look at each one in some detail.

Initialization ($C000–$C048)

Termulator uses the Kernal routine CLALL ($FFE7) to close all files, just in case any have been left open. Next, the value $00 is stored in the RS-232 command register ($0294), and the value $06 is stored in the RS-232 control register ($293).

The next instructions set up a filename for the modem file. The location of the filename is loaded into the X and Y registers, and the length of the name is loaded into the accumulator. Now the important part: the first two bytes of the modem filename must be the RS-232 control and command

registers. Then, by using the Kernal routine SETNAM ($FFBD), the RS-232 interface is instructed to operate according to the RS-232 control and command registers. In this case, the RS-232 interface will operate at 300 baud, with no parity checking, one stop bit, and an eight-bit word length. In order to change these, you must change the values that are loaded into these registers. Change the value at location $C004 (49156) to change the value in the command register, and change the value at location $C009 (49161) to change the value in the control register. For further explanation, see the *Commodore 64 Programmer's Reference Guide.*

A pointer in the zero page of memory is initialized to the start of the receive buffer. This buffer starts at $0900 in order to leave a cushion between the start of BASIC at $0800 and the buffer area. The pointer will be used by the main routine to store the text received into this buffer for future manipulations. The limit of memory pointer is reset in order to protect the file buffers which will be allocated when opening a file for the modem. The limit of memory pointer is also set low enough to protect a monitor or other program stored within the top 6656 bytes of RAM.

The program next sets up the logical first and secondary addresses and opens the modem file. This automatically allocates 512 bytes at the top of free RAM for input and output buffers. The accumulator is loaded with the file number, the X register is loaded with the device number, and the Y register is loaded with the secondary address, which would be a command to the modem. The value $FF loaded into the Y register means no command to the device. Then the SETLFS ($FFBA) and OPEN ($FFC0) Kernal routines are called.

The ASCII data from $C0F4 is displayed until a zero value is found. This includes the character codes to change to upper/lowercase and display white characters as well as a title message.

The Main Loop ($C04A–$C0BF)

The Kernal routine STOP ($FFE1) is called, which will return a $00 in the accumulator if the RUN/STOP key is pressed. If the RUN/STOP key is pressed, all files are closed and the program stops; otherwise, the program branches to set the input device to device 0 (the keyboard).

The Kernal routine GETIN ($FFE4) is used to return one

byte from the keyboard buffer as an ASCII value in the accumulator. If the keyboard buffer was empty, a $00 is returned and the program will branch to the modem input routine. Otherwise, the ASCII value from the keyboard is stored in a zero page location ($6A) for later processing. The ASCII value from the keyboard is translated into standard ASCII by selecting the corresponding value from a list, 256 bytes long, starting at $C226. This is required because Commodore ASCII is not the same as standard ASCII. Also in this list of data are the ASCII values for the CTRL-A through CTRL-Z. When you wish to send a control character while using the program, type the appropriate letter key while holding down the Commodore key. Another list, starting at $C126, contains the Commodore ASCII for the reverse translation. The Kernal routine CHROUT ($FFD2) is used to send the byte, now in the accumulator, over the modem.

The Kernal routines CHKIN ($FFC6) and CHRIN ($FFE4) are used to input a byte from the modem. Then this byte, which is standard ASCII, is translated to Commodore ASCII and stored in zero page (at $6A).

If the value returned from the modem was null ($00), the program will branch back to the beginning of the main routine.

To erase the cursor before outputting to the screen, a space and cursor left are displayed. Then the byte that was received from the modem is printed on the screen.

A check is made to see if the character received, now in the accumulator, is a delete. If it is, the receive buffer pointer is decremented and the program returns to the start of the main loop; if not, the receive buffer pointer is incremented. If the pointer has reached the limit of memory pointer, it is reset to $0900. The character is stored in the receive buffer, and the program returns to the start of the main loop.

The Cursor Subroutine ($C0C0–$C0F3)

The least significant byte of the Commodore 64's jiffy clock is used as a timer for the cursor. This byte is compared with the value $15, which is the length of time the cursor takes to flash on or off. By changing this value in location $C0C3, you can change the speed at which the cursor flashes. If the timer has not expired, then the RTS instruction at $C0C6 will return to the main routine.

If the timer has expired, it is reset and a flag stored at $6B is checked. This flag will be either $00 or $FF. If the flag is set to $FF, it will be cleared to $00 and a space which turns the cursor off will be displayed.

If the flag was clear, then the program branches to set the flag to $FF and displays a reversed space which turns the cursor on. After the cursor is turned either on or off, a cursor left is displayed. This is done so that the next thing displayed will be in the right position. The program then returns to the main routine.

How to Use Termulator

Since the Termulator program is written entirely in machine language, you must use "MLX," the machine language editor in Appendix D, to type it in. When you run MLX you will be asked for the starting and ending address; respond with the following:

Starting address: 49152
Ending address: 49979

After you finish entering all the data for Termulator, use the MLX Save option to save a copy to tape or disk. To use Termulator, load the program with

LOAD "TERMULATOR",8,1 (for disk)

or

LOAD "TERMULATOR",1,1 (for tape)

Then start the program with

SYS 49152

As mentioned above, you can change the operating parameters with POKEs to locations 49156 and 49161 before using the SYS to start the program.

Termulator

Refer to the "MLX" article in Appendix D before entering this listing.

```
49152 :032,231,255,169,000,141,060
49158 :148,002,169,006,141,147,107
49164 :002,169,000,133,097,133,034
49170 :099,169,009,133,098,169,183
49176 :133,133,056,169,002,162,167
49182 :147,160,002,032,189,255,047
49188 :169,128,162,002,160,255,144
49194 :032,186,255,032,192,255,226
```

```
49200 :169,240,141,032,208,169,239
49206 :240,141,033,208,162,000,070
49212 :189,244,192,240,009,032,198
49218 :210,255,232,076,060,192,067
49224 :234,234,032,225,255,208,236
49230 :004,032,231,255,000,162,250
49236 :000,134,153,032,228,255,118
49242 :240,022,133,106,201,133,157
49248 :208,003,032,055,195,162,239
49254 :128,032,201,255,166,106,222
49260 :189,055,194,032,210,255,019
49266 :162,128,032,198,255,032,153
49272 :228,255,170,189,055,193,186
49278 :133,106,162,003,134,154,050
49284 :032,192,192,165,106,240,035
49290 :191,169,032,032,210,255,003
49296 :169,020,032,210,255,165,227
49302 :106,032,210,255,201,020,206
49308 :208,011,164,099,208,002,080
49314 :198,098,198,099,076,074,137
49320 :192,230,099,208,012,230,115
49326 :098,164,098,196,056,208,226
49332 :004,160,009,132,098,164,235
49338 :099,145,097,076,074,192,101
49344 :165,162,201,021,016,001,246
49350 :096,160,000,132,162,164,144
49356 :107,240,012,160,000,132,087
49362 :107,169,032,032,210,255,247
49368 :024,144,019,160,255,132,182
49374 :107,169,018,032,210,255,245
49380 :169,032,032,210,255,169,071
49386 :146,032,210,255,169,157,179
49392 :032,210,255,096,005,014,084
49398 :147,017,017,017,017,017,222
49404 :017,032,032,032,032,032,173
49410 :032,032,212,197,210,205,122
49416 :045,213,045,204,193,212,152
49422 :207,210,032,032,157,157,041
49428 :013,013,032,032,032,032,174
49434 :032,032,032,032,032,032,218
49440 :066,089,032,199,046,032,240
49446 :204,089,077,065,078,013,052
49452 :013,013,000,234,000,000,048
49458 :000,000,000,000,000,000,050
49464 :000,000,137,000,000,000,193
49470 :000,020,000,000,000,000,082
49476 :013,000,000,146,134,000,105
49482 :138,000,000,000,000,000,212
49488 :000,000,000,000,000,000,080
49494 :000,032,033,039,035,036,005
```

```
49500 :037,038,039,040,041,042,073
49506 :043,044,045,046,047,048,115
49512 :049,050,051,052,053,054,157
49518 :055,056,057,058,059,060,199
49524 :061,062,063,064,193,194,241
49530 :195,196,197,198,199,200,027
49536 :201,202,203,204,205,206,069
49542 :207,208,209,210,211,212,111
49548 :213,214,215,216,217,218,153
49554 :091,092,093,094,095,000,099
49560 :065,066,067,068,069,070,045
49566 :071,072,073,074,075,076,087
49572 :077,078,079,080,081,082,129
49578 :083,084,085,086,087,088,171
49584 :089,090,000,000,000,000,099
49590 :000,000,000,000,137,000,063
49596 :000,000,000,020,000,000,208
49602 :000,000,013,000,000,146,097
49608 :134,000,138,000,000,000,216
49614 :000,000,000,000,000,000,206
49620 :000,000,000,032,033,034,055
49626 :035,036,037,038,039,040,187
49632 :041,042,043,044,045,046,229
49638 :047,048,049,050,051,052,015
49644 :053,054,055,056,057,058,057
49650 :059,060,061,062,063,064,099
49656 :193,194,195,196,197,198,141
49662 :199,200,201,202,203,204,183
49668 :205,206,207,208,209,210,225
49674 :211,212,213,214,215,216,011
49680 :217,218,091,092,093,094,053
49686 :095,000,065,066,067,068,127
49692 :069,070,071,072,073,074,201
49698 :075,076,077,078,079,080,243
49704 :081,082,083,084,085,086,029
49710 :087,088,089,090,000,000,144
49716 :000,000,000,000,000,000,052
49722 :000,000,000,000,000,000,058
49728 :000,000,000,000,013,000,077
49734 :000,000,000,000,000,008,078
49740 :000,000,000,000,000,000,076
49746 :000,000,000,000,000,032,114
49752 :033,034,035,036,037,038,045
49758 :039,040,041,042,043,044,087
49764 :045,046,047,048,049,050,129
49770 :051,052,053,054,055,056,171
49776 :057,058,059,060,061,062,213
49782 :063,064,097,098,099,100,127
49788 :101,102,103,104,105,106,233
49794 :107,108,109,110,111,112,019
```

```
49800 :113,114,115,116,117,118,061
49806 :119,120,121,122,091,092,039
49812 :093,094,095,000,000,000,174
49818 :000,000,000,000,000,000,154
49824 :000,000,000,000,000,000,160
49830 :000,000,000,000,000,000,166
49836 :000,000,000,000,000,000,172
49842 :000,000,000,000,000,000,178
49848 :000,000,000,000,003,017,204
49854 :019,000,003,019,000,000,231
49860 :000,000,000,000,000,016,212
49866 :000,000,000,000,000,000,202
49872 :000,000,000,000,000,000,208
49878 :000,000,011,009,020,000,254
49884 :007,000,013,000,000,014,254
49890 :017,004,026,019,016,001,053
49896 :005,018,023,008,010,012,052
49902 :025,021,015,000,006,003,052
49908 :024,022,002,000,065,066,167
49914 :067,068,069,070,071,072,155
49920 :073,074,075,076,077,078,197
49926 :079,080,081,082,083,084,239
49932 :085,086,087,088,089,090,025
49938 :000,000,000,000,000,000,018
49944 :000,000,000,000,000,000,024
49950 :000,000,000,000,000,000,030
49956 :000,000,000,000,000,000,036
49962 :000,000,000,000,000,000,042
49968 :000,000,000,000,000,000,048
49974 :000,096,000,000,000,000,150
```

Plus/Term

Gregg Peele

Here's a top-notch terminal program that lets you access almost any computer or information service over the phone with your Commodore 64. Its features include key redefinition, word-wrapping, 1200 bps support, uploading, and downloading. Written in BASIC and machine language, the program works on any 64 with a modem.

There's a lot more out there than you think.

Sure, you can use your home computer to play games, write letters, and balance your budget. But *telecomputing*—communicating with other computers over the phone lines—can let you do even more. "Plus/Term" and a modem will turn your home computer into a full-fledged communications terminal. You can link up with the personal computers of your friends, the mainframe computer at work or at school, electronic bulletin boards, online databases, and commercial information services such as CompuServe, The Source, and Dow Jones News/Retrieval.

Plus/Term is designed to make your computer emulate an *asynchronous ASCII terminal.* An asynchronous terminal does not require special timing (sync) characters and doesn't require the receiving terminal to operate in step with your system. ASCII is a standard character code that computers use to understand each other. Most microcomputer communications are asynchronous and in ASCII.

Typing Plus/Term

Plus/Term consists of two parts: a BASIC program that displays menu options and a machine language routine that handles the actual communications.

First, type in the BASIC portion (Program 1) and save it on tape or disk. *If you're using tape, change the ,8,1 in line 100 to ,1,1.* Also, some non-Commodore plug-in modems for the 64 do not use all of the modem port signal lines in the same way that the Commodore modems do. If you have a Mitey Mo or HESmodem model, you'll need to make the following changes to Program 1:

```
180 IF PEEK(185)<>255 THEN FZ=1:GOTO 200  :rem 148
680 OPEN2,2,255,CHR$(PEEK(659))+CHR$(PEEK(660))+CH
    R$(PEEK(661))+CHR$(PEEK(662))          :rem 112
685 POKE 56579,102:POKE 56577,2            :rem 118
```

To type in the machine language portion, you must use "MLX," the machine language editor in Appendix D. When you run MLX you will be asked for the starting and ending address; respond with the following:

Starting address: 50152
Ending address: 52563

Save the machine language portion on the same disk as the BASIC portion or on the same tape as, and immediately following, the BASIC portion. *You must save the machine language portion using the filename referenced in line 100 of the BASIC program* (PLUS/TERM.ML).

To start Plus/Term, run the BASIC program. It automatically loads the machine language part from tape or disk using the filename in line 100 (be sure that your tape is positioned to the beginning of the machine language file).

Entering Terminal Mode

When you run Plus/Term, the program asks you to specify a *baud rate.* The baud rate, more properly known as the *data transfer rate,* is the speed in bits per second (bps) at which a modem communicates. Inexpensive modems—including most of those sold for the Commodore 64 can transmit and receive information at speeds ranging from 110 to 300 bps (about 10 to 30 characters per second). Modems costing $400 or more can usually be switched to 1200 bps to speed up communications by a factor of four.

Remember that the computer at the other end of the phone line must be transmitting and receiving at the same speed as yours. You can't send and receive at 1200 bps if the other computer has only a 300 bps modem. Many electronic bulletin boards and commercial information services are capable of communicating at both 300 and 1200 bps. Some even recognize your baud rate when you first sign on and will adjust themselves accordingly. But you still have to set Plus/Term for the proper baud rate each time you run the program.

After you specify the baud rate, Plus/Term enters terminal mode. A blinking underline cursor will appear at the upper-left corner of the screen.

To see how terminal mode works, try typing these two sentences:

This is a test of the Plus/Term software. It is designed to provide lots of options for use with many systems.

Notice how Plus/Term handles words that are typed at the end of a line. Rather than splitting words, Plus/Term moves the entire word to the next line. This feature, known as *word-wrap,* makes text easier to read. It's found on most word processors.

You can turn word-wrap on or off at any time by calling up a menu. All the main features in Plus/Term are controlled from a main menu and its submenus. When you're in terminal mode, you can flip the screen to the main menu whenever you want by pressing the f7 special function key.

Plus/Term Main Menu

Here's what it looks like:

PARAMETERS
1. WORD LENGTH
2. STOP BITS
3. BAUD RATE
4. PARITY
5. DUPLEX
6. DEFINE KEY
7. TERMINAL OPTIONS
8. RETURN TO TERMINAL
9. RETURN TO BASIC

The first five options control communications parameters. Plus/Term defaults to these settings:

8-bit word length
1 stop bit
300 baud
No parity
Half duplex

Always set your modem to full duplex while using Plus/Term. That way you can control the duplex setting with the program. To change Plus/Term from half duplex to full duplex, press the 5 key to select option 5 from the main menu

(you'll want to change to full duplex whenever calling a BBS or an information service). The menu goes away and a submenu appears. Again, press the appropriate key to select the option you want (half or full duplex); your choice will be highlighted in reverse video. Press RETURN to go back to the main menu.

All the other options in Plus/Term work the same way. Just select an option from the main menu and another menu will usually appear.

If you change baud rates from within Plus/Term, all other parameters will appear on the various submenus to have reverted to their default values. The actual parameter settings will not have changed, just the values shown in the menus. Thus, if you change the baud rate after changing other parameters, the menus will no longer reflect the actual settings of the other parameters. For this reason you should always change the baud rate before changing any other parameters. Usually, you need to set the baud rate only when first running the program.

Never press RUN/STOP–RESTORE when the menu is on the screen. If you do, the program halts. You can restore it by typing POKE 648,4 and pressing RETURN, but you'll have to type blindly because the operating system thinks the screen is at a different location.

Terminal Mode Commands

You can return to terminal mode from the main menu by selecting option 8 (option 9 exits Plus/Term to BASIC). Notice that the text you left on the screen is still there.

Other keys besides f7 execute commands in terminal mode. You must press three keys simultaneously: Hold down SHIFT and CTRL, then press the appropriate command key (this sequence makes it possible for you to send special control codes in terminal mode by pressing CTRL and a character key). Here are the terminal mode commands:

CTRL-SHIFT-B Change background color
CTRL-SHIFT-F Change border color
CTRL-SHIFT-K Change text color
CTRL-SHIFT-O Open buffer (start storing characters in memory)
CTRL-SHIFT-C Close buffer (stop storing characters in memory)
CTRL-SHIFT-S Save buffer contents on disk or tape
CTRL-SHIFT-L Load buffer contents from disk or tape
CTRL-SHIFT-Z Zero (erase) buffer

Notice that some of these commands involve the manipulation of a *buffer.* A buffer is an area in memory set aside to store data. If the buffer is open (CTRL–SHIFT-O), all the characters sent and received by your computer are stored in memory. The contents of the buffer can then be saved on disk or tape or sent to a printer. This feature lets you *download* (receive) text files and programs from remote computers. You can also *upload* (send) files to other computers. We'll discuss these procedures in a moment.

The buffer is 30,720 bytes long (about 30K). The file you plan to upload or download must fit in the buffer, unless you handle it in pieces to be assembled later. If the buffer fills up when you're downloading, a screen prompt asks SAVE BUFFER, YES OR NO? *If you answer no, the contents of the buffer are erased.* Press CTRL-Q to continue your conversation with the other system.

Terminal Options

Option 7 on the main menu, TERMINAL OPTIONS, controls some of the most useful features of Plus/Term. Here's what the terminal options submenu looks like:

1. DIRECTORY (DISK)
2. COMM TO COMM
3. COMM TO ASCII
4. WORD WRAP
5. NORMAL SCREEN
6. PRINT BUFFER
7. LINEFEED WITH RETURN

Option 1 (DIRECTORY) simply lets you call a disk directory without leaving Plus/Term.

Options 2 and 3 (COMM TO COMM and COMM TO ASCII) toggle between each other. Option 3 is the default setting. Plus/Term normally translates Commodore codes into ASCII and vice versa. If you select option 2, Plus/Term stops converting Commodore codes to ASCII. This is useful when communicating with other Commodore systems or when transferring files, as we'll see in a moment. Option 3 also lets you save or load key redefinitions with a tape or disk drive. After you've customized the keys as described below, select option 3 and follow the screen prompts.

Options 4 and 5 (WORD WRAP and NORMAL SCREEN) also toggle back and forth to turn word-wrap on or off.

Option 6 (PRINT BUFFER) lets you access the most powerful features of Plus/Term. You can print the contents of the buffer on the screen or a printer, or send it through the RS-232 port (which may be connected to your modem or a serial printer). Whenever you're printing the buffer, you can pause the action by pressing the SHIFT key, slow it by pressing CTRL, or stop it by pressing the space bar. Since some printers may enter graphics mode if certain character codes are sent, you may need to modify the OPEN statement in line 1900 to lock your printer into text mode.

Option 7 (LINEFEED WITH RETURN) lets you disable the linefeed character that normally accompanies the RETURN character. Normally, when you press RETURN, two things happen: The cursor jumps to the left side of the screen and also moves down a line. The downward cursor movement is a linefeed. Some remote computers automatically send a linefeed when they receive a RETURN, so the extra linefeed is unnecessary. If option 7 is highlighted, the RETURN character will include a linefeed. Selecting this option toggles linefeeds on and off.

Customizing Plus/Term

We've already mentioned key redefinition briefly. This is a feature usually found only on the better terminal programs, and it requires some explanation. Basically, it lets you customize Plus/Term for communicating with a specific remote computer. To use this feature, select option 6 on the main menu.

Here's why it's important: When Plus/Term is in normal ASCII mode, all the characters you type are translated into the standard ASCII codes before they are sent over the phone line. This assumes that the other computer also is sending and receiving the same ASCII codes. But some computers occasionally depart from ASCII. For instance, some systems use ASCII code 127 as a delete character, while pressing the INST/DEL key on a Commodore 64 generates ASCII code 20. The result will be a failure to communicate.

Plus/Term lets you redefine any key on the keyboard to send out any ASCII code you want. To redefine the INST/DEL key to send the ASCII code 127 that the other computer expects instead of the ASCII code 20, you'd first select option 6 from the main menu. The following submenu appears:

CHANGE VALUES
1. GOING OUT
2. COMING IN

Since you want to change the value you're sending out, select option 1. A screen prompt asks you to press the key you want to redefine; press INST/DEL. Plus/Term tells you that the key currently sends an ASCII 20 and asks you to type in the code you want. Type 127 and press RETURN. The main menu reappears.

It's that easy. Now the INST/DEL key sends an ASCII 127 instead of 20.

Two-Way Translating

You're only half done, though. When Plus/Term sends the 127 over the phone line, the other computer will accept it as a delete key, all right. But then the remote computer echoes the code back to *your* computer (we won't get into the technical reasons). Plus/Term knows that it's supposed to send a 127 instead of a 20, but it doesn't know how to translate the 127 coming back into the 20 that your computer recognizes as a delete key. Instead of deleting characters on your screen, pressing INST/DEL would make back arrows appear.

The solution, as you may have guessed, is to customize Plus/Term further so that it translates the key in both directions. Select option 6 from the main menu again, then choose option 2 on the submenu (COMING IN). Now you can match the incoming code with the appropriate Commodore code. When the program asks you which code you want to change, type 127. When it asks you for the new value, type 20. Pressing RETURN brings you back to the main menu.

Don't forget that the function keys (except for f7, which calls the main menu) can also be redefined. If you want to save the new definitions so that you don't have to repeat the process each time you run Plus/Term, select option 3 from the terminal options menu as described above.

Uploading and Downloading

As we mentioned, one of Plus/Term's most powerful features is the ability to exchange files with other computers.

Downloading is as simple as opening the buffer (CTRL–SHIFT-O in terminal mode), clearing it out if necessary (CTRL–SHIFT-Z), and closing it when you've received every-

thing you want (CTRL–SHIFT-C). Then you can save the buffer on tape or disk by pressing CTRL–SHIFT-S, or print it out from the terminal options menu.

Since the RS-232 routines share zero page locations with the tape input/output routines, tape users must be offline to perform any type of tape I/O.

Frequently, when you attempt to download a program from a bulletin board or commercial information service, you will be asked whether you wish to use an *error checking protocol,* as described in the previous section entitled "Sending Programs over the Phone." You should specify that no protocol is to be used, since Plus/Term does not support error checking when downloading or uploading; it simply sends and receives files as continuous streams of text. Unless you have a particularly bad phone connection, this will usually be sufficient to successfully transfer the desired information.

To upload a file, reverse the process. Clear the buffer if necessary by pressing CTRL–SHIFT-Z; load the file you wish to transmit by pressing CTRL–SHIFT-L; go to the terminal options menu and select option 6 (PRINT BUFFER); and send the file to the RS-232 port, where your modem is connected.

However, there are some complications—imposed by the computer, not the program. Transferring text files is easy. Usually, they're already stored in ASCII format by the word processor, and they can be loaded into another word processor after the transfer is complete. But BASIC program files present a problem.

Most computers, including Commodores, can store programs on tape or disk in two formats: ASCII and *tokenized.* Tokenized files are abbreviated versions of ASCII files. A program must be tokenized before it will run on a 64. Unfortunately, the 64 lacks a command to load an ASCII file back into the computer and convert it to a tokenized file. After you transfer a program you won't be able to run it.

The Tokenizer Solution

To overcome this limitation, we've included a short tokenizer utility (Program 3) which converts ASCII files to tokenized files. However, it works only if you have a disk drive. Therefore, if you're using a tape drive, you can upload BASIC programs with Plus/Term, but you can't download them in a form your computer can execute.

To convert a tokenized BASIC program file into an ASCII file for uploading, use the following procedure. First, before running Plus/Term, load the program you wish to transfer into the computer. Then type the following and press RETURN:

OPEN 8,8,8,"0:*filename*,P,W":CMD8:LIST [for disk]
OPEN 8,1,1,"*filename*":CMD8:LIST [for tape]

(Replace *filename* with a filename that is different from the BASIC program that you just loaded.)

When the cursor returns, type the following and press RETURN:

PRINT#8:CLOSE8

The program has now been converted into a Commodore ASCII file which can be uploaded.

Sending a File

Now follow these steps:

1. Load and run Plus/Term and enter terminal mode.
2. Zero (erase) the buffer (press CTRL–SHIFT-Z).
3. Load your file into the buffer (press CTRL–SHIFT-L). A screen prompt will ask you to enter the filename, and another prompt will ask if you want to load from tape or disk.
4. When the tape stops, or when the disk stops whirring (and the red busy light goes off), close the buffer (press CTRL–SHIFT-C).
5. Establish your communications link with the remote computer (if you are using a disk drive, you could have done this during step 1, if desired). Notify the person at the other end of the line that you're ready to send the program file. The other system must be set to receive Commodore ASCII. If the other person has Plus/Term, both of you should adjust your parameters for COMM TO COMM (selection 2 on the terminal options menu described above). The person at the other end should then open and zero his or her buffer (CTRL–SHIFT-O and CTRL–SHIFT-Z).
6. Now press the f7 key to exit terminal mode and reach the main menu. Select option 7 to call up the terminal options menu. Choose option 6 (PRINT BUFFER) and send the file through the RS-232 port (where your modem is connected). After awhile, you'll be asked to press any key to continue. After you press a key, the transfer is complete.

As the file is transmitted, it is listed on the screen of the remote computer. When the word READY appears, the upload is finished. The buffer can then be closed (CTRL–SHIFT-C) and saved on tape or disk (CTRL–SHIFT-S). If the file is a BASIC program, remember to use the Tokenizer utility to convert it from ASCII to a tokenized file before running it.

Using the Tokenizer

Type in Program 3 with MLX. Use a starting address of 828 and ending address of 971.

To use the Tokenizer, load the file produced by MLX into memory (be sure to load it using ,8,1). Type NEW, press RETURN, type the following line, and press RETURN:

SYS 828,"0:*filename*"

(Substitute the *filename* for the file you wish to tokenize.)

The file should list on your screen and end with a SYNTAX ERROR message. This is normal; ignore the error. If the uploading/downloading process has been successful, you will have a ready-to-run BASIC program in memory that you can save on disk or tape.

80-Column Compatibility

Many mainframe computers expect communications terminals to display 80 columns of text per line, so they format output in that fashion. If you want an 80-column display, Plus/Term is compatible with the "Screen-80" program published in *COMPUTE!'s Third Book of Commodore 64.*

There are only a few operating differences in 80-column mode: Word-wrap doesn't work; any information on the screen is erased when you leave terminal mode to access the menu, and you must restart the computer to switch back to 40 columns. Otherwise, Plus/Term and Screen-80 make a good team.

Program 1. Plus/Term BASIC Portion

For mistake-proof program entry, be sure to use "The Automatic Proofreader," Appendix C.

```
100 CLOSE2:IF Q=0 THEN Q=1:LOAD"PLUS/TERM.ML",8,1
                                          :rem 127
110 POKE680,1:PRINT"{CLR}";:SYS 65517:IF PEEK(781)
    =22THEN LO=6144:QC=4608:GOTO130        :rem 16
120 LO = 50152:QC=52736                   :rem 122
```

```
130 FU = 787                                        :rem 18
135 POKE QC+19,0                                    :rem 77
140 NA = 831:RT$="{RVS}"                            :rem 148
150 WL$(1)="{RVS}":SB$(1)="{RVS}":PA$(1)="{RVS}":D
    I$(2)="{RVS}":CA$(2)="{RVS}":FS$(1)="{RVS}"
                                                    :rem 131
160 POKE53281,12:POKE53280,12:PRINT"{CLR}{BLK}":PO
    KE646,0:A$=CHR$(13)+"{DOWN}{10 RIGHT}"  :rem 25
170 PRINTCHR$(14);CHR$(8)                           :rem 161
180 IF PEEK(185)<>99THENFZ=1:GOTO200                :rem 106
190 SYSLO+6                                         :rem 149
200 SYS65517:IF PEEK(781)=22THEN A$=CHR$(13)+"
    {DOWN}":GOTO220                                 :rem 39
210 A$=CHR$(13)+"{DOWN}{10 RIGHT}"                  :rem 141
220 IF FZTHENFZ=0:GOTO540                           :rem 11
230 POKE53281,12:POKE53280,12:PRINT"{CLR}";A$;"
    {2 RIGHT}PARAMETERS"                            :rem 59
240 PRINTA$;"1. WORD LENGTH";A$;"2. STOP BITS";A$;
    "3. BAUD RATE";                                 :rem 94
250 PRINTA$;"4. PARITY";A$;"5. DUPLEX";A$;"6. DEFI
    NE KEY";                                        :rem 233
260 PRINTA$;"7. TERMINAL OPTIONS";A$;"8. RETURN TO
     TERMINAL";                                     :rem 149
270 PRINTA$;"9. RETURN TO BASIC"                    :rem 86
280 GET M1$:IF M1$=""THEN 280                       :rem 209
290 IF VAL(M1$)<1 OR VAL(M1$)>9 THEN 280            :rem 36
300 ON VAL(M1$) GOTO 310,450,540,710,860,970,1230,
    1760,1800                                       :rem 152
310 REM WORD LENGTH                                 :rem 118
320 PRINT"{CLR}";A$;"{3 RIGHT}{6 DOWN}WORD LENGTH"
                                                    :rem 211
330 PRINTA$;WL$(1);"{2 RIGHT}1. 8 DATA BITS"
                                                    :rem 168
340 PRINTA$;WL$(2);"{2 RIGHT}2. 7 DATA BITS"
                                                    :rem 170
350 PRINTA$;WL$(3);"{2 RIGHT}3. 6 DATA BITS"
                                                    :rem 172
360 PRINTA$;WL$(4);"{2 RIGHT}4. 5 DATA BITS"
                                                    :rem 174
370 POKE198,0                                       :rem 199
380 GET MA$:IF MA$=""THEN 380                       :rem 243
390 IF MA$=CHR$(13)THEN200                          :rem 145
400 FOR T= 1 TO 4:WL$(T)="":NEXT:WL$(VAL(MA$))= "
    {RVS}"                                          :rem 127
410 IF VAL(MA$)<1 OR VAL(MA$)>4 THEN 380            :rem 58
420 POKE659,(PEEK(659)AND159)OR((VAL(MA$)-1)*32)
                                                    :rem 136
430 POKE198,0                                       :rem 196
440 GOTO310                                         :rem 101
```

```
450 PRINT"{CLR}";A$;"{RIGHT}{11 DOWN}STOP BITS ";S
    B$(1);"1";"{OFF} OR ";SB$(2);"2";"{OFF}?";
                                              :rem 247
460 POKE198,0                                 :rem 199
470 GET MB$:IF MB$=""THEN470                  :rem 245
480 IF MB$=CHR$(13)THEN200                    :rem 146
490 FOR T= 1 TO 2:SB$(T)="":NEXT:SB$(VAL(MB$))= "
    {RVS}"                                    :rem 107
500 IF VAL(MB$)<1OR VAL(MB$)>2THEN470          :rem 58
510 IF VAL(MB$)=1THENPOKE659,(PEEK(659)AND127):GOT
    O 530                                     :rem 139
520 POKE659,PEEK(659)OR128                    :rem 236
530 POKE198,0:GOTO450                         :rem 209
540 PRINT"{CLR}";A$;"{UP}{RIGHT}BAUD RATES";A$;BR$
    (1);"1. 50 BAUD";                          :rem 20
550 PRINTA$;BR$(2);"2. 75 BAUD";A$;BR$(3);"3. 110
    {SPACE}BAUD";                             :rem 73
560 PRINTA$;BR$(4);"4. 134.5 BAUD";A$;BR$(5);"5. 1
    50 BAUD";                                 :rem 229
570 PRINTA$;BR$(6);"6. 300 BAUD";A$;BR$(7);"7. 600
     BAUD";                                   :rem 134
580 PRINTA$;BR$(8);"8. 1200 BAUD";A$;BR$(9);"9. 18
    00 BAUD";                                 :rem 242
590 PRINTA$;BR$(10);"10. 2400 BAUD";A$;        :rem 0
600 MC$="":INPUT"ENTER SELECTION";MC$         :rem 236
610 IF MC$=""THENMC$=STR$(PEEK(645))          :rem 254
620 IF VAL(MC$)<1OR VAL(MC$)>10THEN540        :rem 108
630 SYS65517:IFPEEK(781)=22THEN POKE659,(PEEK(659)
    AND240)ORVAL(MC$)                         :rem 171
640 TM(1)=50:TM(2)=75:TM(3)=110:TM(4)=134.5:TM(5)=
    150:TM(6)=300:TM(7)=600                   :rem 200
650 TM(8)=1225:TM(9)=1800:TM(10)=2400         :rem 199
660 NT=1022730/TM(VAL(MC$))*.5-100:POKE662,NT/256
                                              :rem 207
670 POKE661,(NT/256-INT(NT/256))*256:POKE645,VAL(M
    C$):CLOSE2                                :rem 240
680 OPEN2,2,3,CHR$(PEEK(659))+CHR$(PEEK(660))+CHR$
    (PEEK(661))+CHR$(PEEK(662))                :rem 7
690 FOR T= 1 TO 10:BR$(T)="":NEXT:BR$(PEEK(645))=
    {SPACE}"{RVS}"                            :rem 200
700 GOTO110                                    :rem 98
710 PRINT"{CLR}";A$;"{5 DOWN}PARITY";A$;PA$(1);"1.
     NO PARITY";                              :rem 234
720 PRINTA$;PA$(2);"2. ODD PAR SNT/RCVD";      :rem 37
730 PRINTA$;PA$(3);"3. EVN PARITY";           :rem 221
740 PRINTA$;PA$(4);"4. MRK PAR SNT/NO CHK";
                                              :rem 130
750 PRINTA$;PA$(5);"5. SPC PAR SNT/NO CHK";
                                              :rem 129
760 GET MD$:IF MD$=""THEN 760                 :rem 253
```

```
770 IF MD$=CHR$(13)THEN200                          :rem 150
780 FOR T= 1 TO 5:PA$(T)="":NEXT:PA$(VAL(MD$))= "
    {RVS}"                                          :rem 106
790 IF VAL(MD$)<1OR VAL(MD$)>5THEN760               :rem 78
800 ON VAL(MD$)GOTO 805,810,820,830,840             :rem 14
805 POKE 660,PEEK(660)AND 31:GOTO 850               :rem 237
810 POKE660,(PEEK(660)AND31)OR32:GOTO850            :rem 64
820 POKE660,(PEEK(660)AND31)OR96:GOTO850            :rem 75
830 POKE660,(PEEK(660)AND31)OR160:GOTO850           :rem 116
840 POKE660,(PEEK(660)AND31)OR224                   :rem 102
850 GOTO710                                         :rem 110
860 PRINT"{CLR}";A$;"{6 DOWN}{4 RIGHT}DUPLEX";A$;
                                                    :rem 168
870 IF PEEK(787)THENDI$(1)="{RVS}":DI$(2)="":GOTO8
    90                                              :rem 66
880 DI$(1)="":DI$(2)="{RVS}"                        :rem 85
890 PRINT DI$(1);"1. FULL DUPLEX";A$;DI$(2)"2. HAL
    F DUPLEX"                                       :rem 228
900 GET ME$:IF ME$=""THEN900                        :rem 247
910 IF ME$=CHR$(13)THEN200                          :rem 147
920 FOR T= 1 TO 2:DI$(T)="":NEXT:DI$(VAL(ME$))= "
    {RVS}"                                          :rem 92
930 IF VAL(ME$)<1OR VAL(ME$)>2THEN900               :rem 69
940 IF VAL(ME$)=1THENPOKE660,PEEK(660)AND239:POKEF
    U,1:GOTO960                                     :rem 160
950 POKE660,PEEK(660)OR16:POKE FU,0                 :rem 15
960 GOTO860                                         :rem 118
970 PRINT"{CLR}";A$"{6 DOWN}CHANGE VALUES";A$;
                                                    :rem 159
980 PRINT"1. GOING OUT";A$;"2. COMING IN";          :rem 75
990 GET MF$:IF MF$=""THEN990                        :rem 11
1000 IF MF$=CHR$(13)THEN200                         :rem 187
1010 IF VAL(MF$)<1ORVAL(MF$)>2THEN990               :rem 118
1020 ONVAL(MF$)GOTO 1030,1120                       :rem 56
1030 PRINT"{CLR}{8 DOWN}";"PRESS THE KEY YOU WANT
     {SPACE}TO CHANGE":POKE198,0                    :rem 109
1040 GET KY$:IF KY$=""THEN1040                      :rem 115
1050 KY = PEEK(QC+256+ASC(KY$))                     :rem 148
1060 PRINT"{4 DOWN}THAT SENDS A CHR$(";             :rem 47
1070 PRINTRIGHT$(STR$(KY),LEN(STR$(KY))-1)+")"
                                                    :rem 190
1080 INPUT"{4 DOWN}REPLACE WITH";RK$                :rem 21
1090 IF VAL(RK$)>255THEN 1030                       :rem 27
1100 POKEQC+256+ASC(KY$),VAL(RK$)                   :rem 137
1110 GOTO 200                                       :rem 142
1120 INPUT"{CLR}{8 DOWN}CODE TO CHANGE";IC$ :rem 2
1130 IF IC$=""THEN970                               :rem 84
1140 IF VAL(IC$)>255ORVAL(IC$)=0 THEN 1120:rem 248
1150 PRINT"{4 DOWN}NOW A CHR$(";                    :rem 117
1160 IC = PEEK(QC+VAL(IC$))                         :rem 170
```

```
1170 PRINTRIGHT$(STR$(IC),LEN(STR$(IC))-1)+")"
                                          :rem 143
1180 INPUT "{4 DOWN}CHANGE TO CHR$";NK$    :rem 36
1190 IF NK$=""THEN970                      :rem 103
1200 IF VAL(NK$)>255THEN 1120              :rem 16
1210 POKE QC+VAL(IC$),VAL(NK$)             :rem 179
1220 GOTO200                               :rem 144
1230 PRINT "{CLR}";A$;"{4 DOWN}{4 RIGHT}OPTIONS";A
     $;"1. DIRECTORY (DISK)";              :rem 23
1240 PRINTA$;CA$(1);"2. COMM TO COMM";     :rem 51
1250 PRINTA$;CA$(2);"3. COMM TO ASCII";    :rem 115
1260 PRINTA$;FS$(1);"4. WORD WRAP";        :rem 199
1270 PRINTA$;FS$(2);"5. NORMAL SCREEN";    :rem 221
1280 PRINTA$;"6. PRINT BUFFER";            :rem 34
1290 PRINTA$;RT$;"7. LINEFEED W/ RETURN"   :rem 73
1300 GET OP$:IF OP$=""THEN 1300            :rem 103
1310 IF OP$=CHR$(13)THEN200                :rem 203
1320 IF VAL(OP$)=2THENCA$(1)="{RVS}":CA$(2)=""
                                          :rem 141
1330 IF VAL(OP$)=3THENCA$(2)="{RVS}":CA$(1)=""
                                          :rem 143
1340 IF VAL(OP$)=4THENFS$(1)="{RVS}":FS$(2)=""
                                          :rem 187
1350 IF VAL(OP$)=5THENFS$(2)="{RVS}":FS$(1)=""
                                          :rem 189
1360 IF VAL(OP$)=7 THEN POKE 680,-(PEEK(680)=0)
                                          :rem 235
1370 IF PEEK(680)THENRT$="{RVS}":GOTO1390  :rem 58
1380 RT$=""                                :rem 23
1390 IF VAL(OP$)<1OR VAL(OP$)>7THEN1300    :rem 192
1400 ON VAL(OP$)GOTO 1410,1540,1550,1780,1790,1810
     ,1230                                 :rem 38
1410 PRINT"{CLR}":OPEN1,8,0,"$0"           :rem 75
1420 GET #1,T$,T$                          :rem 67
1430 GET #1,T$,T$                          :rem 68
1440 S=ST:IF S<>0 THENCLOSE1:GOTO 1500     :rem 213
1450 GET #1,LU$,HI$:                       :rem 10
1460 LU=ASC(LU$+CHR$(0)):HI=ASC(HI$+CHR$(0)):LN=LU
     +HI*256:LN$=MID$(STR$(LN),2)          :rem 244
1470 PRINTLN$+" ";                         :rem 193
1480 GET#1,B$:IF B$="" THEN PRINT:GOTO1430 :rem 58
1490 PRINTB$;:GOTO1480                     :rem 60
1500 OPEN15,8,15:INPUT#15,EN,EM$,ET,ES:CLOSE15:IF
     {SPACE}ENTHENPRINTEN;EM$;ET;ES        :rem 42
1510 PRINT"{RVS}PRESS RETURN TO CONTINUE{OFF}"
                                          :rem 177
1520 GET T$:IF T$<>CHR$(13)THEN1520        :rem 136
1530 GOTO1230                              :rem 200
1540 POKE NA,1:GOTO1230                    :rem 30
```

```
1550 POKENA,0                                    :rem 229
1560 PRINT"{CLR}{6 DOWN}";A$;"ASCII OPTIONS";A$;"1
     . LOAD CONFIG";                             :rem 217
1570 PRINTA$;"2. SAVE CONFIG";A$;                 :rem 94
1580 PRINT"3. RETURN TO MENU"                     :rem 184
1590 GET CN$:IF CN$=""THEN1590                    :rem 97
1600 IF VAL(CN$)<1ORVAL(CN$)>3THEN1590            :rem 165
1610 ON VAL(CN$)GOTO1620,1630,1640                :rem 61
1620 GOSUB 1650:SYS PEEK(764)+256*PEEK(765):GOSUB1
     740:GOTO1230                                 :rem 46
1630 GOSUB 1650:SYS PEEK(766)+256*PEEK(767):GOSUB1
     740:GOTO1230                                 :rem 51
1640 GOTO1230                                     :rem 202
1650 PRINT"{CLR}";A$;"{RVS}D{OFF}ISK OR {RVS}T
     {OFF}APE";A$;                               :rem 104
1660 GET DV$:IF DV$<>"T"ANDDV$<>"D"THEN1660
                                                  :rem 147
1670 INPUT"FILENAME";FI$                          :rem 209
1680 IF LEN(FI$)>16THEN 1670                      :rem 227
1690 IF LEFT$(DV$,1)="D"THEN D=8:GOTO 1710  :rem 3
1700 D=1                                          :rem 122
1710 FOR T= 684 TO 684+LEN(FI$)-1:POKET,ASC(MID$(F
     I$,T-683,1)):NEXT                           :rem 203
1720 POKE679,D:POKE763,D:POKE681,LEN(FI$):POKE682,
     172:POKE683,2                               :rem 214
1730 RETURN                                       :rem 171
1740 OPEN15,8,15:INPUT#15,EN,EM$,ET,ES:CLOSE15:PRI
     NT:IFENTHENPRINTEN;EM$;ET;ES                 :rem 247
1750 FOR T=1 TO 1500:NEXT:RETURN                  :rem 114
1760 PRINT"{CLR}":SYSLO                             :rem 6
1770 GOTO2000                                     :rem 154
1780 POKE703,0:GOTO1230                            :rem 46
1790 POKE703,1:GOTO1230                            :rem 48
1800 END                                          :rem 160
1810 BY=PEEK(706)+256*PEEK(707)-(PEEK(55)+256*PEEK
     (56)):PRINT"{CLR}{DOWN}";A$;BY;              :rem 76
1820 PRINT"BYTES IN BUFFER";A$;:PRINT" TOTAL BYTES
     ";                                          :rem 160
1830 PRINT(PEEK(249)+256*PEEK(250))-(PEEK(55)+256*
     PEEK(56))                                   :rem 239
1840 PRINTA$;"PRINT TO"                           :rem 110
1850 PRINTA$;"1. RETURN";A$;"2. RS232 ";A$;"3. SCR
     EEN";A$;"4. PRINTER";                        :rem 89
1860 GET ZE$:ZE=VAL(ZE$):IF ZE<1OR ZE>4 THEN 1860
                                                   :rem 4
1870 PRINT"{CLR}":IF ZE=1 THEN1230               :rem 255
1880 IF ZE=2 THEN 1910                            :rem 104
1890 IF BY=0THEN1990                              :rem 107
1900 OPEN5,ZE,7                                    :rem 95
```

```
1910 FOR T = PEEK(55)+256*PEEK(56)TO(PEEK(706)+256
     *PEEK(707))-1:POKE212,0                    :rem 187
1920 IF PEEK(653)=1 THEN1920                    :rem 216
1930 IF PEEK(197)=60THENFORT=0TO0               :rem 192
1940 IF PEEK(653)=4 THEN FOR J= 1 TO 1000:NEXT
                                                :rem 141
1950 IF ZE = 2 THENPRINT#2,CHR$(PEEK(T));:GOTO1970
                                                 :rem 68
1960 PRINT#5,CHR$(PEEK(T));                      :rem 56
1970 NEXT                                        :rem 16
1980 IF ZE<>2 THEN PRINT#5:CLOSE 5              :rem 165
1990 POKE198,0:PRINTA$;"PRESS ANY KEY TO CONT"
                                                :rem 224
2000 GET J$:IF J$=""THEN2000                    :rem 185
2010 GOTO 1230                                  :rem 194
```

Program 2. Plus/Term ML Portion

Refer to the "MLX" article in Appendix D before entering this listing.

```
50152 :032,075,204,076,251,196,042
50158 :169,000,141,100,196,141,217
50164 :103,196,141,084,205,133,082
50170 :002,141,191,002,141,063,022
50176 :003,169,231,141,252,002,030
50182 :169,204,141,253,002,169,176
50188 :008,141,254,002,169,205,023
50194 :141,255,002,169,001,141,215
50200 :021,208,169,006,141,033,090
50206 :208,173,038,003,201,210,095
50212 :208,015,173,039,003,201,163
50218 :002,208,008,169,001,141,059
50224 :094,205,076,127,196,169,147
50230 :000,141,094,205,169,004,155
50236 :141,136,002,169,023,141,160
50242 :024,208,169,003,013,002,229
50248 :221,141,002,221,169,003,061
50254 :013,000,221,141,000,221,162
50260 :120,169,051,133,001,169,215
50266 :208,141,101,196,141,104,213
50272 :196,160,000,185,255,255,123
50278 :153,255,255,200,208,247,140
50284 :238,101,196,238,104,196,157
50290 :173,104,196,201,224,208,196
50296 :234,169,055,133,001,088,032
50302 :152,162,064,157,064,003,216
50308 :202,016,250,169,255,141,141
50314 :085,003,169,013,141,248,029
50320 :007,032,168,196,169,000,204
50326 :141,194,002,133,055,141,048
```

```
50332 :019,003,169,038,133,056,062
50338 :141,195,002,076,008,197,013
50344 :160,255,152,192,219,176,042
50350 :024,192,193,144,006,056,021
50356 :233,128,076,201,196,192,182
50362 :065,144,012,192,096,176,103
50368 :006,024,105,032,076,201,124
50374 :196,169,000,153,000,207,155
50380 :136,192,255,208,217,160,092
50386 :255,152,192,128,176,024,113
50392 :192,096,144,006,056,233,175
50398 :032,076,242,196,192,065,001
50404 :144,012,192,091,176,008,083
50410 :024,105,128,076,242,196,237
50416 :169,000,153,000,206,136,136
50422 :192,255,208,217,096,174,108
50428 :094,205,240,008,169,147,091
50434 :141,085,205,032,248,201,146
50440 :032,048,200,032,204,255,011
50446 :032,228,255,201,000,208,170
50452 :003,076,202,197,141,107,234
50458 :205,201,136,208,006,072,086
50464 :032,175,203,104,096,174,048
50470 :141,002,224,005,208,115,221
50476 :201,015,208,011,162,001,130
50482 :142,098,205,032,248,197,204
50488 :076,202,197,201,003,208,175
50494 :011,169,000,141,098,205,174
50500 :032,028,198,076,202,197,033
50506 :201,026,208,016,169,000,182
50512 :141,194,002,165,056,141,011
50518 :195,002,032,066,198,076,143
50524 :202,197,201,019,208,006,157
50530 :032,124,198,076,202,197,159
50536 :201,012,208,006,032,185,236
50542 :199,076,202,197,201,002,219
50548 :208,006,238,033,208,076,117
50554 :202,197,201,011,208,006,179
50560 :238,134,002,076,202,197,209
50566 :201,006,208,006,238,032,057
50572 :208,076,202,197,201,021,021
50578 :208,011,173,024,208,073,075
50584 :002,141,024,208,076,202,037
50590 :197,162,002,032,201,255,239
50596 :173,107,205,072,168,174,039
50602 :063,003,208,006,185,000,123
50608 :207,076,182,197,104,072,246
50614 :032,210,255,104,172,019,206
50620 :003,208,011,141,085,205,073
50626 :072,032,204,255,104,032,125
```

```
50632 :106,201,032,048,200,032,051
50638 :204,255,162,002,032,198,035
50644 :255,032,228,255,201,000,159
50650 :208,003,076,008,197,174,116
50656 :063,003,208,006,041,127,160
50662 :168,185,000,206,141,085,247
50668 :205,072,032,204,255,104,084
50674 :032,106,201,076,008,197,094
50680 :160,000,152,072,185,013,062
50686 :198,141,085,205,032,248,139
50692 :201,104,168,200,192,015,116
50698 :208,238,096,013,091,066,210
50704 :085,070,070,069,082,032,168
50710 :079,080,069,078,093,013,178
50716 :160,000,152,072,185,049,134
50722 :198,141,085,205,032,248,175
50728 :201,104,168,200,192,017,154
50734 :208,238,096,013,091,066,246
50740 :085,070,070,069,082,032,204
50746 :067,076,079,083,069,068,244
50752 :093,013,160,000,152,072,042
50758 :185,087,198,141,085,205,203
50764 :032,248,201,104,168,200,005
50770 :192,017,208,238,096,013,078
50776 :091,066,085,070,070,069,027
50782 :082,032,090,069,082,079,016
50788 :069,068,093,013,160,000,247
50794 :152,072,185,236,199,141,067
50800 :085,205,032,248,201,104,219
50806 :168,200,192,014,208,238,114
50812 :160,000,152,072,185,251,176
50818 :199,141,085,205,032,248,016
50824 :201,104,168,200,192,013,246
50830 :208,238,032,228,255,240,063
50836 :251,201,089,240,007,201,113
50842 :078,208,243,076,106,199,040
50848 :169,000,141,095,205,160,162
50854 :000,152,072,185,009,200,016
50860 :141,085,205,032,248,201,060
50866 :104,168,200,192,011,208,037
50872 :238,032,204,255,160,000,049
50878 :140,101,205,032,048,200,148
50884 :032,228,255,201,000,240,128
50890 :246,201,013,240,048,201,127
50896 :020,208,011,172,101,205,157
50902 :240,233,206,101,205,076,251
50908 :239,198,201,031,144,223,232
50914 :201,090,176,219,172,101,161
50920 :205,153,238,002,238,101,145
50926 :205,141,085,205,032,248,130
```

```
50932 :201,172,101,205,192,016,107
50938 :240,197,076,193,198,172,046
50944 :101,205,140,099,205,160,142
50950 :000,185,020,200,141,085,125
50956 :205,140,100,205,032,248,174
50962 :201,172,100,205,200,192,064
50968 :014,208,236,032,228,255,229
50974 :240,251,201,084,240,007,029
50980 :201,068,240,008,076,027,144
50986 :199,162,001,076,050,199,217
50992 :162,008,169,010,160,000,045
50998 :032,186,255,173,099,205,236
51004 :162,238,160,002,032,189,075
51010 :255,169,000,141,021,208,092
51016 :169,147,032,210,255,169,030
51022 :147,141,085,205,032,248,168
51028 :201,174,095,205,208,029,228
51034 :169,000,141,021,208,174,035
51040 :194,002,172,195,002,169,062
51046 :055,032,216,255,165,055,112
51052 :141,194,002,165,056,141,039
51058 :195,002,076,142,199,169,129
51064 :000,166,055,164,056,032,081
51070 :213,255,142,194,002,140,048
51076 :195,002,162,000,134,055,168
51082 :160,038,132,056,169,001,182
51088 :141,021,208,169,000,162,077
51094 :064,157,064,003,202,016,144
51100 :250,169,255,141,085,003,035
51106 :160,003,185,181,199,141,007
51112 :085,205,152,072,032,248,194
51118 :201,104,168,136,016,240,015
51124 :096,013,075,079,013,160,104
51130 :000,140,101,205,185,034,083
51136 :200,141,085,205,032,248,079
51142 :201,238,101,205,172,101,192
51148 :205,192,014,208,234,032,065
51154 :228,255,201,000,240,249,103
51160 :201,089,240,007,201,078,008
51166 :240,138,076,209,199,162,222
51172 :001,141,095,205,032,165,099
51178 :198,096,013,091,066,085,015
51184 :070,070,069,082,032,070,121
51190 :085,076,076,093,013,013,090
51196 :083,065,086,069,032,089,164
51202 :032,079,082,032,078,063,112
51208 :013,013,070,073,076,069,066
51214 :078,065,077,069,058,013,118
51220 :013,084,065,080,069,032,107
51226 :079,082,032,068,073,083,187
```

```
51232 :075,013,013,076,079,065,097
51238 :068,032,089,032,079,082,164
51244 :032,078,063,013,174,094,242
51250 :205,240,006,162,000,141,036
51256 :021,208,096,173,054,205,045
51262 :048,015,201,040,144,024,022
51268 :169,000,141,054,205,238,107
51274 :055,205,076,092,200,238,172
51280 :054,205,206,055,205,048,085
51286 :023,169,039,141,054,205,205
51292 :173,055,205,048,013,201,019
51298 :025,144,012,206,055,205,233
51304 :032,234,232,076,113,200,223
51310 :238,055,205,169,000,141,150
51316 :051,205,173,054,205,010,046
51322 :010,141,050,205,014,050,080
51328 :205,046,051,205,024,173,064
51334 :050,205,105,024,141,000,147
51340 :208,173,051,205,105,000,114
51346 :141,016,208,173,055,205,176
51352 :010,010,010,141,086,205,102
51358 :024,173,086,205,105,050,033
51364 :141,001,208,165,162,201,018
51370 :014,144,013,133,162,173,041
51376 :033,208,041,015,141,039,141
51382 :208,076,192,200,173,134,141
51388 :002,141,039,208,165,162,137
51394 :201,028,144,004,169,000,228
51400 :133,162,172,055,205,185,088
51406 :240,236,133,209,185,056,241
51412 :205,133,210,096,172,054,058
51418 :205,177,209,201,032,208,226
51424 :003,076,105,201,162,000,003
51430 :177,209,157,169,003,072,249
51436 :024,165,210,105,212,133,061
51442 :210,177,209,157,129,003,103
51448 :056,165,210,233,212,133,233
51454 :210,136,232,224,039,240,055
51460 :011,104,201,032,208,220,012
51466 :142,053,205,076,020,201,195
51472 :104,076,105,201,174,053,217
51478 :205,200,169,032,145,209,214
51484 :200,202,208,248,173,055,090
51490 :205,201,024,208,006,032,198
51496 :234,232,206,055,205,238,186
51502 :055,205,169,000,141,054,158
51508 :205,174,053,205,168,202,035
51514 :202,189,169,003,141,083,077
51520 :205,024,165,210,105,212,217
51526 :133,210,189,129,003,141,107
```

```
51532 :134,002,072,152,072,138,134
51538 :072,032,093,202,104,170,243
51544 :104,168,104,056,165,210,127
51550 :233,212,133,210,200,202,004
51556 :016,213,206,054,205,096,122
51562 :174,098,205,208,003,076,102
51568 :248,201,160,000,141,085,179
51574 :205,166,251,142,096,205,159
51580 :166,252,142,097,205,174,136
51586 :194,002,134,251,174,195,056
51592 :002,134,252,145,251,072,224
51598 :174,096,205,134,251,174,152
51604 :097,205,134,252,056,165,033
51610 :249,237,194,002,141,088,041
51616 :205,165,250,237,195,002,190
51622 :013,088,205,208,021,162,095
51628 :002,032,201,255,169,019,082
51634 :032,210,255,032,204,255,142
51640 :032,104,198,032,066,198,046
51646 :104,096,104,201,020,240,187
51652 :011,238,194,002,208,046,127
51658 :238,195,002,076,248,201,138
51664 :141,085,205,173,194,002,240
51670 :229,055,141,088,205,173,081
51676 :195,002,229,056,013,088,035
51682 :205,240,019,072,056,173,223
51688 :194,002,233,001,141,194,229
51694 :002,173,195,002,233,000,075
51700 :141,195,002,104,173,085,176
51706 :205,174,094,205,240,072,216
51712 :162,000,142,021,208,201,222
51718 :013,240,008,162,001,142,060
51724 :244,173,076,043,202,162,144
51730 :001,142,244,173,072,120,002
51736 :162,054,134,001,032,210,105
51742 :164,032,068,168,032,125,107
51748 :164,162,055,134,001,088,128
51754 :104,174,102,205,134,251,244
51760 :174,103,205,134,252,032,180
51766 :210,002,166,251,142,102,159
51772 :205,166,252,142,103,205,109
51778 :162,000,142,244,173,096,115
51784 :173,085,205,201,032,144,144
51790 :091,201,127,144,007,201,081
51796 :160,176,003,076,170,202,103
51802 :032,065,203,172,055,205,054
51808 :185,240,236,133,209,185,004
51814 :056,205,133,210,172,054,164
51820 :205,173,084,205,240,010,001
51826 :173,083,205,009,128,145,089
```

```
51832 :209,076,129,202,173,083,224
51838 :205,145,209,024,165,210,060
51844 :105,212,133,210,173,134,075
51850 :002,145,209,056,165,210,157
51856 :233,212,133,210,173,054,135
51862 :205,201,039,208,008,174,217
51868 :191,002,208,003,032,216,040
51874 :200,238,054,205,032,048,171
51880 :200,096,173,085,205,201,104
51886 :032,176,074,201,010,208,107
51892 :003,238,055,205,201,013,127
51898 :208,005,072,032,155,203,093
51904 :104,201,014,208,010,072,033
51910 :169,002,013,024,208,141,243
51916 :024,208,104,201,017,208,198
51922 :003,238,055,205,201,018,162
51928 :208,005,162,001,142,084,050
51934 :205,201,019,208,008,162,001
51940 :000,142,054,205,142,055,058
51946 :205,201,020,208,005,072,177
51952 :032,085,203,104,201,029,126
51958 :208,003,238,054,205,201,131
51964 :141,208,005,072,032,155,097
51970 :203,104,201,142,208,010,102
51976 :072,173,024,208,041,253,011
51982 :141,024,208,104,201,145,069
51988 :208,003,206,055,205,201,130
51994 :146,208,005,162,000,142,177
52000 :084,205,201,147,208,016,125
52006 :072,032,068,229,169,000,096
52012 :141,054,205,141,055,205,077
52018 :032,048,200,104,201,157,024
52024 :208,003,206,054,205,032,252
52030 :048,200,096,173,085,205,101
52036 :072,041,128,074,141,087,099
52042 :205,104,041,063,013,087,075
52048 :205,141,083,205,096,172,214
52054 :055,205,185,240,236,133,116
52060 :209,185,056,205,133,210,066
52066 :172,054,205,240,051,056,108
52072 :169,039,237,054,205,170,210
52078 :177,209,136,145,209,200,162
52084 :024,165,210,105,212,133,197
52090 :210,177,209,136,145,209,184
52096 :056,165,210,233,212,133,113
52102 :210,200,200,202,224,255,145
52108 :208,224,169,032,160,039,204
52114 :145,209,206,054,205,032,229
52120 :048,200,096,174,168,002,072
52126 :240,003,238,055,205,169,044
```

```
52132 :000,141,054,205,141,084,021
52138 :205,032,048,200,096,173,156
52144 :094,205,240,003,076,074,100
52150 :204,174,054,205,140,090,025
52156 :205,172,055,205,140,089,030
52162 :205,162,002,032,201,255,027
52168 :169,019,032,210,255,032,149
52174 :204,255,169,216,141,229,140
52180 :203,169,000,141,228,203,132
52186 :168,141,231,203,169,176,026
52192 :141,232,203,185,255,255,215
52198 :153,255,255,056,173,228,070
52204 :203,233,232,141,088,205,058
52210 :173,229,203,233,219,013,032
52216 :088,205,240,017,238,228,240
52222 :203,238,231,203,208,223,024
52228 :238,229,203,238,232,203,067
52234 :076,227,203,169,000,141,058
52240 :021,208,169,192,141,136,115
52246 :002,173,000,221,041,252,199
52252 :141,000,221,173,024,208,027
52258 :041,015,141,024,208,173,124
52264 :033,208,141,091,205,173,123
52270 :032,208,141,092,205,173,129
52276 :134,002,141,093,205,160,019
52282 :025,185,217,000,153,000,126
52288 :180,185,000,181,153,217,212
52294 :000,136,016,241,096,173,220
52300 :094,205,208,250,169,176,154
52306 :141,119,204,169,000,141,088
52312 :118,204,168,162,002,032,006
52318 :201,255,169,017,032,210,210
52324 :255,032,204,255,141,121,084
52330 :204,169,216,141,122,204,138
52336 :120,169,054,133,001,185,006
52342 :255,255,153,255,255,056,067
52348 :173,121,204,233,233,141,205
52354 :088,205,173,122,204,233,131
52360 :219,013,088,205,240,034,167
52366 :238,118,204,238,121,204,241
52372 :208,223,238,119,204,238,098
52378 :122,204,076,117,204,160,013
52384 :025,185,217,000,153,000,228
52390 :181,185,000,180,153,217,058
52396 :000,136,016,241,169,055,021
52402 :133,001,088,173,091,205,101
52408 :141,033,208,173,093,205,013
52414 :141,134,002,173,092,205,169
52420 :141,032,208,169,004,141,123
52426 :136,002,169,001,141,021,160
```

```
52432 :208,169,003,013,002,221,056
52438 :141,002,221,169,003,013,251
52444 :000,221,141,000,221,169,204
52450 :023,141,024,208,096,173,123
52456 :167,002,174,251,002,160,220
52462 :001,032,186,255,173,169,030
52468 :002,162,172,160,002,032,006
52474 :189,255,169,000,170,160,169
52480 :206,032,213,255,032,147,117
52486 :199,096,173,167,002,174,049
52492 :251,002,160,001,032,186,132
52498 :255,173,169,002,162,172,183
52504 :160,002,032,189,255,169,063
52510 :206,133,254,169,000,133,157
52516 :253,169,253,162,255,160,008
52522 :207,032,216,255,032,147,163
52528 :199,096,000,000,000,000,087
52534 :000,000,004,004,004,004,070
52540 :004,004,004,005,005,005,087
52546 :005,005,005,006,006,006,099
52552 :006,006,006,006,007,007,110
52558 :007,007,007,000,255,013,111
```

Program 3. Tokenizer (Disk Only)

Refer to the "MLX" article in Appendix D before entering this listing.

```
828 :032,237,255,224,022,240,046
834 :012,032,253,174,032,158,215
840 :173,032,130,183,076,095,249
846 :003,032,253,206,032,158,250
852 :205,032,130,215,166,034,098
858 :164,035,032,189,255,166,163
864 :034,164,035,032,189,255,037
870 :169,032,162,008,160,008,129
876 :032,186,255,032,192,255,036
882 :169,125,141,036,003,169,245
888 :003,141,037,003,096,008,152
894 :138,072,152,072,169,008,225
900 :032,180,255,169,104,032,136
906 :150,255,032,165,255,141,112
912 :203,003,032,171,255,165,205
918 :144,240,026,169,032,032,025
924 :195,255,032,138,255,169,176
930 :008,032,177,255,169,232,011
936 :032,147,255,032,174,255,039
942 :169,013,141,203,003,173,108
948 :204,003,208,010,173,203,213
954 :003,201,013,240,003,032,166
960 :210,255,104,168,104,170,179
966 :040,173,203,003,096,000,201
```

Appendices

A
Online Services

BRS/After Dark
Bibliographic Retrieval Service
1200 Route 7
Latham, NY 12110
(800) 345-4277 in New York State, Canada, and Hawaii
(800) 833-4707 in the rest of continental U.S.
(518) 783-7251 in Alaska

CompuServe
5000 Arlington Centre Boulevard
P. O. Box 20212
Columbus, OH 43220
(800) 848-8199 in continental U.S. (except Ohio)
(614) 457-0802 in Ohio and outside continental U.S.

Delphi
General Videotex Corporation
3 Blackstone Street
Cambridge, MA 02139
(617) 491-3393

Dialog's Knowledge Index
Dialog Information Services, Inc.
3460 Hillview Avenue
Palo Alto, CA 94304
(800) 528-6050, ext. 415

Dow Jones News/Retrieval
P. O. Box 300
Princeton, NJ 08540
(800) 257-5114 in continental U.S. (except New Jersey)
(609) 452-1511 in New Jersey and outside continental U.S.

LEXIS, NEXIS
Mead Data Central
P. O. Box 933
Dayton, OH 45401
(800) 227-4908

MCI Mail
Box 1001
1900 M Street, N.W.
Washington, DC 20036
(800) 624-2255

NewsNet
NewsNet, Inc.
945 Haverford Road
Bryn Mawr, PA 19010
(800) 345-1301
(215) 527-8030 in Pennsylvania

PLATO Homelink
Control Data Corporation
P.O. Box 1305
McLean, VA 22102
(800) 328-7104 in continental U.S. except Virginia and Hawaii
(703) 821-6888 in Virginia and Hawaii

SDC/ORBIT
2500 Colorado Avenue
Santa Monica, CA 90406
(213) 820-4111
(800) 421-7229

Source Telecomputing Corporation
1616 Anderson Road
McLean, VA 22102
(800) 336-3366 in continental U.S. (except Virginia)
(800) 562-2070 in Virginia
(703) 821-6666 outside continental U.S.

B
How to Type In Programs

Some of the programs in this book contain special control characters (such as cursor controls, color keys, and reverse video). To make it easy to know exactly what to type when you enter one of these programs into your computer, we have established the following listing conventions.

Generally, Commodore 64 program listings contain words within braces which spell out any special characters: {DOWN} means to press the cursor-down key; {5 SPACES} means to press the space bar five times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing the other key), the key will be underlined in our listings. For example, S means to type the S key while holding the SHIFT key. This will appear on your screen as a heart symbol. If you find an underlined key enclosed in braces, for example, {10 N}, you should type the key as many times as indicated. In this case, you would enter ten shifted N's.

If a key is enclosed in special brackets, [<>], you should hold down the *Commodore key* while pressing the key inside the special brackets. (The Commodore key is the key in the lower-left corner of the keyboard.) Again, if the key is preceded by a number, you should press the key as many times as necessary.

Quote Mode

You know that you can move the cursor around the screen with the CRSR keys. Sometimes a programmer will want to move the cursor under program control. That's why you see all the {LEFT}'s, {HOME}'s, and {BLU}'s in our programs. The only way the computer can tell the difference between direct and programmed cursor control is the quote mode.

Once you press the quote (the double quote, SHIFT-2), you are in the quote mode. If you type something and then try to change it by moving the cursor left, you'll get only a bunch of reverse-video lines. These are the symbols for cursor left.

The only editing key that isn't programmable is the delete (INST/DEL) key; you can still use INST/DEL to back up and edit the line. Once you type another quote, you are out of quote mode.

You also go into quote mode when you use the insert (SHIFT-INST/DEL) key to insert spaces into a line. In any case, the easiest way to get out of quote mode is just to press RETURN. You'll then be out of quote mode and you can cursor up to the mistyped line and fix it.

In order to insure accurate entry of each program line, we have included a checksum program. Please read "The Automatic Proofreader" (Appendix C) before typing in any of the programs in this book.

Refer to the following table when entering cursor and color control keys:

When You Read:	Press:	See:
{CLR}	SHIFT CLR/HOME	
{HOME}	CLR/HOME	
{UP}	SHIFT ↑ CRSR ↓	
{DOWN}	↑ CRSR ↓	
{LEFT}	SHIFT ← CRSR →	
{RIGHT}	← CRSR →	
{RVS}	CTRL 9	
{OFF}	CTRL 0	
{BLK}	CTRL 1	
{WHT}	CTRL 2	
{RED}	CTRL 3	
{CYN}	CTRL 4	
{PUR}	CTRL 5	
{GRN}	CTRL 6	
{BLU}	CTRL 7	
{YEL}	CTRL 8	

When You Read:	Press:	See:
{ 1 }	COMMODORE 1	
{ 2 }	COMMODORE 2	
{ 3 }	COMMODORE 3	
{ 4 }	COMMODORE 4	
{ 5 }	COMMODORE 5	
{ 6 }	COMMODORE 6	
{ 7 }	COMMODORE 7	
{ 8 }	COMMODORE 8	
{ F1 }	f1	
{ F2 }	SHIFT f1	
{ F3 }	f3	
{ F4 }	SHIFT f3	
{ F5 }	f5	
{ F6 }	SHIFT f5	
{ F7 }	f7	
{ F8 }	SHIFT f7	
←	←	
↑	SHIFT ↑	

C
The Automatic Proofreader

Charles Brannon

"The Automatic Proofreader" will help you type in program listings without typing mistakes. It is a short error-checking program that hides itself in memory. When activated, it lets you know immediately after you type a line from a program listing if you have made a mistake. Please read these instructions carefully before typing any programs from chapter 5 of this book.

Preparing the Proofreader

1. Using the listing below, type in the Proofreader. Be very careful when entering the DATA statements—don't type an *l* instead of a *1*, an *O* instead of a *0*, extra commas, and so on.
2. Save the Proofreader on tape or disk at least twice *before running it for the first time.* This is very important because the Proofreader erases part of itself when you first type RUN.
3. After the Proofreader is saved, type RUN. It will check itself for typing errors in the DATA statements and warn you if there's a mistake. Correct any errors and save the corrected version. Keep a copy in a safe place—you'll need it again and again, every time you enter a program from this book, *COMPUTE!'s Gazette,* or *COMPUTE!* magazine.
4. When a correct version of the Proofreader is run, it activates itself. You are now ready to enter a program listing. If you press RUN/STOP–RESTORE, the Proofreader is disabled. To reactivate it, just type the command SYS 886 and press RETURN.

Using the Proofreader

All listings in this book have a *checksum number* appended to the end of each line, for example, *:rem 123. Don't enter this statement when typing in a program.* It is just for your information. The rem makes the number harmless if someone does type it in. It will, however, use up memory if you enter it, and

it will confuse the Proofreader, even if you entered the rest of the line correctly.

When you type in a line from a program listing and press RETURN, the Proofreader displays a number at the top of your screen. *This checksum number must match the checksum number in the printed listing.* If it doesn't, it means you typed the line differently from the way it is listed. Immediately recheck your typing. Remember, don't type the rem statement with the checksum number; it is published only so you can check it against the number which appears on your screen.

The Proofreader is not picky about spaces. It will not notice extra spaces or missing ones. This is for your convenience since spacing is generally not important. But occasionally proper spacing *is* important, so be extra careful with spaces.

Due to the nature of a checksum, the Proofreader will not catch all errors. Since 1 + 3 + 5 = 3 + 1 + 5, the Proofreader cannot catch errors of transposition. Thus, the Proofreader will not notice if you type GOTO 385 where you mean GOTO 835. In fact, you could type in the line in any order and the Proofreader wouldn't notice. The Proofreader should help you catch most typing mistakes, but keep this in mind if a program that checks out with the Proofreader still seems to have errors.

Here's another thing to watch out for: If you enter the line by using abbreviations for commands, the checksum will not match up. But there is a way to make the Proofreader check it. After entering the line, LIST it. This eliminates the abbreviations. Then move the cursor up to the line and press RETURN. It should now match the checksum. You can check whole groups of lines this way.

Special Tape SAVE Instructions

When you're through typing in a listing, you must disable the Proofreader before saving the program on tape. Disable the Proofreader by pressing RUN/STOP–RESTORE (hold down the RUN/STOP key and sharply hit the RESTORE key). This procedure is not necessary for disk SAVEs, *but you must disable the Proofreader this way before a tape SAVE.*

A SAVE to tape erases the Proofreader from memory, so you'll have to load and run it again if you want to type another listing. A SAVE to disk does not erase the Proofreader.

Hidden Perils

The Proofreader's home in memory is not a very safe haven. Since the cassette buffer is wiped out during tape operations, you need to disable the Proofreader with RUN/STOP–RESTORE before you save your program. This applies only to tape use. Disk users have nothing to worry about.

Not so for 64 owners with tape drives. What if you type in a program in several sittings? The next day, you come to your computer, load and run the Proofreader, then try to load the partially completed program so that you can add to it. But since the Proofreader is trying to hide in the cassette buffer, it is wiped out!

What you need is a way to load the Proofreader after you've loaded the partial program. The problem is a tape LOAD to the buffer destroys what it's supposed to load.

If you intend to type in a program in more than one sitting or wish to make a safety SAVE, follow this procedure:

1. Load and run the Proofreader.
2. Disable it by pressing RUN/STOP–RESTORE.
3. Type the following three lines in direct mode (without line numbers):

```
A$="PROOFREADER.T":B$="{10 SPACES}":FOR X= 1 TO 4:
   A$=A$+B$:NEXT X
FOR X = 886 TO 1018: A$=A$+CHR$(PEEK(X)):NEXT X
OPEN 1,1,1,A$:CLOSE 1
```

After you enter the last line, you will be asked to press RECORD and PLAY on your cassette recorder. Put this program at the beginning of a new tape.

You now have a new version of the Proofreader. Turn your computer off and on, then load the program you were working on. Put the cassette containing the Proofreader into the tape unit and type

OPEN1:CLOSE1

You'll be instructed to press the PLAY button on the recorder, then you'll see the familiar SEARCHING and FOUND messages, but *not* a LOADING message. Don't worry about this; the Proofreader is safely in memory. You can now start the Proofreader by typing SYS 886. To test this, PRINT PEEK (886) should return the number 173. If it does not, repeat the

steps above, making sure that A$ ("PROOFREADER.T") contains 13 characters and that B$ contains 10 spaces.

You can now reload the Proofreader into memory whenever LOAD or SAVE destroys it, restoring your personal typing helper.

The Automatic Proofreader

```
100 PRINT"{CLR}PLEASE WAIT...":FORI=886TO1018:READ
    A:CK=CK+A:POKEI,A:NEXT
110 IF CK<>17539 THEN PRINT"{DOWN}YOU MADE AN ERRO
    R":PRINT"IN DATA STATEMENTS.":END
120 SYS886:PRINT"{CLR}{2 DOWN}PROOFREADER ACTIVATE
    D.":NEW
886 DATA 173,036,003,201,150,208
892 DATA 001,096,141,151,003,173
898 DATA 037,003,141,152,003,169
904 DATA 150,141,036,003,169,003
910 DATA 141,037,003,169,000,133
916 DATA 254,096,032,087,241,133
922 DATA 251,134,252,132,253,008
928 DATA 201,013,240,017,201,032
934 DATA 240,005,024,101,254,133
940 DATA 254,165,251,166,252,164
946 DATA 253,040,096,169,013,032
952 DATA 210,255,165,214,141,251
958 DATA 003,206,251,003,169,000
964 DATA 133,216,169,019,032,210
970 DATA 255,169,018,032,210,255
976 DATA 169,058,032,210,255,166
982 DATA 254,169,000,133,254,172
988 DATA 151,003,192,087,208,006
994 DATA 032,205,189,076,235,003
1000 DATA 032,205,221,169,032,032
1006 DATA 210,255,032,210,255,173
1012 DATA 251,003,133,214,076,173
1018 DATA 003
```

D
Using the Machine Language Editor: MLX

Charles Brannon

Remember the last time you typed in the BASIC loader for a long machine language program? You typed in hundreds of numbers and commas. Even then, you couldn't be sure if you typed it in right. So you went back, proofread, tried to run the program, crashed, went back again, proofread, corrected a few typing errors, ran again, crashed again, rechecked your typing . . . .

Frustrating, wasn't it?

Now, "MLX" comes to the rescue. MLX makes it easy to enter all those long machine language programs with a minimum of fuss. It lets you enter the numbers from a special list that looks similar to DATA statements, and it checks your typing on a line-by-line basis. It won't let you enter illegal characters when you should be typing numbers. It won't let you enter numbers greater than 255. It will prevent you from entering the numbers on the wrong line. In short, MLX will make proofreading obsolete.

Tape or Disk Copies

In addition, MLX will generate a ready-to-use tape or disk copy of your machine language program. You can then use the LOAD command to read the program into the computer, just like you would with a BASIC program. Specifically, you enter LOAD *"program name"*,1,1 (for tape) or LOAD *"program name"*,8,1 (for disk).

To start the program, you need to enter a SYS command that tranfers control from BASIC to your machine language program. The starting SYS will always be given in the article which presents the machine language program in MLX format.

Using MLX

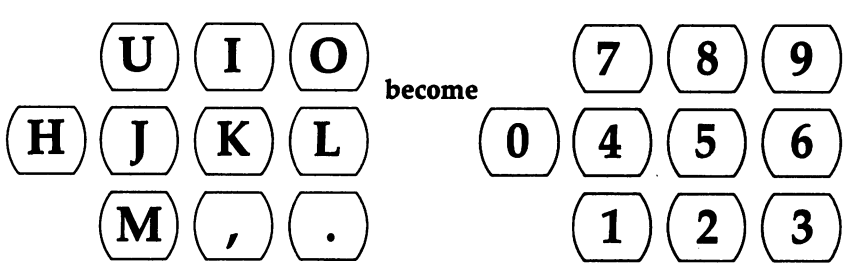
Type in and save MLX (you'll want to use it in the future). When you're ready to type in the machine language program, run MLX. MLX will ask you for two numbers: the starting address and the ending address. For "Plus/Term" these addresses are starting address 50152 and ending address 52563; for "Tokenizer" they are starting address 828 and ending address 971. You'll then get a prompt showing the specified starting address; that tells you to type in the corresponding first line of the program.

Subsequent prompts will ask you to type in subsequent lines from the MLX listing. Each line is six numbers plus a checksum. If you enter any of the six numbers wrong, or if you enter the checksum wrong, the 64 will sound a buzzer and prompt you to reenter the entire line. If you enter the line correctly, a pleasant bell tone will sound and you may go on to enter the next line.

A Special Editor

You are not using the normal 64 BASIC editor with MLX. For example, it will accept only numbers as input. If you make a typing error, press the INST/DEL key; the entire number is deleted. You can press it as many times as necessary, back to the start of the line. If you enter three-digit numbers as listed, the computer automatically prints the comma and goes on to accept the next number. If you enter less than three digits, you can press either the space bar or RETURN key to advance to the next number. The checksum automatically appears in reverse video for emphasis.

To make it even easier to enter these numbers, MLX redefines part of the keyboard as a numeric keypad (lines 581–584).



When testing it, I've found MLX to be an extremely easy way to enter long listings. With the audio cues provided, you don't even have to look at the screen if you're a touch-typist.

Done at Last!

When you get through typing, assuming you type your machine language program all in one session, you can then save the completed, bug-free program to tape or disk. Follow the instructions displayed on the screen. If you get any error messages while saving, you probably have a bad disk, a full disk, or a typo in MLX. Sorry, MLX can't check itself!

Command Control

What if you don't want to enter the whole program in one sitting? MLX lets you enter as much as you want, save the completed portion, and then reload your work from tape or disk when you want to continue. MLX recognizes these commands:

SHIFT-S Save
SHIFT-L Load
SHIFT-N New Address
SHIFT-D Display

Hold down SHIFT while you press the appropriate key. You will jump out of the line you've been typing, so I recommend you do it at a prompt. Use the Save command to store what you've been working on. It will write the tape or disk file as if you've finished. Remember what address you stop on. Then, the next time you run MLX, answer all the prompts as you did before and insert the disk or tape containing the stored file. When you get the entry prompt, press SHIFT-L to reload the file into memory. You'll then use the New Address command (SHIFT-N) to resume typing.

New Address and Display

After you press SHIFT-N, enter the address where you previously stopped. The prompt will change and you can continue typing. Always enter a New Address that matches up with one of the line numbers in the special listing or the checksums won't match up. You can use the Display command to display a section of your typing. After you press SHIFT-D, enter two addresses within the line number range of the listing. You can stop the display by pressing any key.

Tricky Stuff

You can use the Save and Load commands to make copies of the complete machine language program. Use the Load command to reload the tape or disk, then insert a new tape or disk and use the Save command to create a new copy.

One quirk about tapes made with the MLX Save command: When you load them, the message "FOUND *program*" may appear twice. The tape will load just fine, however.

Programmers will find MLX to be an interesting program which protects the user from most typing mistakes. Some screen formatting techniques are also used. Most interesting is the use of ROM Kernal routines for loading and saving blocks of memory. To use these routines, just POKE the starting address (low byte/high byte) into memory locations 251 and 252, and POKE the ending address into locations 254 and 255. Any error code for the SAVE or LOAD can be found in location 253 (an error would be a code less than ten).

I hope you will find MLX to be a true labor-saving program. Since it has been tested by entering actual programs, you can count on it as an aid for generating bug-free machine language. Be sure to save MLX; it will be used for future applications in other COMPUTE! books.

MLX

For mistake-proof program entry, be sure to use "The Automatic Proofreader," Appendix C.

```
10 REM LINES CHANGED FROM MLX VERSION 2.00 ARE 750
   ,765,770 AND 860                              :rem 50
20 REM LINE CHANGED FROM MLX VERSION 2.01 IS 300
                                                 :rem 147
30 REM LINE CHANGED FROM MLX VERSION 2.02 IS 763
                                                 :rem 162
100 PRINT"{CLR}{6}";CHR$(142);CHR$(8);:POKE53281,1
    :POKE53280,1                                  :rem 67
101 POKE 788,52:REM DISABLE RUN/STOP             :rem 119
200 PRINT"{2 DOWN}{PUR}{BLK} MACHINE LANGUAGE EDIT
    OR VERSION 2.03{5 DOWN}"                     :rem 239
210 PRINT"{5}{2 UP}STARTING ADDRESS?{8 SPACES}
    {9 LEFT}";                                   :rem 143
215 INPUTS:F=1-F:C$=CHR$(31+119*F)               :rem 166
220 IFS<256OR(S>40960ANDS<49152)ORS>53247THENGOSUB
    3000:GOTO210                                 :rem 235
225 PRINT:PRINT:PRINT                            :rem 180
230 PRINT"{5}{2 UP}ENDING ADDRESS?{8 SPACES}
    {9 LEFT}";:INPUTE:F=1-F:C$=CHR$(31+119*F)
                                                 :rem 20
```

```
240 IFE<256OR(E>40960ANDE<49152)ORE>53247THENGOSUB
    3000:GOTO230                                  :rem 183
250 IFE<STHENPRINTC$;"{RVS}ENDING < START
    {2 SPACES}":GOSUB1000:GOTO 230                :rem 176
260 PRINT:PRINT:PRINT                             :rem 179
300 PRINT"{CLR}";CHR$(14):AD=S                    :rem 56
310 A=1:PRINTRIGHT$("0000"+MID$(STR$(AD),2),5);":"
    ;                                             :rem 33
315 FORJ=ATO6                                     :rem 33
320 GOSUB570:IFN=-1THENJ=J+N:GOTO320              :rem 228
390 IFN=-211THEN 710                              :rem 62
400 IFN=-204THEN 790                              :rem 64
410 IFN=-206THENPRINT:INPUT"{DOWN}ENTER NEW ADDRES
    S";ZZ                                         :rem 44
415 IFN=-206THENIFZZ<SORZZ>ETHENPRINT"{RVS}OUT OF
    {SPACE}RANGE":GOSUB1000:GOTO410               :rem 225
417 IFN=-206THENAD=ZZ:PRINT:GOTO310               :rem 238
420 IF N<>-196 THEN 480                           :rem 133
430 PRINT:INPUT"DISPLAY:FROM";F:PRINT,"TO";:INPUTT
                                                  :rem 234
440 IFF<SORF>EORT<SORT>ETHENPRINT"AT LEAST";S;"
    {LEFT}, NOT MORE THAN";E:GOTO430              :rem 159
450 FORI=FTOTSTEP6:PRINT:PRINTRIGHT$("0000"+MID$(S
    TR$(I),2),5);":";                             :rem 30
451 FORK=0TO5:N=PEEK(I+K):PRINTRIGHT$("00"+MID$(ST
    R$(N),2),3);",";                              :rem 66
460 GETA$:IFA$>""THENPRINT:PRINT:GOTO310          :rem 25
470 NEXTK:PRINTCHR$(20);:NEXTI:PRINT:PRINT:GOTO310
                                                  :rem 50
480 IFN<0 THEN PRINT:GOTO310                      :rem 168
490 A(J)=N:NEXTJ                                  :rem 199
500 CKSUM=AD-INT(AD/256)*256:FORI=1TO6:CKSUM=(CKSU
    M+A(I))AND255:NEXT                            :rem 200
510 PRINTCHR$(18);:GOSUB570:PRINTCHR$(146);:rem 94
511 IFN=-1THENA=6:GOTO315                         :rem 254
515 PRINTCHR$(20):IFN=CKSUMTHEN530                :rem 122
520 PRINT:PRINT"LINE ENTERED WRONG : RE-ENTER":PRI
    NT:GOSUB1000:GOTO310                          :rem 176
530 GOSUB2000                                     :rem 218
540 FORI=1TO6:POKEAD+I-1,A(I):NEXT:POKE54272,0:POK
    E54273,0                                      :rem 227
550 AD=AD+6:IF AD<E THEN 310                      :rem 212
560 GOTO 710                                      :rem 108
570 N=0:Z=0                                       :rem 88
580 PRINT"[£]";                                   :rem 81
581 GETA$:IFA$=""THEN581                          :rem 95
582 AV=-(A$="M")-2*(A$=",")-3*(A$=".")-4*(A$="J")-
    5*(A$="K")-6*(A$="L")                         :rem 41
583 AV=AV-7*(A$="U")-8*(A$="I")-9*(A$="O"):IFA$="H
    "THENA$="0"                                   :rem 134
```

```
584 IFAV>ØTHENA$=CHR$(48+AV)                    :rem 134
585 PRINTCHR$(2Ø);:A=ASC(A$):IFA=13ORA=44ORA=32THE
    N67Ø                                        :rem 229
59Ø IFA>128THENN=-A:RETURN                      :rem 137
6ØØ IFA<>2Ø THEN 63Ø                             :rem 1Ø
61Ø GOSUB69Ø:IFI=1ANDT=44THENN=-1:PRINT"{OFF}
    {LEFT} {LEFT}";:GOTO69Ø                      :rem 62
62Ø GOTO57Ø                                     :rem 1Ø9
63Ø IFA<48ORA>57THEN58Ø                         :rem 1Ø5
64Ø PRINTA$;:N=N*1Ø+A-48                        :rem 1Ø6
65Ø IFN>255 THEN A=2Ø:GOSUB1ØØØ:GOTO6ØØ         :rem 229
66Ø Z=Z+1:IFZ<3THEN58Ø                           :rem 71
67Ø IFZ=ØTHENGOSUB1ØØØ:GOTO57Ø                  :rem 114
68Ø PRINT",";:RETURN                            :rem 24Ø
69Ø S%=PEEK(2Ø9)+256*PEEK(21Ø)+PEEK(211)        :rem 149
691 FORI=1TO3:T=PEEK(S%-I)                       :rem 67
695 IFT<>44ANDT<>58THENPOKES%-I,32:NEXT          :rem 2Ø5
7ØØ PRINTLEFT$("{3 LEFT}",I-1);:RETURN            :rem 7
71Ø PRINT"{CLR}{RVS}*** SAVE ***{3 DOWN}"       :rem 236
715 PRINT"{2 DOWN}(PRESS {RVS}RETURN{OFF} ALONE TO
     CANCEL SAVE){DOWN}"                        :rem 1Ø6
72Ø F$="":INPUT"{DOWN} FILENAME";F$:IFF$=""THENPRI
    NT:PRINT:GOTO31Ø                             :rem 71
73Ø PRINT:PRINT"{2 DOWN}{RVS}T{OFF}APE OR {RVS}D
    {OFF}ISK: (T/D)"                            :rem 228
74Ø GETA$:IFA$<>"T"ANDA$<>"D"THEN74Ø             :rem 36
75Ø DV=1-7*(A$="D"):IFDV=8THENF$="Ø:"+F$:OPEN15,8,
    15,"S"+F$:CLOSE15                           :rem 212
76Ø T$=F$:ZK=PEEK(53)+256*PEEK(54)-LEN(T$):POKE782
    ,ZK/256                                      :rem 3
762 POKE781,ZK-PEEK(782)*256:POKE78Ø,LEN(T$):SYS65
    469                                         :rem 1Ø9
763 POKE78Ø,1:POKE781,DV:POKE782,Ø:SYS65466:rem 68
765 K=S:POKE254,K/256:POKE253,K-PEEK(254)*256:POKE
    78Ø,253                                      :rem 17
766 K=E+1:POKE782,K/256:POKE781,K-PEEK(782)*256:SY
    S65496                                      :rem 235
77Ø IF(PEEK(783)AND1)OR(191ANDST)THEN78Ø         :rem 111
775 PRINT"{DOWN}DONE.{DOWN}":GOTO31Ø             :rem 113
78Ø PRINT"{DOWN}ERROR ON SAVE.{2 SPACES}TRY AGAIN.
    ":IFDV=1THEN72Ø                              :rem 171
781 OPEN15,8,15:INPUT#15,E1$,E2$:PRINTE1$;E2$:CLOS
    E15:GOTO72Ø                                 :rem 1Ø3
79Ø PRINT"{CLR}{RVS}*** LOAD ***{2 DOWN}"       :rem 212
795 PRINT"{2 DOWN}(PRESS {RVS}RETURN{OFF} ALONE TO
     CANCEL LOAD)"                               :rem 82
8ØØ F$="":INPUT"{2 DOWN} FILENAME";F$:IFF$=""THENP
    RINT:GOTO31Ø                                :rem 144
81Ø PRINT:PRINT"{2 DOWN}{RVS}T{OFF}APE OR {RVS}D
    {OFF}ISK: (T/D)"                            :rem 227
```

```
820 GETA$:IFA$<>"T"ANDA$<>"D"THEN820          :rem 34
830 DV=1-7*(A$="D"):IFDV=8THENF$="0:"+F$   :rem 157
840 T$=F$:ZK=PEEK(53)+256*PEEK(54)-LEN(T$):POKE782
    ,ZK/256                                    :rem 2
841 POKE781,ZK-PEEK(782)*256:POKE780,LEN(T$):SYS65
    469                                       :rem 107
845 POKE780,1:POKE781,DV:POKE782,1:SYS65466:rem 70
850 POKE780,0:SYS65493                        :rem 11
860 IF(PEEK(783)AND1)OR(191ANDST)THEN870   :rem 111
865 PRINT"{DOWN}DONE.":GOTO310                :rem 96
870 PRINT"{DOWN}ERROR ON LOAD.{2 SPACES}TRY AGAIN.
    {DOWN}":IFDV=1THEN800                     :rem 172
880 OPEN15,8,15:INPUT#15,E1$,E2$:PRINTE1$;E2$:CLOS
    E15:GOTO800                               :rem 102
1000 REM BUZZER                               :rem 135
1001 POKE54296,15:POKE54277,45:POKE54278,165
                                              :rem 207
1002 POKE54276,33:POKE 54273,6:POKE54272,5  :rem 42
1003 FORT=1TO200:NEXT:POKE54276,32:POKE54273,0:POK
     E54272,0:RETURN                          :rem 202
2000 REM BELL SOUND                           :rem 78
2001 POKE54296,15:POKE54277,0:POKE54278,247
                                              :rem 152
2002 POKE 54276,17:POKE54273,40:POKE54272,0:rem 86
2003 FORT=1TO100:NEXT:POKE54276,16:RETURN   :rem 57
3000 PRINTC$;"{RVS}NOT ZERO PAGE OR ROM":GOTO1000
                                              :rem 89
```

Index

To order your copy of *COMPUTE!'s Telecomputing on the Commodore 64 Disk*, call our toll-free US order line: 1-800-334-0868 (in NC call 919-275-9809) or send your prepaid order to:

COMPUTE!'s Telecomputing on the Commodore 64 Disk
COMPUTE! Publications
P.O. Box 5058
Greensboro, NC 27403

All orders must be prepaid (check, charge, or money order). NC residents add 4.5% sales tax.

Send ____ copies of *COMPUTE!'s Telecomputing on the Commodore 64 Disk* at $12.95 per copy.

Subtotal $_____

Shipping & Handling: $2.00/disk $_____

Sales tax (if applicable) $_____

Total payment enclosed $_____

All payments must be in U.S. funds.

□ Payment enclosed
Charge □ Visa □ MasterCard □ American Express

Acct. No. _____ Exp. Date _____ (Required)

Signature _____

Name _____

Address _____

City _____ State _____ Zip _____

Please allow 4-5 weeks for delivery.

4590093

COMPUTE! Books

Ask your retailer for these **COMPUTE! Books** or order directly from **COMPUTE!**.

Call toll free (in US) **800-334-0868** (in NC 919-275-9809) or write COMPUTE! Books, P.O. Box 5058, Greensboro, NC 27403.

Quantity	Title	Price*	Total
_____	SpeedScript: The Word Processor for the Commodore 64 and VIC-20 (94-9)	$ 9.95	_____
_____	Commodore SpeedScript Book Disk	$12.95	_____
_____	COMPUTE!'s Commodore 64/128 Collection (97-3)	$12.95	_____
_____	All About the Commodore 64, Volume Two (45-0)	$16.95	_____
_____	All About the Commodore 64, Volume One (40-X)	$12.95	_____
_____	Programming the Commodore 64: The Definitive Guide (50-7)	$19.95	_____
_____	COMPUTE!'s Data File Handler for the Commodore 64 (86-8)	$12.95	_____
_____	Kids and the Commodore 64 (77-9)	$12.95	_____
_____	COMPUTE!'s Commodore Collection, Volume 1 (55-8)	$12.95	_____
_____	COMPUTE!'s Commodore Collection, Volume 2 (70-1)	$12.95	_____
_____	COMPUTE!'s VIC-20 and Commodore 64 Tool Kit: BASIC (32-9)	$16.95	_____
_____	COMPUTE!'s VIC-20 and Commodore 64 Tool Kit: Kernal (33-7)	$16.95	_____
_____	COMPUTE!'s Telecomputing on the Commodore 64 (009)	$12.95	_____
_____	COMPUTE!'s VIC-20 Collection (007)	$12.95	_____
_____	Programming the VIC (52-3)	$24.95	_____
_____	VIC Games for Kids (35-3)	$12.95	_____
_____	COMPUTE!'s First Book of VIC (07-8)	$12.95	_____
_____	COMPUTE!'s Second Book of VIC (16-7)	$12.95	_____
_____	COMPUTE!'s Third Book of VIC (43-4)	$12.95	_____
_____	Mapping the VIC (24-8)	$14.95	_____
_____	COMPUTE!'s VIC-20 Collection (007)	$12.95	_____

*Add $2.00 per book for shipping and handling.
Outside US add $5.00 air mail or $2.00 surface mail.

NC residents add 4.5% sales tax _____
Shipping & handling: $2.00/book _____
Total payment _____

All orders must be prepaid (check, charge, or money order).
All payments must be in US funds.
☐ Payment enclosed.
Charge ☐ Visa ☐ MasterCard ☐ American Express

Acct. No._____ Exp. Date_____ (Required)

Name_____

Address_____

City_____ State _____ Zip_____

*Allow 4–5 weeks for delivery.
Prices and availability subject to change.
Current catalog available upon request.

4590093

If you've enjoyed the articles in this book, you'll find the same style and quality in every monthly issue of **COMPUTE!'s Gazette** for Commodore.

For Fastest Service
Call Our **Toll-Free** US Order Line
800-334-0868
In NC call 919-275-9809

COMPUTE!'s Gazette

P.O. Box 5058
Greensboro, NC 27403

My computer is:
☐ Commodore 64 ☐ VIC-20 ☐ Other_____

☐ $24 One Year US Subscription
☐ $45 Two Year US Subscription
☐ $65 Three Year US Subscription

Subscription rates outside the US:

☐ $30 Canada
☐ $65 Air Mail Delivery
☐ $30 International Surface Mail

Name _____

Address _____

City _____ State _____ Zip _____

Country _____

Payment must be in US funds drawn on a US bank, international money order, or charge card. Your subscription will begin with the next available issue. Please allow 4–6 weeks for delivery of first issue. Subscription prices subject to change at any time.

☐ Payment Enclosed ☐ Visa
☐ MasterCard ☐ American Express

Acct. No. _____ Expires ___/___
(Required)

The *COMPUTE!'s Gazette* subscriber list is made available to carefully screened organizations with a product or service which may be of interest to our readers. If you prefer not to receive such mailings, please check this box ☐.

759199

COMPUTE! Books

Ask your retailer for these **COMPUTE! Books** or order directly from **COMPUTE!**.

Call toll free (in US) **800-334-0868** (in NC 919-275-9809) or write COMPUTE! Books, P.O. Box 5058, Greensboro, NC 27403.

Quantity	Title	Price*	Total
_____	Machine Language for Beginners (11-6)	**$14.95**	_____
_____	The Second Book of Machine Language (53-1)	**$14.95**	_____
_____	COMPUTE!'s Guide to Adventure Games (67-1)	**$12.95**	_____
_____	Computing Together: A Parents & Teachers Guide to Computing with Young Children (51-5)	**$12.95**	_____
_____	Personal Telecomputing (47-7)	**$12.95**	_____
_____	BASIC Programs for Small Computers (38-8)	**$12.95**	_____
_____	Programmer's Reference Guide to the Color Computer (19-1)	**$12.95**	_____
_____	Home Energy Applications (10-8)	**$14.95**	_____
	The Home Computer Wars: An Insider's Account of Commodore and Jack Tramiel		
_____	Hardback (75-2)	**$16.95**	_____
_____	Paperback (78-7)	**$ 9.95**	_____
_____	The Book of BASIC (61-2)	**$12.95**	_____
_____	Every Kid's First Book of Robots and Computers (05-1)	**$ 4.95†**	_____
_____	The Beginner's Guide to Buying a Personal Computer (22-1)	**$ 3.95†**	_____
_____	The Greatest Games: The 93 Best Computer Games of all Time (95-7)	**$ 9.95**	
_____	Investment Management with Your Personal Computer (005)	**$14.95**	_____

* Add $2.00 per book for shipping and handling.
† Add $1.00 per book for shipping and handling.
Outside US add $5.00 air mail or $2.00 surface mail.

NC residents add 4.5% sales tax. _____
Shipping & handling: $2.00/book _____
Total payment _____

All orders must be prepaid (check, charge, or money order).
All payments must be in US funds.
☐ Payment enclosed.
Charge ☐ Visa ☐ MasterCard ☐ American Express

Acct. No. _____ Exp. Date _____ (Required)

Name _____

Address _____

City _____ State _____ Zip _____

*Allow 4–5 weeks for delivery.
Prices and availability subject to change.
Current catalog available upon request.

4590093

The Modem World

Your Commodore 64 can talk to the world. All it needs is a modem and a phone line. And all you need to start using your 64 for telecommunicating is *COMPUTE!'s Telecomputing on the Commodore 64*.

Interest in telecomputing is booming. Your 64 can be a pathway to up-to-the-minute news, interesting discussions, and valuable programs. With your computer and a modem, you can explore large information services (like CompuServe and The Source) or hook up with bulletin board systems (which are often devoted to specific topics such as music or games).

COMPUTE!'s Telecomputing on the Commodore 64 is more than just a how-to book, though. It shows how telecomputing works and how it is changing the way we live. Here's a sample of what's inside:

- A buyer's guide so you can compare the features on some of the most popular modems currently available.
- Descriptions of the information and research services and electronic bulletin boards that are available today online.
- Thorough discussions of *uploading* (sending) and *downloading* (receiving) text and programs.
- Three type-in terminal programs, including "Plus/Term," which has important download and upload buffering capabilities and allows printouts of captured text.
- A handy glossary that describes telecomputing terms, especially helpful for the beginner.
- A discussion of *telecommuting*—how some people are going to the office without even leaving the house.
- Tutorials on ASCII, RS-232, and how data is transmitted with modems.

COMPUTE!'s Telecomputing on the Commodore 64 is an easy-to-understand introduction to telecomputing—everything from how to buy a modem to understanding the technical details of transmitting data. With superior programs and plenty of information, it will help you and your 64 successfully enter the world of computer communications.

ISBN 0-87455-009-2

COMPUTE!'s Telecomputing on the Commodore 64

COMPUTE! Books