



The Apple II Guide



A complete resource for users of Apple II computers
Fall 1990

What do you think?

We are interested in your thoughts about *The Apple II Guide*. Simply complete, fold this card, affix a postage stamp, and mail it back to us.

1. How did you obtain your copy of *The Apple II Guide*?

- User Group
- Dealer
- Apple Employee
- Other, please describe _____

2. In order of preference, which sections of *The Apple II Guide* did you find most useful (1 as most useful)?

- | | |
|---|--|
| <input type="checkbox"/> Apple II — Yesterday, Today | <input type="checkbox"/> Troubleshooting |
| <input type="checkbox"/> Today, and Tomorrow | <input type="checkbox"/> Apple Sales, Service, and Support |
| <input type="checkbox"/> Understanding the Basics | <input type="checkbox"/> Understanding Technical Information |
| <input type="checkbox"/> Making the Most of Your Apple II | <input type="checkbox"/> Information Resources |
| <input type="checkbox"/> Communication Strategies | |

3. What additional topics you would like to see covered in future editions of *The Apple II Guide*?

4. Do you have any additional comments, questions, or issues about *The Apple II Guide*?

5. We would like additional information about you and your Apple equipment.

(Please check all that apply):

	What Apple equipment do you own/use?		What Apple equipment do you plan to buy during the next 12 to 18 months?
Apple II Plus	_____		_____
Apple IIe	_____		_____
Apple IIc	_____		_____
Apple IIc Plus	_____		_____
Apple IIGS	_____		_____
Macintosh	_____		_____
(please list type)	_____	(please list type)	_____
Other brands	_____		_____
(please list type)	_____	(please list type)	_____

6. Where do you use your Apple II computer (please check all that apply)?

- At Home
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- At School

7. Would you like to receive additional information about Apple computer products?

If yes, please complete the following:

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Title

Company

Address

City State Zip

Telephone Number

Place
Stamp
Here

The Apple II Guide

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The Apple II Guide

A complete resource for users of
Apple II computers

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A Note from Steve Wozniak

Apple® was founded on the singular vision of empowering the individual. We believed that individuals, not institutions, were the key to the future. We had enthusiasm for changing society in a positive way. Although we were too young for the 1960s, we still had revolutionary ideas and a belief that individuals can actually make a difference in the world.

This explains why the Apple II was the perfect product. The Apple II pushed technology beyond the limits of conventional wisdom. It gave us an incredible tool for the mind. It was a tool that ignited the revolution of the individual, using high technology to show new ways of doing things.

The Apple II was truly a revolutionary product because it was conceived by the people who were going to use it. It was an easy-to-use computer in the home, school, or the office.

As an Apple II user, you are very special kind of person. You believe that the best way to predict the future is to invent it. And you understand that the real power of what people do with personal computing technology resides not simply in the computer as a tool, but in what people are inspired to do with that tool. The computer taps the most wonderfully unpredictable element of all: your imagination.

Enjoy *The Apple II Guide*. I hope that it enables you to be even more productive and find more enjoyment with your Apple II computer.

A handwritten signature in black ink, appearing to read "Woz", written in a cursive, slanted style.

Apple II: More Than a Promise

A letter from John Sculley to
the Apple II community

“Apple Computer, Inc. is committed to selling, supporting, and servicing Apple II computers for years to come.” You’ve heard this from Apple employees for awhile, but what does it mean? We firmly believe that people will be using Apple IIs for computing in homes, schools, and small businesses across the world well into the 1990s, and we appreciate the loyalty over the years of our Apple II customers to Apple and its products. We intend to reward that loyalty with appropriate service, support, and product enhancements. *The Apple II Guide* is a tangible part of our plan to assist you in getting the most from your Apple II investment.

Apple II owners are a very vocal group. On behalf of Apple, I want to thank each of you for sharing your continued excitement and passion for Apple II computers. Your continued appreciation for our products and suggestions about our products guide us in decisions regarding the future of the Apple II computer line. It is particularly gratifying to myself and Apple employees, especially Apple II engineers past and present, to see that the Apple II, which launched Apple as a business, continues to be heartily endorsed by educators, consumers, and small business owners.

Since last spring, I’ve become more personally involved in Apple’s product research and development efforts. The future of Apple II’s development is now in the very capable hands of Roger Heinen, Apple Products vice president of software, and Ralph Russo, Apple Products director of Apple II development, whose charge is to see that the enhancements to the Apple II on the drawing boards come to fruition, and to propose and carry out new ideas. Within the last year, we’ve also added employees in both worldwide product marketing and U.S.A. product marketing dedicated to the Apple II line.

In 1989 and 1990, Apple introduced a number of significant technological improvements for the Apple IIGs[®], IIC Plus and IIE computers without increasing the price of the basic products. Several important examples of Apple II product enhancements are Apple IIGS System Software 5.0; one megabyte of standard memory for new Apple IIGS computers; the Apple II Video Overlay Card; and the new Apple High-Speed SCSI Card.

In response to requests from customers and developers for improved ease of use and functionality, with Apple IIgs System Software 5.0, we improved the system software speed and network capabilities, and made changes to the toolbox that enable the system to handle basic functions, including sound, drawing, scrolling, and memory management about twice as fast as our earlier System Software 4.0.

The new High-Speed SCSI Card is just one example of Apple's philosophy — based on customers' need — to allow Apple II users access to many of the same SCSI peripheral devices as Macintosh® computer users. By building bridges between Apple's two product lines, our customers can take advantage of the strengths of each. Taken together, our recent Apple II products mean significant improvement in functionality and increase the value of Apple IIs for our customers.

Currently, we are working closely with Apple II hardware and software developers to encourage the creation of innovative products for the Apple II family and to provide them with the information they need to make decisions so their businesses continue to be viable. We also offer new development tools that assist developers in co-development for both the Apple II and the Macintosh. A number of developers in the past year have introduced new software and hardware products for the Apple II family as well as made commitments to their customers to continue to introduce creative, new products that support our own Apple II activities. This commitment from a few key Apple II software developers was documented in a video that Apple mailed to more than 12,000 educators last spring.

We also understand our customers' need for continued enhancements to the product line — including improvements in the way Apple II and Macintosh computers interact on the AppleTalk® network. Apple II customers, particularly primary and secondary schools, want their large installed base of Apple IIs to operate in concert with Macintosh computers. We are currently working on a variety of "bridges" between the Apple II and Macintosh to make that synergy even better. In early 1991, we will offer a card for the new Macintosh LC computer so it can emulate the Apple IIe — and, therefore, run IIe software. This will provide our customers a wider range of functionality in a single platform.

I can reassure our Apple II customers that we value the Apple II product family as an asset, which we will continue to nourish. However, new products aren't the entire answer, and at Apple, we are constantly evaluating the changing needs of the Apple II community to ensure top-notch service. We recently established a one-year warranty for new owners of Apple II computers, and we continue to offer Apple Care to all owners of Apple II computers.

As toolmakers of state-of-the-art personal computers, we recognize that Apple II computers continue to remain versatile and eminently expandable. Millions of educators, consumers, and small business owners worldwide rely on the Apple IIGS, IIe, and IIc Plus and will for many years to come. For those reasons, Apple Computer is committed to continuing to enhance the functionality of Apple II computers, improving our support to customers, and encouraging developers to push the Apple II technology as far as it can go. As Apple develops new entry-level products, the Apple II family will continue to be recognized for the immense value it provides our customers and our company.

We make this commitment here, and we continually make this same commitment to customers and developers in person. This Apple II guide is part of that commitment and was developed to help you improve the functionality, performance, and usefulness of your computer. To assist us in determining your current issues, concerns, and questions about the Apple II, we've included a response card in the back of this Apple II guide for you to fill out and mail in. We hope to hear your ideas and suggestions soon. We believe and hope you agree that *The Apple II Guide* is another of Apple's continuing efforts, not only to reward your loyalty, but also to make owning and using an Apple II computer the great experience it was meant to be.

Sincerely,

A handwritten signature in black ink, appearing to read "John Sculley". The signature is fluid and cursive, with a large initial "J" and "S".

John Sculley
Chairman, President and Chief Executive Officer
Apple Computer, Inc.

Apple's Vision of Personal Computing

Extending Apple's vision into the future

It is important for Apple II computer users to know that our vision of personal computing is the same today as it was 13 years ago when we began doing business. Apple wants to help people change the world for the better by empowering individuals through personal computing technology.

We believe that personal computers, as we envision them, are becoming humankind's greatest cultural tools. Personal computers allow people and organizations not only to perform current tasks better, but also to realize dreams and capabilities they have not yet imagined. Consequently, we believe the positive social impact of these developments will change the world in ways we cannot yet foresee.

Our vision is a unique and compelling one. Because we design computers for people, we understand that the true usefulness of personal computing technology grows out of people's willingness, comfort, and enthusiasm for using it. Everything we do revolves around closing the gap between the individual and the technology to create exceptional tools that amplify human ability and extend each person's reach.

Apple II computers have already changed the way people work, think, create, and communicate in education, in business, and at home. Apple technology fundamentally alters the way organizations perform: empowering individuals, flattening organizations, and providing better, faster decision making. We plan to continue to act as a catalyst, encouraging human development by opening new frontiers of expression and thought for individual intellectual and creative pursuits.

It is within the context of this original vision that we can best understand where Apple Computer will be going in the future. The power of Apple's vision of personal computing is evidenced by the company's meteoric rise from its simple beginnings in a Santa Clara, California garage to a Fortune 100 company doing business in more than 120 countries.

Over the years, Apple maintained a singular vision: to make computing power accessible to people by focusing on the individual. Because the company aims to create products that provide meaningful differences rather than promote conformity, Apple's technological innovations have pioneered new applications and will continue to expand the market for personal computers throughout the 1990s and into the 21st century. This independent focus on technological innovation has provided the company with significant control over its role and position in the industry and the freedom to hold fast to its corporate identity.

Apple's corporate identity is based on three charters:

- Create great personal computer products. Apple is an applied technology company that creates products that people want to use and that enhance their knowledge and ability.
- Change the world. Apple wants to make personal computers a way of life in work, in education, and in the home for any person, regardless of their abilities or disabilities. We want to be a catalyst for improving the way things are done.
- Build an exciting environment. Apple wants to make working at Apple a fun, rewarding and exciting experience. Openness, shared vision, and a freedom to learn characterize the environment.

Like crafters of fine art, Apple aims to patiently advance its distinct concept of personal computing. We will continue to focus on the individual as the design point, to craft all the pieces of our technology to fit together seamlessly, and to tighten the relationship between the individual and the personal computer. We are committed to bringing our technology to more and more people. We're broadening the product family at all levels: from high-end to low-end. This strategy allows us to create computers that are appropriate for all kinds of people: from kindergarten students to business people to scientists and engineers.

The Apple II Family

Apple offers an extensive line of personal computers, communications peripherals, and system software designed to address the needs of individuals and markets. The Apple II, first introduced in 1977, has proven to be an extremely durable technology. Because of the Apple II's popularity throughout the years, more than 15,000 software programs have been written for education, small business, and personal productivity. The Apple II family is noted for the considerable value it has provided and continues to provide our customers and our company.

The Apple II family of products consists of three central processing units (CPUs): the Apple IIc Plus — a transportable, affordable entry-level computer; the Apple IIe — a flexible, expandable, mid-range computer system; and the Apple IIGS — the high end of the Apple II family, which combines graphics, sound, and enhanced color for sophisticated applications.

Apple and Education

Apple's ongoing goal — to empower individuals by building great personal computers — prompted the company's early focus on education. Today, educators throughout the world are using computers in preschool through university classrooms.

For the past 11 years, Apple has granted millions of dollars worth of computer systems to schools, universities, and community organizations to improve education, innovation, and services. True to its reputation as a leader in technology and innovation, Apple is currently encouraging the development of interactive multimedia tools to assist educators, and improve and change education. Much future software will be a combination of text, full-motion video, animation, and sound, all controllable through the computer. To bring this next giant step in education to schools and universities, Apple has established strategic partnerships with noted education organizations and companies including Lucasfilm, the Smithsonian Institute, ABC News Interactive, and the National Geographic Society.

The Apple II product family continues to provide excellent value to more than 5.5 million customers, many of whom are educators and students, who use Apple IIs everyday. Apple's philosophy is to listen to educators and closely involve them as new solutions and enhancements to our products line are developed. We have continued to maintain software compatibility throughout the Apple II line, and soon Apple II compatibility will be available in the Macintosh family, a key consideration for educators.

Our Commitment

At Apple, our design point is the individual and the individual within the organization — not the organization, agency, environment or the technology itself. It's what people do with our tools that is most important to us — not megabytes and speed. The real power of personal computing technology is in people's confidence, enthusiasm, and comfort in using it. We want to encourage all Apple computer owners to push our technology to the limit, and continue to offer suggestions and ideas to help us provide the tools that give you the power to be your best.

Apple and Apple II History

Apple and the Apple II changed the course of computing

Apple and the Apple II have become legends in their own time, landmarks in the age of computing they helped create. The Apple lore includes many firsts and fascinating facts. Here's how it happened:

1976 No keyboard, no case, no sound, no graphics — but lots of vision



Original logo for Apple Computer Company

- March* ♦ Steve Wozniak (age 26) finishes work on a prototype for a preassembled computer circuit board. The prototype took about 6 months to design and 40 hours to build. It's barely a computer by current standards — it has no keyboard, case, sound, or graphics. It's named the Apple Computer I.
- April* ♦ Wozniak — better known as Woz — and Steve Jobs (age 21) form the Apple Computer Company on April Fool's Day.
- ♦ The Apple I debuts at the Homebrew Computer Club in Palo Alto, California.
- July* ♦ The Apple I board is released for sale to hobbyists and electronics enthusiasts at the price of \$666.66.

1977 The debut of the Apple II

- January* ♦ Apple Computer is incorporated by Jobs, Wozniak, and their new partner and chairman, Mike Markkula.
- ♦ Apple moves from Jobs' parents' garage to a building on Stevens Creek Boulevard in Cupertino, California.
- April* ♦ The new Apple II is unveiled at the first West Coast Computer Faire. It's the first personal computer to generate color graphics and includes a keyboard, power supply, and attractive case.

- June* ♦ The Apple II is now available to the general public. Fully assembled and pretested, it includes 4K of standard memory. It comes equipped with two game paddles and a demo audio cassette. The price is \$1,298. Customers use their own TV sets as monitors and store programs on audio cassettes.

1978 Hard work to make computing easier

- June* ♦ Apple's Disk II® disk drive is introduced at the Consumer Electronics Show. It is the lowest priced minifloppy disk drive ever offered by a computer manufacturer. It's also the fastest and the easiest to use. At first, production is handled by just two employees, turning out 30 drives a day.

1979 No more typewriters

- February* ♦ President Mike Scott declares that Apple should set an example for business everywhere and issues a company-wide mandate: "No more typewriters."
- June* ♦ The Apple II Plus is introduced, available with 48K of memory and a new auto-start ROM for easier startup and screen editing. It costs \$1,195.
- ♦ Apple's first printer, the Silentype®, is introduced.
- October* ♦ Personal Software, Inc., releases VisiCalc for the Apple II. The spreadsheet is the first application to make personal computers a practical tool for people who don't know how to write their own programs.
- December* ♦ Apple II annual sales rate is at 35,000 units, up 400 percent from 1978.
- ♦ Apple employs 900 people working out of four buildings.



Apple logo circa 1977

1980 Apple III joins the Apple II

- September*
- ◆ The Apple III is announced at the National Computer Conference. With a new operating system, a built-in disk controller, and four peripheral slots, the Apple III, priced at \$3,495, is the most advanced system in the company's history.
 - ◆ Apple's employee count breaks 1,000.

1981 "Welcome, IBM. Seriously."

- August*
- ◆ International Business Machines introduces the IBM Personal Computer. Apple greets its new competitor with a full-page ad in the Wall Street Journal with a headline that reads, "Welcome, IBM. Seriously."
- September*
- ◆ Apple's first mass storage system, the 5 MB ProFile™ hard disk is introduced, priced at \$3,499.

1982 A billion dollar party

- November*
- ◆ AppleFest® — a showplace for more than 5,000 Apple-related products — opens in San Francisco.
 - ◆ Brøderbund Software releases Bank Street Writer, a word processing program for the Apple computer. It's still a fixture in many classrooms.
- December*
- ◆ Apple becomes the first personal computer company to reach a \$1 billion annual sales rate. It throws a "Billion Dollar Party" for employees.

1983 It's the Fortune 500 for Apple, but kids can't wait

- January*
- ◆ Apple introduces the Apple IIe computer, priced at \$1,395, and the Lisa® computer, priced at \$9,995. Several new peripheral devices are also introduced.

- April* ♦ John Sculley, formerly president of PepsiCo, is hired as Apple's new president and CEO.
- May* ♦ Apple enters the Fortune 500 at number 411 — less than five years after its founding.
 - ♦ The “Kids Can't Wait” program is announced. Apple II computers are to be given to about 10,000 California schools by September.
- June* ♦ The 1,000,000th Apple II rolls off the assembly line and is the first of the computers to be awarded in the “Kids Can't Wait” grant.
- November* ♦ AppleWorks[®], an integrated word processing, spreadsheet, and database software package, is introduced. It soon becomes the world's best selling software.
- December* ♦ The ImageWriter[®] printer is introduced and lists for \$675.

1984 Macintosh is new, but the Apple II is forever

- January* ♦ The Macintosh is unveiled at Apple's annual shareholders' meeting, to be sold for \$2,495.
- April* ♦ The Apple IIc, priced at \$1,295, is introduced at the company's “Apple II Forever”[™] conference in San Francisco. Two thousand dealers place orders for more than 52,000 units on the spot — an industry record.
 - ♦ Development of the Apple III line is discontinued.
- May* ♦ Brøderbund Software announces The Print Shop, the program that many credit with paving the way for the desktop publishing market.
- November* ♦ The 2,000,000th Apple II is sold.

1985 Connectivity is the goal

- January* ♦ At its annual shareholder's meeting, Apple introduces the LaserWriter® printer, priced at \$6,999, and the AppleTalk® Personal Network, priced at \$50.
- February* ♦ Wozniak resigns to start a new company that will develop products for the home.
- March* ♦ Apple IIe computers are enhanced with four new higher performance chips.
- April* ♦ The Apple IIc celebrates its first year of production. More than 400,000 units have been sold.
- July* ♦ The AppleLink® telecommunications network goes into service, connecting Apple employees, dealers, suppliers, developers, and vendors through electronic mail and information libraries.
 - ♦ Apple's Office of Special Education is created to identify the computer-related needs of people with disabilities and assist in the development of responsive programs.
- September* ♦ Steve Jobs resigns to start a new computer company.
- November* ♦ First Lady Nancy Reagan presents an Apple IIe to the College de Lemans International in Versoix, Switzerland during the Reagan-Gorbachev summit.

1986 Super deals, supercomputers, and a super new Apple II

- January* ♦ Macintosh Plus and LaserWriter Plus are unveiled at the AppleWorldSM Conference in San Francisco. The Macintosh Plus is priced at \$2,599; the LaserWriter Plus at \$6,798.
 - ♦ Apple gives U.S. schools the opportunity to trade in old Apple, IBM, Tandy, and Commodore personal computers for credits toward the purchase of new Apple computers.
 - ♦ Applied Engineering more than triples the speed of the Apple II with its Transwarp accelerator card.

- September* ♦ The Apple IIGS is introduced. It features enhanced graphics, sound, and expanded memory, and the 256K CPU is priced at \$999. An enhanced Apple IIc is also introduced.

1987 Updates and innovations

- January* ♦ Apple updates the Apple IIe, priced at \$829.
- March* ♦ The Macintosh SE and Macintosh II are introduced.
- April* ♦ Apple announces plans to create an independent software company, later named Claris.
- November* ♦ For Apple II users who want to run MS-DOS programs, Applied Engineering offers PC Transporter.

1988 AppleLink—Personal Edition comes on-line

- January* ♦ Apple introduces the LaserWriter II family of desktop laser printers.
- ♦ Timeworks ships Publish It!, the first true desktop-publishing program for the Apple II.
- March* ♦ Apple introduces the AppleCD SC[®], an optical storage device for storing and using huge amounts of information.
- May* ♦ Apple and Quantum Computer Services introduce the AppleLink—Personal Edition, an on-line communication and information service designed specifically for Apple II computer owners.
- September* ♦ The Apple IIc Plus is introduced. It's faster and less expensive than the original Apple IIc that it replaces. The price of an Apple IIc Plus color system is \$1,099. GS/OS[®], the enhanced operating system for the Apple IIGS, is also announced. It retails for \$39.

- ◆ Apple introduces the Macintosh IIx computer, the first Macintosh to use Motorola's 68030 microprocessor and 68882 math coprocessor. The company also introduces the FDHD™ — Floppy Drive High Density — Apple's new 1.44 MB floppy disk drive that can read and write to MS-DOS, OS/2, and ProDOS® disks.
- October* ◆ Claris releases AppleWorks GS, a powerful program available for the Apple IIGS.
- November* ◆ Apple IIGS can be upgraded to 7.0 MHz with Applied Engineering's Transwarp GS.

1989 Speed, memory, video power

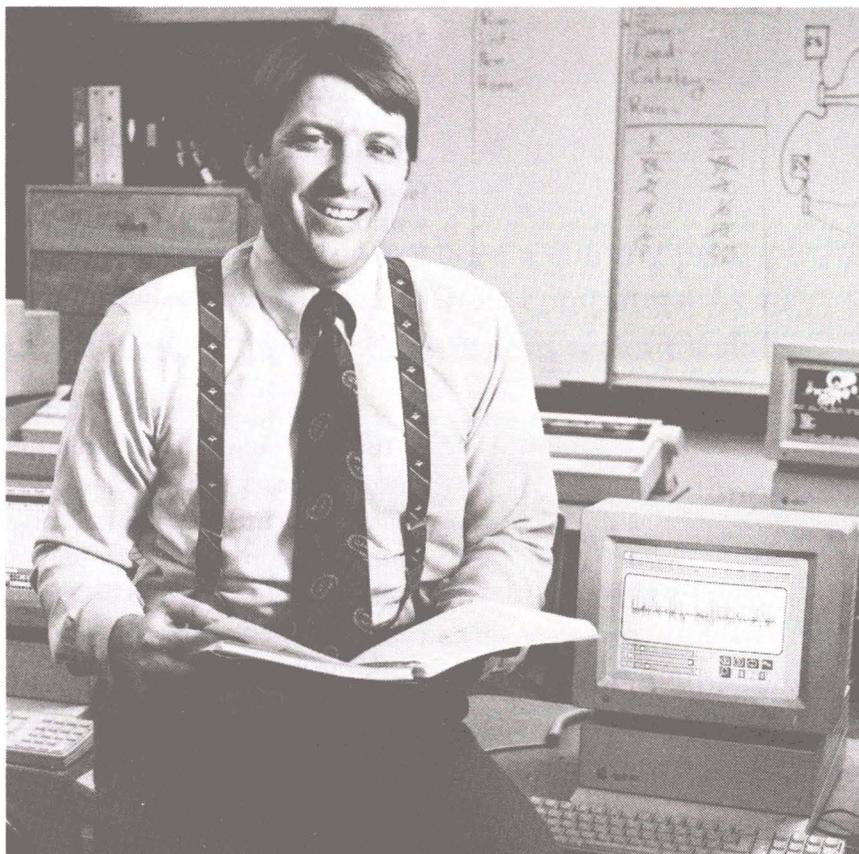
- March* ◆ Claris upgrades a classic with AppleWorks 3.0.
- April* ◆ The Apple II Video Overlay Card is introduced. It works with the Apple IIGS and the Apple IIe to superimpose screen images — text or graphics — on video images from video tapes or disks.
- May* ◆ Roger Wagner Publishing turns the Apple IIGS into a hypermedia workstation with its revolutionary HyperStudio software.
- July* ◆ The Apple IIGS system software, version 5.0, is announced. It's the first 16-bit operating system for the Apple IIGS that operates over the AppleTalk network system.
- August* ◆ Apple introduces a new Apple IIGS with 1 MB of RAM standard, at a price of \$1,149.
- ◆ Claris proves AppleWorks can get better with the release of AppleWorks 3.0 Networked Version.
- September* ◆ Apple announces two new Macintosh computers: the Macintosh Portable and the Macintosh IIfx. The Macintosh Portable is a full-function Macintosh in a portable design. The Macintosh IIfx is a high-performance version of the Macintosh IIcx, with 25 MHz and built-in video.

1990 The next step toward the future

- March*
- ◆ The new Apple II High-Speed SCSI Card is introduced.
 - ◆ The Macintosh IIfx is introduced, Apple's most powerful computer to date.
- April*
- ◆ In a videotaped message to educators in the United States, Apple reaffirms its commitment to Apple II users, and to bridging the Apple II and Macintosh lines. John Sculley promises that a future, entry-level Macintosh will have an option to run Apple II software.

An Apple II Success Story

Computers accelerate the education of students and teachers at Meigs Magnet School



What is eight years old, exists in a building that predates the Civil War, and has more than 150 Apple computers? The answer is the Meigs Magnet School for fifth- to eighth-grade students in Nashville, Tennessee. According to Mike Smith, computer coordinator at Meigs, the school serves all of Davidson County in the Metro Nashville area and has 575 students, all of whom were specially selected for the school's accelerated academic program.

Currently, the school has 50 Apple IIGS computers, 27 Apple IIe computers, 11 Apple IIc computers, seven Apple III computers, and 64 Apple Macintosh computers, all networked together via 3,000 feet of cable.

The school uses thousands of software applications during the course of a school year, all available on the network from a dedicated Macintosh network file server. The programs can be called up by any

teacher or student from any computer on the network. Of all the programs available on the system, Smith says that AppleWorks GS and GraphicWriter are two mainstays that every student learns to use.

The advanced curriculum at Meigs is designed to better prepare a child to meet the rigors and challenges of modern life in a high-tech world. “The basic skills needed in today’s society have changed. They’re no longer reading, writing, and arithmetic. We define the new skills as advanced mathematics, communications, and computer skills,” Smith says.

Computers are used in all academic areas, but the school’s goal is not to turn out computer programmers. “A main goal is to eliminate computer fears and phobias,” says Smith. “Our students learn that a computer is merely sand (silicon, the main component of a computer chip, is made from sand) and solder that requires input from a human source to become an effective tool. We use Apple computers because they are the easiest to learn and operate, and they work the most logically — the way people think and speak. So does the software written for Apple computers.”

Some of the school’s faculty members also had to be taught not to fear the computers. Many teachers at first felt it was not necessary to include the computers in their curriculums. After providing personalized instruction, Smith says that all faculty members now use the computers for most of their classroom and administrative tasks. “Paper gradebooks are a thing of the past here,” he says.

After graduating from Meigs, students can go on to a magnet high school to continue their accelerated education. Both schools are free of charge to the students, but they must pay for transportation. “This cost savings allows a school to provide the best faculty members and classroom equipment — such as our Apple computers,” Smith concludes.

Please see the “Third-Party Products” listing in the Information Resources section for more information about third-party products mentioned in this Apple II success story.

Understanding the Basics

Ease of use has always been a guiding principle in the development of Apple computers. As an Apple II user, you don't need technical skills to use your computer.

This section gives you a behind-the-scenes glimpse of fundamental computing concepts. And in case acronyms like RAM and ROM make you a little uncomfortable, the section eases you into the technical language of computers by including the definitions of terms and concepts. There is also an introduction to the specifications of the three Apple II computers.

After mastering the basics, if you are ready for more technical information about Apple II hardware and operating systems, please see the Understanding Technical Information section.

The Fundamentals

What you really need to know about Apple II computers

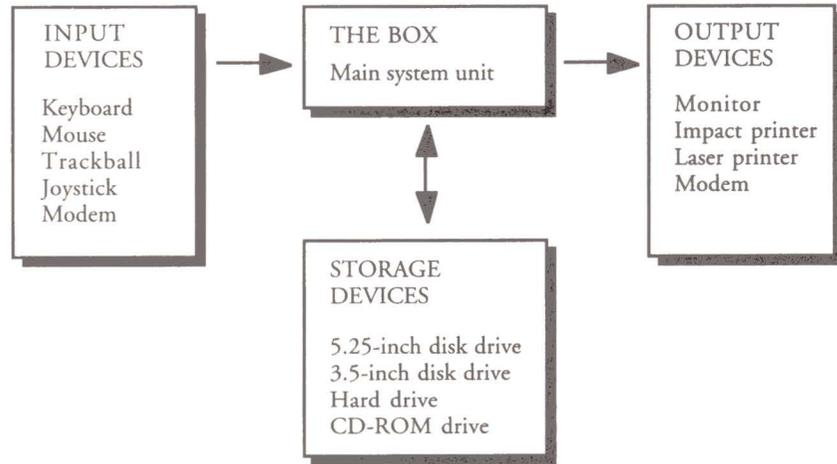
by Pam Michaelson and Frank Sweetser

Maybe you've heard the buzzwords — input, output, CPU, ROM, RAM, and all the rest. But maybe you don't know what they mean. Maybe you use these words, but sometimes aren't sure what the engineers have in mind when they use them. Maybe you want things spelled out. If so, this article is for you.

A computer is a magic gateway to the world's knowledge, to people everywhere, to adventure and mystery and beauty. It's an always up-to-date reference library, a complete office, and a publishing system. It's a studio for the arts — for music, for painting, for poetry, for the imagination. It's a tool for handling information.

The modern computer electronically handles all kinds of information. Text, such as the words you're reading now. Graphics, such as the pictures in this book. Sounds. Animation. Or numbers, like those in your checkbook. The ability to handle all these kinds of information rapidly and effectively gives the computer its apparently magical qualities.

But the computer is actually a system — a set of equipment that receives and stores information and then acts on it. One of these pieces of equipment is the main system unit — a box with a processor that handles your information. A variety of *peripheral devices* attach to this box. Storage devices such as a disk drive keep a permanent record of your information. The keyboard and other input devices help you “talk” to your computer. The monitor and other output devices, such as printers and modems, allow the computer to “talk” back.



Your computer is a system — a box that contains the central processing unit, plus peripheral devices, system software, and applications that help you work more productively.

The Box — What makes your Apple II so smart?

Most people think of a computer as a box. This “box” contains the *central processing unit* (CPU) — the source of the computer’s intelligence. These days it’s usually called the microcomputer.

The microcomputer is like an orchestra conductor, telling the parts how to work together in harmony. In it, you’ll find the actual decision-making microprocessor chips, special kinds of computer “memory” called RAM and ROM, and a variety of circuit boards and other microprocessor chips used to coordinate and connect additional devices such as the keyboard, the monitor, disk drives, modems, and printers.

Quickly defined, ROM is the *read-only memory* that holds the permanent instructions for the computer. These instructions tell the computer how to do things like add, subtract, and recognize the letter *A*. They tell it how to access the printer, disk drive, and other peripheral devices. These instructions are always available to the computer as soon as you switch on the power.

RAM is *random-access memory*, which is temporary memory. It’s erased every time you turn off the computer. It changes when you use a different program.

When you turn on your computer, the ROM tells the computer to look in the disk drive. If the computer finds a disk there, it loads the program from the disk into RAM memory. You don't see this happening. You see a menu of program options or the opening screen after the light on the disk drive goes out.

You will hear people describe the amount of ROM and RAM in terms of bytes, kilobytes, and megabytes. A *byte* is a basic unit of measurement for a computer's memory, about enough to remember a single letter of text. A kilobyte (K) is about 1,000 bytes, and a megabyte (MB) is about 1,000,000 bytes.

Input — The story of keyboards, mice, and your Apple II

Information you send to your computer is called *input*, and when you send it you are *inputting* data. The most common way to input information is through the *keyboard*. Each of the Apple II computers has a slightly different keyboard, but they all work the same way. You use the keyboard when you're typing documents, filling in forms in a database, using numbers in a spreadsheet, or sending instructions to applications.

There are other input devices as well. The *mouse* is a hand-held device you move across the surface of your desk. As you move the device, the mouse "senses" the direction and distance, and converts this information into coordinates (x and y) that correspond to positions on the computer screen. You can use a mouse in many applications to perform basic operations, but it's particularly useful as a drawing tool in graphics applications. A cable connects the mouse to the back of your computer (on the IIe, IIc, or IIc Plus) or to your keyboard (on the IIGS). With the Apple IIe, you'll need to put an *interface card* inside your computer. An interface card is a circuit board that you plug into a slot inside the computer's box to link a peripheral device to the computer. In this case, the interface card interprets the movements of the mouse.

A *trackball* operates on the same principle as a mouse. It attaches to your computer in the same way but remains stationary as your fingers rotate a built-in ball. A *joystick* is another type of input device, usually used to control the movement of characters, creatures, or objects in a computer game.

Output — When the Apple II shows what it can do for you!

Output is the way that your computer talks back to you. There are several tools for this purpose.

Your *monitor* displays text or graphics on a television-like screen. A monochrome monitor screen shows text and graphics in amber, green, white, or another single color against a solid background, usually black or dark blue. A color monitor can display a range of colors on the screen, depending on the program you're using. There are two kinds of color monitors: a *composite color monitor* that uses composite signals to create color images on the screen, and an *RGB color monitor* that uses red, green, and blue dots to simulate a range of colors on the screen.

A *printer* can print out on paper the letter you've been writing or that graphic design you "painted" with your mouse. Several different types of printers are available for use with the Apple II line of computers. The ImageWriter is a *dot-matrix printer*, which uses tiny pins that strike the paper in combination to create recognizable letters or graphics, either in black on white paper or in color. A *daisy-wheel printer* uses a pinwheel with preformed letters for text printing only. When the microprocessor tells it to use an *a*, it types an *a*, just like a typewriter. The third type of printer is the *laser printer*, which gives you near-typeset quality for your letter or newsletter and can print on both plain paper and transparencies.

Your computer has a built-in *speaker*, with many possible uses. Its basic use is to alert you to mistakes — it beeps whenever you do something wrong. But with proper software, it also permits the computer to speak instructions out loud to a user, a capability that can help a person with a visual disability use the computer just like anyone else. And with a speaker, you can make beautiful music, as well as beautiful text and graphics, with your computer.

MIDI Abbreviation for **Musical Instrument Digital Interface**. This software and hardware standard, set by the music industry, allows electronic instruments to communicate with one another and with computers.

To make the most of the built-in speaker, you may want to use some of the sound cards that are available for the Apple IIe and Apple IIGS. The Apple IIGS comes with an Ensoniq synthesizer chip already built in, so you can produce high-quality music right away. You can also add sound cards that take advantage of the Ensoniq chip's special capabilities. While some of these sound cards can use the internal speaker, external speakers are more commonly used. You can also add stereo cards, audio digitizers, and MIDI interfaces to musical instruments to further enhance your creative abilities with the Apple IIGS.

A *home control device* is another kind of output device. It sends information from your computer to an electrical appliance in your home. You can plug it into an electrical outlet and program the computer to turn on a light, coffee maker, stereo, sprinkler, or a host of other appliances.

Another way of sending (and receiving) information is through a *modem*. A modem connects your computer to telephone lines, allowing it to communicate with other computers throughout the world. Telephone lines were originally designed for human voices, but a modem translates your computer's "digital" output into a form that can be transmitted over these lines. A modem on the other end of the line puts the data back in the correct form for use by the receiving computer.

You can communicate with another computer by calling directly, or you can dial into a bulletin board or commercial on-line service. Bulletin board systems (BBS) are an inexpensive means of communicating with other computer users. Commercial services offer more options but charge fees — some higher than others — to use those services.

Storage Devices — Where to save all that information

That letter that you are writing on your computer is only in the computer's RAM memory, which disappears when you turn off your system. To store it permanently, you must save it on a disk. Then, if you want to return to the letter at a later date, you will be able to *load* it from your disk and work on it some more or print it out and mail it.

Data, such as a letter, is only one kind of information that can be saved on disks. Programs — also called *software* or *applications* — are also saved on disks. Programs that you purchase come on either a 3.5-inch or a 5.25-inch disk. The 3.5-inch disk is a hard-plastic-cased disk with a metal sliding closure that protects the storage medium inside. It can hold up to 800K of information or about 500 pages of text. The 5.25-inch disk has a thin, flexible plasticized case and holds 140K of information — not quite 100 pages of text. Its storage medium is exposed, so you should always keep a 5.25-inch disk in a protective sleeve when you're not using it.

You need a disk drive to use or save your data on one of these types of disks. When you purchased your Apple II computer system, you also purchased a disk drive. A disk drive reads the information on a disk or saves information from RAM on a disk for later use. On the Apple IIe and II Plus computers, disk drives are attached, through the back of the computer, to interface cards in slots inside the computer. The Apple IIc and IIc Plus have built-in drives: a 5.25-inch drive in the IIc and a 3.5-inch drive in the IIc Plus. You can add a drive to the Apple IIgs or an Apple IIc or IIc Plus simply by plugging the drive's cable into the back of the computer. A drive icon shows you where to plug in the cable.

Another important storage device is a *hard disk*. (By contrast, 3.5-inch and 5.25-inch disks are sometimes called *floppy disks*.) A hard disk is a high-capacity drive that can hold anywhere from 5 MB of programs and data to more than 300 MB — about 200,000 pages of text! Obviously, one advantage of the hard disk is the ability to store many programs, as well as all your data files, on a single disk. Plus, hard disk drives access programs and data much faster than the smaller capacity drives.

Hard disks may be attached to your computer in much the same way as a 3.5- or 5.25-inch disk. Such disks are called *external hard disks*. However, some hard disks now fit inside the computer. They are called *internal hard disks*.

CD-ROM Acronym for compact disc, read-only memory. These discs use laser technology to store data.

CD-ROMs are gaining popularity as storage devices. They are the champs when it comes to storage volume: They can store up to 500 MB of information. But compact discs are read-only discs. You can't store or save new information on them. They come with all the programs and information they will ever contain. To use CD-ROMs, you need a CD-ROM reader such as the AppleCD SC. You plug this reader into your Apple II computer the same way as an external hard disk.

Software — How your Apple II knows its job

Software is a “program that gives the hardware something to do.” A program is a set of instructions for the computer written in a form the computer understands. You don't have to know how to program to use your computer. Software comes on a disk, ready to use as soon as you insert it.

There are several types of software. *Application software* includes all the programs that do the many things you want to do with your computer, from writing letters and reports to balancing your checkbook to relaxing with a game or two.

System software gives your computer its personality. It is the set of instructions that tells the hardware how to communicate with you and your application software. The Apple II line can use several different operating systems: DOS 3.3, ProDOS, and GS/OS. ProDOS is the standard operating system for the Apple II Plus, the Apple IIe, and the Apple IIc, and it also runs on the Apple IIgs. The standard operating system for the Apple IIgs is GS/OS. Each system software version has different capabilities and operates in a different way. As a rule, you don't have to worry about which operating system to use, because most Apple II programs come with the system software already on the program disk. They depend on the system software to provide the computer “environment” they need to run.

Utility software provides useful tools for the computer user. With it, you can copy files from disk to disk, make backup copies of important programs or data disks, delete old files that you're no longer using, and even retrieve files you've accidentally deleted.

Most software you use will be commercial software. But you may also want to take advantage of *public-domain software*. Public-domain software is written by people who like to program and aren't necessarily doing it for the money. In some cases, they have spent a lot of time and effort on a program and have copyrighted it, but offer it for a minimal cost — usually less than \$40 — on a pay-on-your-honor basis. Such programs are called *shareware*. Public-domain and shareware programs are available through user groups and bulletin boards.

Copying commercial software to give to your friends is illegal. By purchasing your own copy of the software and sending in the enclosed registration card, you can be sure to receive notices of updates. You usually also get a special price for updates. More important, you guarantee that developers continue to spend the time and money necessary to develop first-class applications for the Apple II.

Expansion — Who knows what your Apple II will be when it grows up!

All the computers in the Apple II line can grow. You can add peripheral devices such as printers, additional disk drives, a modem, or a mouse. You can also improve the computer's internal intelligence and memory capabilities.

The Apple IIc, IIc Plus, and IIGS have external connectors called *ports* for adding peripheral devices. These ports have icons that show exactly where the cable for each type of peripheral device should be plugged in. All the other computers in the Apple II line have *expansion slots* that allow the computer to grow and expand its capabilities. By adding extra circuit board *cards* in these expansion slots, you can add extra memory to your computer, speed up its processing, control the various kinds of disk drives, and add other guide capabilities. You can also add special-purpose cards such as the Video Overlay Card. (See the "Video Overlay" article in the Making the Most of Your Apple II section for details.)

Another way to increase your computer's power is by adding chips to the *motherboard* — the main circuit board that covers the bottom of your microcomputer. The microprocessor chip called the Zip Chip, for example, can speed up your Apple IIe or Apple IIc.

Now you know

The box. The input and output. The storage devices. The software. These are the basics of your Apple II computer. From these basics spring all the magic, the mystery, the adventure. But perhaps now, the magic won't be quite so mysterious, and you can pursue the adventures of Apple II computing with a lot more confidence.

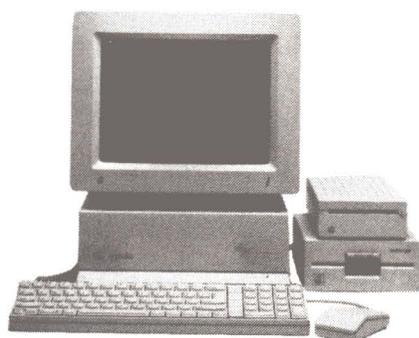
Pam Michaelson is Co-director of Apple/Boston, Boston Computer Society. She is also the owner and editor of the International New Product Newsletter and, with her husband, Tom, owns an advertising/marketing agency.

Frank Sweetser is active in Apple/Boston, Boston Computer Society. His work and interests are diverse — he's a machinist, a science-fiction fan, and an adult literacy volunteer.

The Apple II Computers

Key features differentiate the Apple IIgs, Apple IIe, and Apple IIc Plus

The Apple II family of computers has grown and changed over the years. These three models listed here are the most prevalent today.



Apple IIgs

The Apple IIgs is the most powerful and most colorful Apple II computer ever made. Combining the best of the previous Apple II computers — built-in accessory ports for easy addition of peripherals, and versatile expansion slots for system customization — the Apple IIgs provides an easy-to-use interface, high-resolution color graphics and 15-voice sound capabilities. Its features include:

- Microprocessor
 - 16-bit 65C816
 - 2.6 MHz

- Memory
 - 1 MB of RAM
 - Expandable to 2 MB with Apple II Memory Expansion Card, or to 8 MB with third-party cards
 - System software built into two 128K ROMs

- Peripheral capabilities
 - 8 slots — 7 general-purpose, 1 for memory expansion
 - Built-in ports for serial printer, modem, NTSC or RGB monitors, 3.5-inch and 5.25-inch drives, joystick, and AppleTalk
 - Apple Desktop Bus™ (ADB) port for mouse, keyboard, and other input devices
 - Apple II High-Speed SCSI Card supports devices such as hard disks, CD-ROMs, and tape backup (not included with CPU)

- Memory
 - 128K of RAM
 - Expandable to 1.13 MB with a third-party Memory Expansion Card
 - 32K of ROM

- Peripheral capabilities
 - Composite video output
 - Disk drive connector for daisy-chaining up to 3 external 3.5-inch and/or 5.25-inch disk drives
 - Joystick, game paddle, and mouse port
 - Two RS-232-C compatible serial ports
 - Video port for third-party LCD monitors

- Keyboard
 - Built-in 53-key, full-size keyboard
 - Choice of QWERTY or Dvorak layouts
 - Speaker volume slide control

- Display
 - 40- or 80-column text
 - Monochrome or composite color monitors
 - Low resolution: 16 colors, 40 by 48 blocks
 - High resolution: 6 colors, 280 by 192 dots
 - Double high resolution: 16 colors, 560 by 192 dots

- Sound
 - Audio generator with built-in speakers

An Apple II Success Story

Equal access to computing is fundamental for Shoshana Brand and her family



In 1983, Steve and Jackie Brand became frustrated when they began looking for ways to help their six-year-old daughter Shoshana, who has cerebral palsy and a vision impairment, use a computer to keep up with the other children in school. So Steve took a one-year sabbatical from his teaching job and went to computer school, and Jackie met with other families with similar needs. The result was that Shoshana got a specially equipped Apple II Plus and her parents founded the Disabled Children's Computer Group (DCCG) to help other families like themselves. Apple's Office of Special Education and Rehabilitation, which is dedicated to the concept that personal computers are changing what it means to be disabled today, soon learned of the Brand's work and DCCG. Apple then joined forces with the Brands to create a nationwide organization now called the Alliance for Technology Access (ATA) which "focuses on increasing the awareness, understanding, and implementation of micro-computer technology to benefit people with disabilities of all ages."

Today Shoshana uses computers at home and at Pinole Valley High School, California, where she is a freshman. "For the first time in her life, she can do homework without the aid of an adult," Jackie says. Shoshana uses her Apple IIGS at home more often than she uses the computer at school. She tape records each class and in the evening transcribes necessary information from the tapes and does her homework on her computer. Her computer system is equipped with an Adaptive Firmware Card (AFC) that serves as an interface to a Unicorn Membrane Keyboard. The Unicorn keyboard is touch-sensitive and specially programmed to make it easier for Shoshana to use her Apple IIGS. Shoshana also uses an Echo Speech Synthesizer, which allows her to hear what she is entering into the computer.

"One of the most exciting ways Shoshana has used her Apple IIGS for school was for two science fair projects," says Jackie. While at Adams Middle School in Richmond, California, Shoshana researched how well children vs. adults and males vs. females understand a voice synthesizer. She had people listen to voice synthesizer audio samples and then repeat what they heard into a tape recorder. To present the results of her research at the science fair, Shoshana used her Apple IIGS to make bar graphs, to create a display board, and to write her report. "It was a great experience for her and her classmates. The project renewed the kids respect for Shoshana's skills and showed them how the technology worked," Jackie says. "Shoshana learned more about voice synthesis. She even shared her results with the people at Street Electronics! (makers of Echo Speech Synthesizer)."

Jackie believes that the Apple IIGS is a "terrific" asset for Shoshana as well as kids without disabilities because it enables them to interact. "There's no way in the world Shoshana could be in a regular school without computer technology," Jackie says. And the kids without disabilities learn that people like Shoshana are really no different from themselves.

Please see the "Resources for People with Disabilities" and "Third-Party Products" listings in the Information Resources section for more information about ATA resource centers and third-party products mentioned in this Apple II success story.

Making the Most of Your Apple II

More than 15,000 products have been developed for Apple II computers to help you at school, home, or work. For example, Apple II users can compile lists in databases; create videos, graphics and animation; publish newsletters; send mail electronically; and play and create music. More importantly, an Apple II makes these jobs easy and fun. Programs are available for every educational topic from elementary school to college level — including language arts, math, history, geography, science, physics, and more. And, a wide variety of games can entertain you for hours.

While we cannot explore all the possibilities in this section, we will introduce you to four applications: Apple Works to increase personal productivity; telecommunication to communicate with others; video overlay to access incredible video capabilities; and hypermedia to blend access to stored information with on-screen graphics, music, and animation. Please check the “Third-Party Products” article in the Information Resources section to learn about other products to enhance your Apple II computer.

AppleWorks

Increase productivity with the quintessential Apple II program

by Warren Williams and Steve Carlton

Ask Apple II users how they use their computer and you will soon hear about personal productivity and AppleWorks. If you already own an Apple II, you undoubtedly know that AppleWorks is an integrated program that combines word processing, database, and spreadsheet functions in one convenient, easy-to-use package. You might also have heard some of the folklore that surrounds this popular program.

In this article, we explore the reality and myths about the development of AppleWorks and describe some unique applications that have contributed to the overwhelming success and popularity of the program.

AppleWorks: Folklore and Reality

It's not often that a computer program generates its own folklore, however, AppleWorks is not a typical program. Robert Lissner's name on the AppleWorks startup screen tells you who wrote the program. But how and why he wrote it is a mystery to many.

Unfortunately, most of the exotic rumors about the development of AppleWorks are not true. No, Lissner did not write the program during a short vacation in Alaska. Nor did he write AppleWorks over an intensive weekend at a summer cottage in California. And, no, Lissner is not a recluse who wrote AppleWorks in a log cabin in the mountains, while powering his Apple with a portable generator. Like most folklore, the creation of AppleWorks is more mundane than these myths suggest.

Lissner, who holds a degree in electrical engineering from Stanford University, bought his first Apple II computer in 1979. Interested in programming as much as in engineering, he soon designed and developed QuickFile[®], one of the first successful database programs for the Apple. QuickFile was a flexible, easy-to-use program that appealed to Apple's Steve Jobs, who recognized the program's potential and agreed to market QuickFile through his rapidly growing company.

Lissner recognized that the characteristics that lead to the success of QuickFile could be generalized to other personal productivity programs, and he set out to develop another product. The introduction of Apple's Lisa Office System gave Lissner the idea to produce a program that integrated word processing, database management, and spreadsheet capabilities into a single package that would run on Apple II series computers. In 1982, Lissner started developing Apple Pie, a program that would offer all three modules in one integrated package.

Apple Pie, later called AppleWorks, took two years to design, program, and bring to market. Lissner wrote the program entirely in machine language, working alone in his home office. However, his friends at Apple offered many ideas and suggestions during all phases of the process.

An interesting part of Lissner's work relates to the computers he used to write AppleWorks. In late 1980, Apple introduced the Apple III business system, which was a significant technical achievement for its day. Because Apple was the first company to announce a no typewriters policy, many of the Apple staff in Cupertino had Apple III computers on their desks. Lissner wanted the people at Apple to use Apple Pie, so he wrote his program simultaneously for both the Apple II and III systems. When it came time to market the program, Apple exercised its option to market the Apple II version and left Lissner with the rights to the Apple III product. Lissner sold those rights to a marketing company. The Apple III version of Apple Pie is still available as a program called ///E-Z Pieces, which is fully compatible with all except the latest version of AppleWorks.

The Impact of AppleWorks

AppleWorks soon became the most popular program in the history of computing, with more than one million users. It is difficult to overstate the program's impact on the computing community. At home, users replaced their typewriters with Apple II systems and AppleWorks. At school, administrators, teachers, secretaries, and students used the program to enhance their personal productivity. Schools even developed courses around the program and educators used AppleWorks to prepare students for a computer-oriented society. Thousands of businesses started using AppleWorks to help with communications, finances, and inventory management tasks.

The popularity and flexibility of AppleWorks led to the development of a variety of AppleWorks-related ventures. Four companies (Beagle Bros, Pinpoint Publishing, JEM Software, and PBI Software) introduced products that added more than 100 features to AppleWorks. Dozens of developers produced AppleWorks enhancements and templates, and AppleWorks became the model for programs that run on other computers. For example, Claris Corporation (which developed the latest version of AppleWorks) released AppleWorks GS, a more powerful, graphically oriented program that takes advantage of the graphic capability of the Apple IIGS computer.

AppleWorks also spawned the development of the National AppleWorks Users Group (NAUG), the industry's largest single-product users group, which offers valuable resources and services to support the AppleWorks community.

How AppleWorks is Used

Many applications of AppleWorks are predictable. People use the word processor to produce reports, letters, memos and other documents. The database serves to store information that would normally go on 3" x 5" or 5" x 8" cards. And the spreadsheet serves to maintain financial data and other numeric information. But the program's flexibility has led users to utilize AppleWorks in ways that Lissner never expected. Here are some brief vignettes of these unique uses.

AppleWorks for Butchers

Pricing butchered meat in a grocery store is not as easy as it sounds. The butcher buys a cow and must decide how to price each cut to yield a profit on the entire piece of meat. To complicate matters, butchers often price one or two cuts as sale items below their actual cost and must be price competitive on the remaining cuts.

For 20 years, John Casselina ran the meat department in his Cleveland, Ohio grocery by using paper and pencil to do the necessary calculations and ensure the profitability of his department. But the development of AppleWorks changed that. Now John loads his pricing and inventory templates into AppleWorks, enters his figures, and has the prices for each cut in minutes. When John isn't using his free time to improve the meat department at his store, he is out showing other butchers how to save time with AppleWorks.

AppleWorks and the Post Office

Apple II computers are closely tied to education, but here is an educational application you might not have expected.

The U.S. Postal Service (USPS) uses Apple II computers and proprietary software to train machine operators. The computers simulate the operation of expensive letter sorting machines by presenting trainees with a letter that scrolls horizontally onto the screen. The computer then captures the trainee's keyboard entries.

Each regional training center uses this propriety software to develop lessons for the machine operators. The center maintains a database of local addresses to ensure that operators sort the mail correctly for that region.

The software written for the USPS was developed before the advent of AppleWorks. However, requests from the regional training centers for AppleWorks compatibility led the Postal Service to rewrite the original programs so they could accept data stored in AppleWorks. Now many centers use AppleWorks to store the data used in the letter sorting machine exercises.

To encourage his colleagues to share information between training facilities, Jim Travis, the manager of training at the USPS Boston General Mail Facility, recently installed an Apple II-based electronic bulletin board at his center, which can be accessed through the Postal Service telephone network. With AppleWorks as the common element between the centers, Jim and others post their lesson plans and templates in AppleWorks format files on the electronic service for downloading by other centers.

AppleWorks and the Native Tongue

During the day, John Carson teaches special education courses in a suburb of Montreal. At night, he teaches educational technology courses in Canada's northern tier, more than 1,000 miles from home.

John's students are teachers taking advanced courses in the Distance Education program offered by McGill University. Students and teacher meet only during his rare trips north. Instead, he "lectures" through electronic mail and uses telecommunications services and facsimile equipment for the two-way transfer of information between his home office and his students hundreds of miles away.

Like students everywhere, John's pupils do their work on Apple II computers using AppleWorks. However, these students go beyond using AppleWorks as a personal productivity tool. John's students recently developed a font of the characters in the Inuktitut language. These teachers now use AppleWorks and Beagle Bros' TimeOut SuperFonts to prepare native language printouts without special printing presses and expensive equipment. Following up on this success, students are developing fonts for other native populations. Students and instructor, alike, are pleased to use their equipment and software to maintain and improve students' native language skills.

Volunteer Program Relies on AppleWorks

Anthony Vasek started his computing career in 1945 with punched cards and sorting machines. By the early 1950s, he was developing inventory management systems for Univac Model 1004 computers, a computer that was programmed by changing 2.5' x 2.5' hand-wired boards containing the "software." Now this 72-year-old retired software developer volunteers his skills to help coordinate the Meals on Wheels program in Grand Rapids, Michigan.

Meals on Wheels delivers hot meals to the homes of 160 shut-ins throughout the city. Anthony uses AppleWorks and two popular AppleWorks enhancements, TimeOut UltraMacros, and ReportWriter, to schedule the 122 volunteers who prepare and deliver the meals. AppleWorks also lets him maintain a database of the 22 different menus used by the group. Anthony uses AppleWorks to track the current food inventory, determine the amount that must be ordered to prepare each week's meals, and to compute the cost of the program's operations.

The voice of experience speaks when Anthony says, "My computer, AppleWorks, UltraMacros, and ReportWriter gives me more programming power than I had with mainframe computers in the 1960s."

Art on Disk

Walk into June Sullivan's apartment in the Philadelphia suburbs and you will probably find her at her well-used Apple IIGS. June's computer is her paint brush and pallet, her means of artistic expression. Using a mouse and AppleWorks GS, she draws familiar objects, edits them until they look the way she wants, and adds them to her collection of more than 1,500 images stored on disk.

Ask June how she started using her computer and you will hear interesting stories about how she got started with other exciting projects — like the time she told her family she was going shopping and instead took flying lessons at the local airport.

Unlike one of her other projects (a dismal failure trying to learn to play the bagpipes), June's work with AppleWorks GS is an unqualified success. At age 66, she recently formed her first business and sold 300 of her disk-based images to a software publisher. Now June is working on two other exciting projects she would like to publish.

When asked why it took AppleWorks GS to help her discover her artistic potential, June says, "I love manipulating images and I couldn't do that with paper and pencil. Now, when I erase a mistake from my computer, it is gone forever."

AppleWorks and Property Management

Bruce Rapee, who operates more than 320 apartment units and mobile home park spaces in southern Florida, uses AppleWorks as an integral part of his business management strategy.

An astute businessman, Bruce used an UltraMacros-enhanced copy of AppleWorks to develop an automated, menu-driven system that maintains accounts receivables, tenant rosters and demographics, lease maintenance and renewals, and tenant incident records. The system generates receipts, tenant account histories, deposit slips, rent due reports, Florida's Statutory Rent Due Notice, leases, and parking violation notices. The customized menus on the screen make it easy for operators to enter and locate data, and generate reports without understanding AppleWorks. As a result, AppleWorks saves his staff hours of work while making his real estate venture less dependent on the availability of computer-trained personnel.

One of Bruce's more esoteric applications helps conserve energy and save money. He uses AppleWorks and TimeOut Graph to track water usage in his properties. When consumption rises above the moving average for the past 12 months, he calls a plumber who goes through the units and fixes all the leaking faucets, showers, and toilets.

AppleWorks and Automobile Appraisals

It's summer vacation and you're not thinking of AppleWorks as you wait at the motel for an appraiser to assess the damage from yesterday's automobile accident. But AppleWorks will probably help get that appraiser to your door.

Insurance companies can't keep appraisers in every city and town, so they turn to Bob Rice's Inspection Management Services company to help get your car appraised. Bob and Sue Rice maintain a list of more than 6,500 appraisers who do the necessary inspection and appraisal work. They get the appraiser to the scene, file the necessary reports, and help your insurance company get you on your way.

Bob and Sue use four Apple II computers to manage their business. They log all calls into an AppleWorks database, then AppleWorks helps them locate and contact appraisers throughout the country. They enter appraisers' findings into AppleWorks and use the program to generate all billings.

Their business is growing quickly, and AppleWorks proved so powerful, flexible and easy to use they would not consider any other software package. However, they do plan to buy a Macintosh to let their Apple II computers share files on an AppleShare network.

Positive Self-Concept for Poor Achievers

Underachieving students can enter a downward spiral. Their poor school performance reinforces negative self-concepts. As a result, these students often do not complete their work and fall further behind their classmates.

Rosemary Parmigiani, who teaches junior high school low achievers in Bristol Borough, Pennsylvania, uses AppleWorks to break this cycle. Rosemary teaches her students AppleWorks. She believes that the program is so easy to use that her students' success helps them feel good about themselves and about computing. Once they are comfortable with AppleWorks, she encourages them to use the program to improve their writing and to gather information about the world.

Rosemary finds that students who use AppleWorks are more likely to complete their assignments than students who work by hand. She attributes this finding to the fact that the word processor lets you change your mind about what you write. So, entering a sentence into a word processor document represents less of a commitment than writing on paper. Therefore, her students get better grades, improve their self-image, and try harder at school.

Rosemary's students use the AppleWorks spreadsheet module to learn mathematics. She encourages students to help each other diagnose problems with spreadsheet formulas. As a result, her students develop a better understanding of mathematics and positive feelings about their mathematics skills. Certainly, AppleWorks cannot solve the problem of poor school achievement, but the

program does help many students overcome some of the barriers that inhibit their success.

AppleWorks Support

AppleWorks users benefit from the most comprehensive support infrastructure available for any software package. Claris Corporation, developer of both AppleWorks 3.0 and AppleWorks GS 1.1, offers unlimited support to AppleWorks owners through the company's technical support line. In addition, AppleWorks users get support from all the major on-line services, including CompuServe, GENie, and America Online. There are more than two dozen books that help every level of AppleWorks user. And most local Apple users groups and public school Adult Education programs have AppleWorks experts who are anxious to help solve problems that others experience with the program.

NAUG's more than 15,500 members in 42 countries receive the *AppleWorks Forum*, a 36-page monthly newsletter that describes tips, techniques, and hints to help users get more from AppleWorks. The AppleWorks Forum also includes news of product releases and reviews of AppleWorks enhancements and AppleWorks-compatible software.

NAUG members have access to more than 150 volunteer consultants who provide free telephone support for their fellow members. A list of consultants and their areas of expertise appears in each issue of the AppleWorks Forum.

Members get unlimited access to NAUG's multi-user electronic bulletin board, which lets you communicate with other AppleWorks users, get answers to questions, and download AppleWorks templates and programs. To date, the Electronic Forum has handled more than 44,000 calls from NAUG members seeking help or sharing information with their NAUG colleagues.

NAUG's Public Domain Library contains dozens of disks and hundreds of AppleWorks utilities, enhancements, and templates. The group publishes a 44-page catalog describing the disks in this AppleWorks library. In addition, NAUG members have access to the group's Disk Rescuers Program, professionals who can recover damaged AppleWorks data disks. And NAUG members receive

significant discounts on AppleWorks products from the group and AppleWorks developers.

For more information, contact NAUG, Box 87453, Canton, MI 48187, (313) 454-1115.

Teachers who use AppleWorks should also contact the Teacher's Idea and Information Exchange (TI&IE) and The AppleWorks Educator. TI&IE publishes disks filled with excellent templates, lesson plans, and other ideas that are valuable to teachers. TI&IE has published more than 40 disks that educators should consider for their collection of AppleWorks resources.

You can contact TI&IE at Box 6229, Lincoln, NE 68506 (402) 483-6987.

The AppleWorks Educator is a 16-page newsletter published eight times a year with articles that describe how to use AppleWorks in the educational environment.

The AppleWorks Educator, AACE, Box 2966, Charlottesville, VA 22902.

For Additional AppleWorks Resources

To obtain a comprehensive AppleWorks bibliography, please send your request with a mailing label to Janet Vratny-Watts, Information Scientist, Apple Library, Apple Computer, Inc., 10381 Bandley Dr., Cupertino, CA 95014. Please refer to "Third-Party Products" in the Information Resources section for more information on the third-party products listed in this section.

Dr. Warren Williams is a Professor of Educational Technology at Eastern Michigan University in Ypsilanti, Michigan. He is the President of the National AppleWorks Users Group and has written more than 75 articles and given more than 100 seminars on AppleWorks throughout the country.

Steve Carlton is the AppleWorks Family Product Manager at Claris Corporation.

Telecommunication

Teach your computer to use
the telephone

by Jerry Cline and Greg Schaefer

So you've heard a thing or two about telecommunication. Perhaps you even thought you might like to give it a try. But then you thought it might be too expensive or too complex. Besides, you know it involves the use of your telephone line, so the phone company might want to know what you are doing, and if you're not sure yourself, perhaps you would rather not get involved. If these kinds of concerns are keeping you from discovering the value of telecommunication, this introduction to the topic should ease your mind and get you started.

Telecommunication is a way to use your Apple II computer to find — and share — information. Not just any information, but the particular kind of information that interests you. For example:

- If you are a student, you can get the information you need to write a report from an on-line library. Today, many libraries have reference information available on computer. You can call up the computer and get the information without ever leaving your desk. You can also check the library's card catalog remotely to see whether they have the book you want and whether it's available or checked out.
- If you use your computer to manage your stocks, you can get up-to-the-minute stock quotations and enter them directly into your stock management program for analysis.
- If you are part of the growing revival of cottage industries, telecommunication can help you run your business from home. You can live away from busy populated areas and use your computer and telephone to maintain the business contacts essential to your success.

- If you're a professional scholar or even an armchair scholar, you can use telecommunication to keep up-to-date with the latest developments in your field of interest by joining a special-interest group that "meets" electronically.
- If you want to communicate with a friend, you can fire up your computer and compose a letter with your word processor. You can type your friend's name and address and then instruct your computer to dial the number of an on-line service. Within a couple of minutes, your letter is in your friend's electronic mailbox.
- If you want to tap the enormous body of freeware and shareware, you can use on-line services to find the programs that interest you and, moments later, have them on your computer, ready to use.

To use telecommunication for any of these purposes, you need a telephone line, a modem, a serial card or port, and your Apple II computer. You also need software and someone to call.

The Telephone Line — The phone company doesn't care who's talking

Your telephone line puts the "tele" in telecommunication. Using the phone line for a telecommunications call is no different than using it for a voice call, except that your computer is "talking" instead of you.

Our phone lines were designed for analog voice transmission in which tone, frequency, and volume change gradually, like shades of gray. The computer, however, speaks a digital language, in which everything is black and white — no shades of gray. It understands the controls of switches and whether they are turned on or off. Because the computer speaks only this language of electronic on/off pulses, represented as 1s and 0s, and the phone system can only transmit tones, volume, and frequency, a translating device is necessary.

The Modem — A translating device

A modem is a device that connects your computer to the phone line. It uses a process called *modulation* to change a tone (its frequency and phase) based on the data you are sending. The result is that the 1s and 0s your computer sends to the modem are changed into tones that can be sent across a phone line. The receiving modem uses *demodulation* to change the tones back into 1s and 0s. The word *modem* is a contraction of *modulator* and *demodulator*.

baud A unit of measure for transmission speed, usually equal to one bit (or pulse) per second.

The most important thing to know about a modem is its baud rate — the speed at which it sends and receives information. Standard baud rates for modems are 300, 1200, 2400, and 9600 baud. At 300 baud, your computer can send about 30 characters per second. At 9600 baud, it can send about 960 characters per second. Obviously, when you are calling long distance or paying by the minute for an on-line service, fast is cheaper than slow. (However, some on-line services charge a higher per-minute fee for higher speed transmissions. So get out your calculator!)

Higher speed modems cost more initially. In fact, the ultra-high-speed 9600 baud modem costs several hundred dollars more than a 2400 baud modem. Also, many services are not currently available at 9600 baud. Today, 2400 baud modems have become quite affordable and are certainly adequate for most telecommunications tasks. High-speed modems can usually be used at lower speeds, and most are designed to determine the speed of the calling modem automatically.

You can get an internal or external modem for your Apple II. An internal modem comes on a card that plugs into a slot inside your computer and is powered by your computer's power supply. An external modem has its own case and power supply. You plug it into a serial card or port in your computer.

serial port A device that converts a byte of data into a stream of bits (1s and 0s). The bits are then sent in serial fashion — that is, one at a time — over a cable. Modems and computers “talk” using serial communications.

The Serial Connection — Built in or added on?

You connect a modem to your Apple II with a cable to a serial port (unless you’re using an internal modem). If you have an Apple IIc or Apple IIgs, the serial port is built into the computer. All you need to do is plug the modem into the port.

The Apple IIe doesn’t have a built-in serial port. You need to buy and install a serial communications card, such as the Apple Super Serial Card, and then connect the modem’s cable to the card.

Software — Instructions for you, your modem, and the computer you’re calling

In addition to the hardware, you need software to connect to the outside world. Just as you use a word processor to write reports or letters and a spreadsheet program to calculate budgets, you need a telecommunication program to make connections, and send and receive information.

You use the telecommunication software to make choices about settings — to set the baud rate for your transmission, for example. Software can also save you time by automatically dialing the phone numbers of services you use frequently. You can use software to compose, address, and send messages. You can also use it to send files from your computer to another computer, or to save messages and files that you receive.

Like any application, the features and ease of use depend on the software you choose. Many telecommunications programs are available for the Apple II. According to *InCider/A+* magazine, the two leading programs are ProTERM, by InSync Software, and Point-to-Point, by Beagle Bros. Some telecommunications services have their own proprietary software, designed to help you get the most out of their system (America Online is an example).

Someone to Call — On-line services and bulletin boards

You can use your Apple II, your modem, and your telecommunication software to send information to someone directly — a business associate who needs the terms of a contract quickly, for example, or a friend who wants to see your list of favorite places to rent for a summer vacation. You just let your software dial the recipient's phone number, and then you can send the information directly to his or her computer.

More often, however, you'll be using a telecommunication service. Two types of telecommunication services are available: large commercial services that many users can call at the same time and smaller bulletin board systems, which usually have only one phone line.

upload To send a message, file, or program from your computer to the host computer — the computer that manages the information exchange on the service you are using.

download To receive a message, file, or program from the host computer.

freeware Software that the author allows to be distributed at no cost to the user. Also called public-domain software.

shareware Software that the author allows to be distributed free of charge on a trial basis. If the customer decides to keep the software, a small fee is charged. Usually written instructions and updates are provided after payment. Also called public-domain software.

The large commercial services, generally known as on-line services, provide a variety of information. For example, you can use an on-line service to make travel reservations, get the latest news, or play games. You can "chat" with other people who are on-line at the same time as you by typing messages back and forth. Or you can leave messages to be retrieved by someone later. You can also upload and download freeware and shareware programs that the author has authorized for electronic distribution. These services normally charge for usage by the hour, but in most metropolitan areas, you can reach the service with a local phone call, which can save you phone charges if you want to send information to someone in another city.

A bulletin board system — or BBS — is an electronic version of the message exchange board often found at a social gathering place such as the local grocery store. You can tack a note on the board to announce an item for sale, or look for announcements of services or items you need. The subjects of discussion on a BBS may be varied — from how to learn more about your computer to photography or skin diving. You can peruse the bulletin board and download files that interest you. You can also join in a discussion by posting question or ideas in the form of bulletins. Such discussions are called *threads*, and you can create or follow any thread that interests you and others.

A BBS is often a local service, and many communities have several. Unlike the large commercial services, which use large mainframes or minicomputers to manage the information exchange, a local BBS probably runs on a computer similar to your own. Like your computer, these systems normally run with a single modem and phone line, so only one person can use the system at a time. If you call and the system is in use, you get a busy signal.

Telecommunications Help — Where to get it

If you need help getting started with telecommunication, you can get help from several sources. First, contact your local Apple user group. User groups are sure to have members who can answer questions you have about telecommunication hardware and software. They will almost certainly know about all the local bulletin board systems and may even have one of their own. You can also contact an on-line service. Most on-line services have introductory packages that help you get started and let you sample their services. You'll find information about user groups, software, and on-line services in the Information Resources section of this book.

Jerry Cline started, and is the system operator for, the Arizona Apple Tree bulletin board system in Phoenix. In May 1990, Jerry started InSync Software with Greg Schaefer.

Greg Schaefer rewrote the popular ASCII Express from DOS 3.3 to ProDOS when he was 17. He designed, wrote, and published GBBS and GBBS Pro, the benchmark bulletin board system for his publishing company, which he started when he was 18. His new company, InSync Software, is a joint venture with Jerry Cline.

Video Overlay

Bring the world of video
to your Apple II

by Doug Camplejohn

Have you ever wanted to add your own captions and notes to educational or home videos — to bring a physics concept down to earth, for example, or to enliven footage of a family vacation trip? Well, that's what the Apple II Video Overlay Card — and this article — is all about.

Using a combination of hardware and software, the Apple II Video Overlay Card offers new possibilities for learning and creativity by merging two powerful channels of communication — video and computing. With the Video Overlay Card, you can superimpose Apple II screen images on top of video images. You create the screen images using any software package, such as a paint or animation program. You get the video images from a VCR, a videodisc, video camera, or television. You display the combined images on an RGB monitor or composite monitor and record them directly to another VCR.

Sound difficult? It's not. All you need is the Video Overlay Card and your Apple IIe or Apple IIGS.

The Card's Job — Synchronize your computer and video source, then mix the images

You're probably already familiar with the concept of video overlay because the technique is used in television all the time — for captions on news broadcasts and for diagrams on sport replays. The Apple II Video Overlay Card creates a video overlay using a two-part process.

genlock A process that locks the video signal generated by a computer in synchronization with the signal from another video source, such as videocassette tape or video camera, to display the two signals together on a single screen.

First, the Video Overlay Card detects the incoming video signal and synchronizes the Apple II with the video signal using a process called *genlock*. Then the images are mixed and displayed. The graphics chips on the card determine whether each pixel displayed will be video, graphics, or some combination of the two.

Your Job — Create images, decide where they go

Here's what you actually do. Start by using any Apple II application to produce your own text, graphics, or animations. For example, you could write descriptive captions for video footage of a ski trip to Aspen, make detailed diagrams to illustrate the cross-section of a flower, or even draw your dream house on a video of property you're thinking of buying.

Then, using the VideoMix software included with the Video Overlay Card, decide where you want your overlays to appear and blend the video and graphics images to achieve the results you want. To display your finished product, you need your computer and an RGB monitor, such as the AppleColor™ RGB monitor, or a composite monitor, such as the AppleColor Composite Monitor. You can also record your overlay images on videotape as you display them, using a VCR. What you see on the screen is recorded on the tape, so you can play the tape back later on your computer or on your television screen.

Along with the Apple II Video Overlay Card you get an RGB cable, a video in/out cable, an easy-to-follow owner's guide, and VideoMix (a utility application that comes in both Apple IIgs and IIe versions). You need to add a video source and some software of your own choosing to create the overlay images. You also need an Apple IIgs with 512K of RAM and ROM 01 (or a later version), or an Apple IIe with 128K of RAM and a revision B or later motherboard.

The Possibilities — Everything from instructional material to Hollywood effects

The Video Overlay Card is a tool with lots of possibilities for educators and home users alike.

As an educator you can label or highlight video images on instructional video material. You can run or even author interactive laserdisc video applications that use overlays to combine video and graphics. And, of course, you can help students design their own creative projects.

At home you can add titles, captions, or scrolling credits over video productions. You can also create a range of Hollywood effects such as fades or dissolves and add other creative touches. The only limit is what you can imagine and create with your software.

Doug Camplejohn is a product manager for Video Integration Products at Apple. His responsibilities include the Video Overlay Card. He attended Carnegie Mellon University, where he received his electrical engineering and MBA degrees.

Hypermedia

Expand the horizons of your
information world

by Roger Wagner

Stacks of cards. Buttons, text fields, and graphic items. These are the elements of a new world of information where just about anything can happen — in just about any order. It's the world of hypermedia, and you can get your introduction here.

Ever since the Egyptians learned to take papyrus reeds and make written records with scrolls, people have been recording information and expressing ideas in a linear form. With the early scrolls, the very nature of the physical medium dictated a linear structure to the information. It's not very convenient to move from the beginning to the end and then back to the middle in a scroll, so information soon became organized into a one-pass, beginning-to-end presentation. Even when someone figured out how to fold the scroll up like an accordion and called it a *book*, the linear nature remained.

With computers, however, movement through documents of any kind became much easier, and in the early 1960s, a new term was coined to describe this new ability — *hypertext*. In the hypertext model of information, a researcher who is viewing a document on a computer terminal in a library might come across an author's name, another book title, or an interesting term, and instantly move to another document, using words and phrases in the current document as a jumping off point.

Hypertext was promising, but a new term has introduced a much more ambitious goal. That term is *hypermedia*, and it describes the seamless integration of all the modern modes of information: words, graphics, video, and sound, all combined onto the pages of a magic book, the modern personal computer. Hypermedia means more than just combining information, however. It's also a way for an information user to be an active participant in the information display. The user determines the order of presentation by pointing to things on the screen and clicking with the mouse. Each click can lead to a new part of the total information environment. And with computers like the Apple II and Macintosh, which can manage large amounts of information, display text and graphics on the screen, and add the excitement of sound and full-motion video, the information environment is, indeed, diverse.

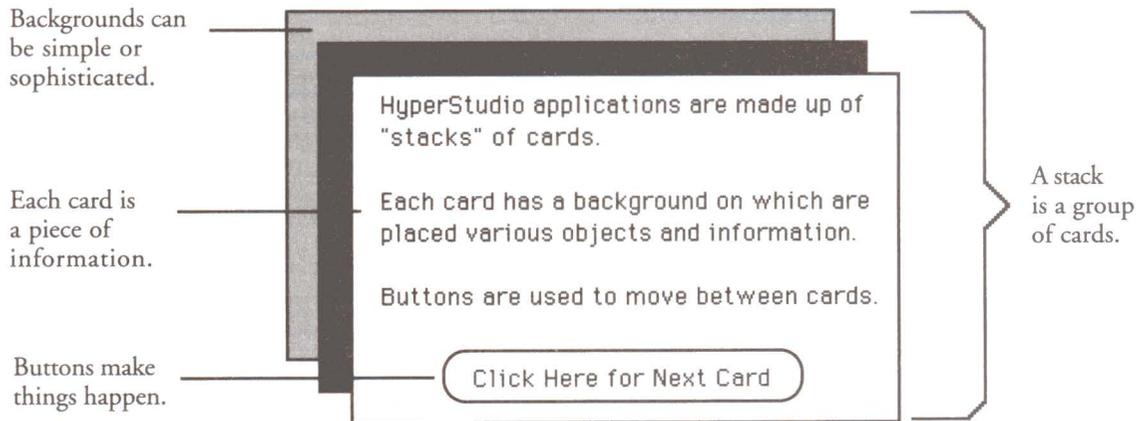
Sometimes people confuse hypermedia with *multimedia*. In years past, multimedia was usually thought of as a slide projector with a record player set up alongside to add an audio background. With today's technology, the computer can control not only external devices, such as projectors and sound equipment for formal presentations, it can be the entire show itself — integrating many sensory forms of information. But in the strict sense, multimedia is a passive experience. Hypermedia, on the other hand, is set apart by the user's interactive participation.

Basic Elements — Stacks of cards

The basic element of a hypermedia application on the Apple II is a *card*. A card is a single computer screen of information. Like a file card in a recipe box or Rolodex, it usually has one piece of information — one recipe, one person's address, or a description of one kind of boat.

A group of these screens, or cards, is called a *stack*. A stack is like a complete application and is usually stored as a single file on your disk. But the grouping of cards does not create fixed boundaries. Movement between stacks is as easy as movement between cards in a single stack.

Each card in a stack has some sort of a graphic *background* that gives the card a context for the information presented. The graphic background may be a representation of a page from an address book, a map of a building, or just a simple solid color or pattern. If you are creating a stack, you can draw the background yourself, or you can construct it from existing graphics of background screens or clip-art borders and other graphic decorations.

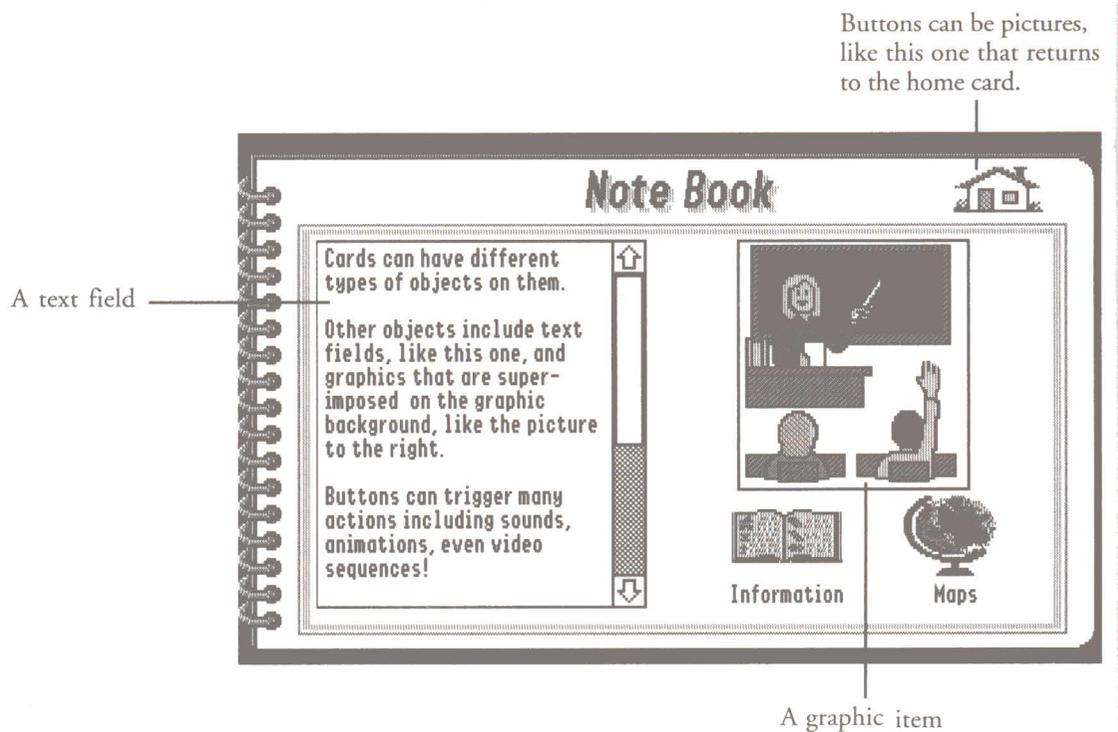


The basic element of a hypermedia application is a card. Cards are combined to build stacks.

Information appears as objects on top of this background. You can use different kinds of objects for different kinds of information. For example, you would use *text fields* for names, addresses, or paragraphs of explanatory text. You can also use *graphic items* for pictures or illustrations that are not part of the background. The most important objects, however, are *buttons*.

Buttons are the action spots on a card. When you point to a button and click with your mouse, something happens. This "something" can be anything the computer can do. You can click a button to move to another card or stack. You can click a button to play a sound or video from a laserdisc. Buttons can start a computer animation, record a test result, or run another computer program.

Buttons make hypermedia interactive. With buttons, you become an active participant in the experience, controlling not only the rate at which you view the information, but the order in which you see it and even the parts you see. What's more, buttons allow you to respond to questions or other prompts from the application, and your responses become part of the stack.



A single card can combine text, graphics, and buttons.

Applications — You can be both viewer and creator

Each stack may be an application, stored as a separate file on your disk. Different applications can look quite different to their users, depending on the design of the stack and its screens and buttons. Hundreds of megabytes of information are currently available in public-domain, educational, and commercial stacks for the Apple II family of computers. Popular applications range from family trees and ABC storybooks to stacks on popular ski resorts and magic tricks.

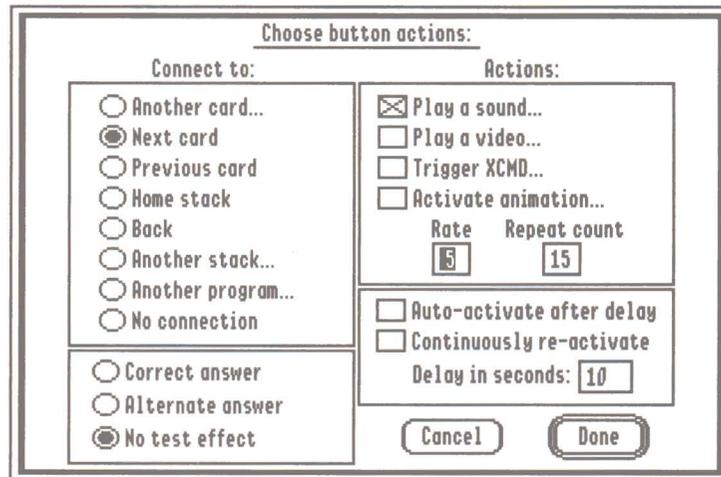
But hypermedia is not only a way to browse through information that someone else has compiled and presented. It's also a powerful tool of expression for anyone with special knowledge, talents, or experience that they want to share with others. For example, it's easy to see how hypermedia makes a great presentation tool for teachers, but it's also a terrific environment for students creating their own reports. For young children with the creative urge or for students looking for a more engaging medium than traditional pen and paper, hypermedia provides a friendly environment whose end results are much more like the graphic and dynamic experiences of the real world.

Asking what hypermedia can be used for is a little like asking what can be done with books, but a look at one hypermedia program, HyperStudio, may give you some ideas on how you can get started in this exciting new area of computing.

HyperStudio — Autoscripting makes it easy

HyperStudio is the first hypermedia environment designed specifically for the Apple IIGS. It runs on any Apple IIGS with at least 1 MB of RAM and a 3.5-inch disk drive. HyperStudio provides creative flexibility without requiring users to know a programming language. The secret to its ease of use is *autoscripting*.

Stacks are created with scripts that tell the computer what to do when you click a button on the screen. With autoscripting, you don't need to know a special script language to create these scripts. You can build a stack with buttons by choosing actions from a dialog box. HyperStudio automatically does all the work to ensure that the buttons do the right things when someone clicks them. For example, when you create a button, you can choose these actions:



With autoscripting, you can build stacks and define buttons by choosing options from a dialog box.

On the left are the actions that connect cards and stacks. These include moving to other cards in the stack (the next card or previous card, for example), returning to the Home Stack, or even launching another program, such as AppleWorks, Point-to-Point, or any other Apple II program.

However, buttons don't always have to lead to other cards or programs. So on the right of the menu above, you'll find another set of possible button actions. These include playing a sound (music and voice can be stored on disk or recorded live within the program), playing a video sequence from a laserdisc player, or activating an animation. Another option is a button that automatically performs delayed actions — and you set the length of the delay.

The HyperStudio test function lets you test yourself or others. By identifying a button as a “correct” or “alternate” answer, you can automatically create a stack that records all the buttons a user clicks and calculate a score based on how many correct buttons were chosen.

Of course, if you're a programmer and want to develop more elaborate scripts for a stack, you can add routines written in assembly language, Pascal, or C to any HyperStudio stack. HyperStudio's “Trigger Xcmd” makes it possible.

Examples — From autobiography to geography

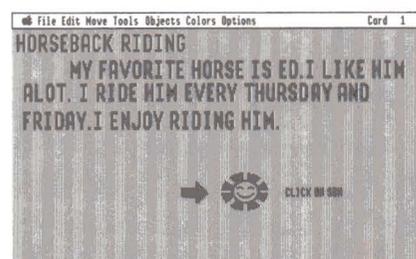
Although the idea of hypermedia may sound imposing, it is actually an environment that makes the computer more accessible than ever to teachers and students, parents and children.

Here's a screen from a stack created by Brie Anne Zimmerman, age 7. It tells about her hobbies, school, pets, and other interests.



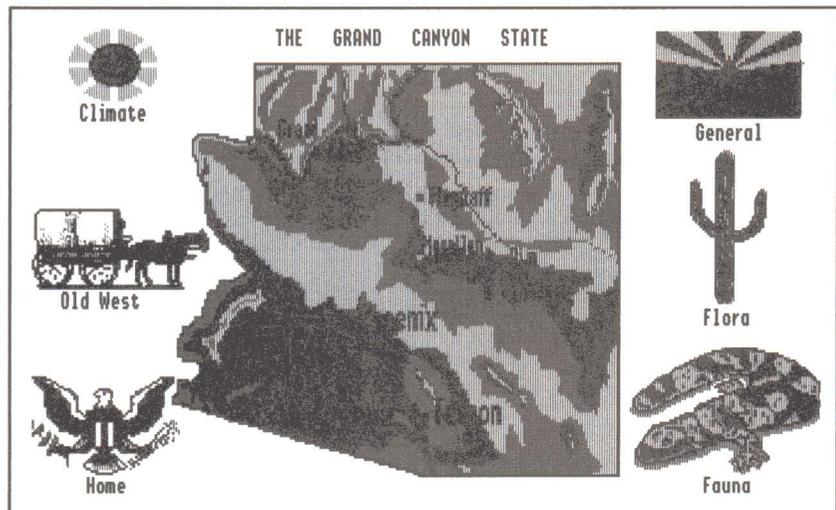
This home card is a visual index to the stack.

If you click on different parts of Brie's home card, you branch to other cards in the stack:



In the stack, you can hear Brie's voice as she tells you about each card.

Here's another example from a stack created by parents to teach their children about the United States. The starting card is a map of the entire United States. The card shown here appears when you click Arizona.



Geography comes to life with graphic buttons that lead to information about plants, animals, climate, and even a peek at the Grand Canyon.

This card contains 13 buttons that take you to other cards with information about the history of the state, its plants and animals, its population, the state flag, and more. When you click on the Grand Canyon, you get to see a picture of the canyon, accompanied by music from "Grand Canyon Suite."

Video — Using hypermedia to create multimedia

The Apple II, with a hypermedia program like HyperStudio, is an ideal multimedia platform for several reasons. The Apple II software is designed with the nontechnical user in mind. In general, if you can use a paint program, you can use any of the hypermedia programs available.

Second, you can combine the power of a hypermedia program with the video capabilities of the Apple II Video Overlay Card. With this card, you can put a video image from a VCR, video camera, or laserdisc player on your computer monitor. Then, using the overlay capability, you can superimpose computer graphics, such as labels, circles, arrows, or even buttons on the video image. On the Apple IIGS, when you add fantastic sound quality in the form of music and natural voices, 1 MB of memory, and superb color graphics, you have the ultimate interactive video machine.

The ultimate multimedia setup is to connect a laserdisc player, such as the Pioneer 2200, 4200, or 8000 to the modem port on the Apple IIGS (or Super Serial Card on the Apple IIe). In this configuration, the computer controls the laserdisc player, which can hold up to 100,000 individual photographs, or up to two hours of full-motion video. Imagine “reading” a stack about the U.S. space program and clicking on a graphic of the space shuttle to suddenly hear the roar of the engines and see it lift from the launch pad. This exciting application of hypermedia is actually happening in thousands of classrooms around the world every day.

Even without additional hardware, however, the Apple IIe, IIc, and IIGS are video naturals. They can be connected directly to any VCR, and whatever is on the screen will be recorded, along with sound if you like. This means that students can take home their “computer reports,” and home users can make their own video presentations.

The 1990s — The decade of the hypermedia revolution

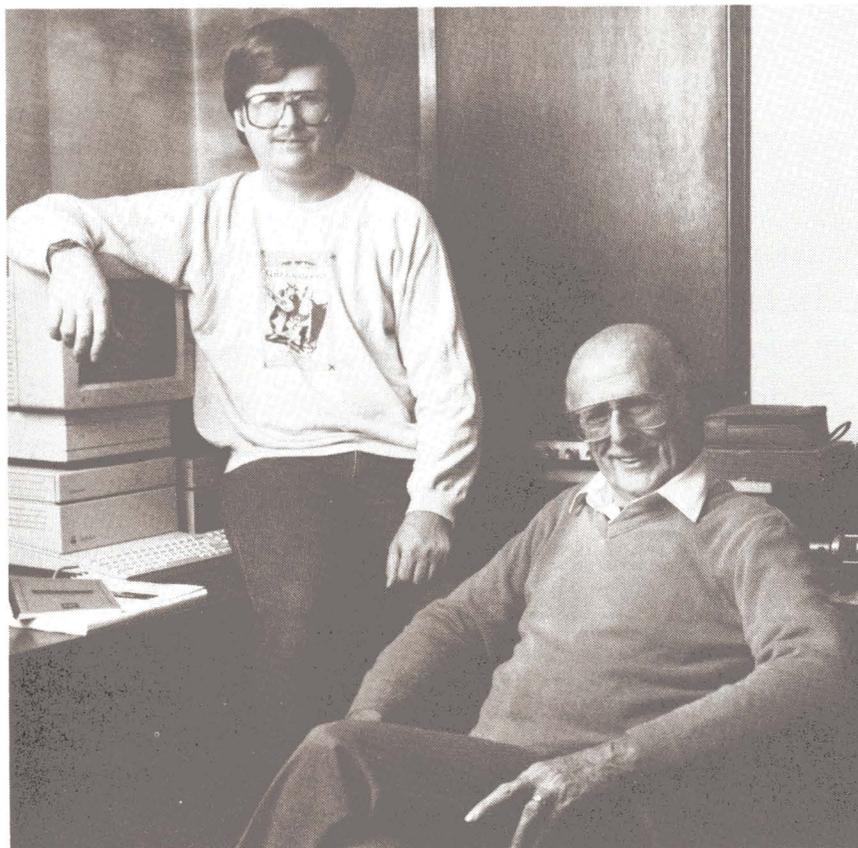
Hypermedia used to be a dream. But with the combination of software and hardware available today, hypermedia is poised to change the world of computing. Products like the AppleCD SC, which can play CD-ROMs with more than 500 MB of data and audio tracks, provide the kind of memory needed to support hypermedia stacks that would have seemed impossible a few years ago.

If you haven't had an opportunity to see a hypermedia application on the Apple II, be sure to stop by your local Apple dealer or visit a user group or school that's using it. Whether you already own a computer or are just now investigating what an Apple computer has to offer, don't miss this opportunity to take part in the newest revolution in personal computing!

Roger Wagner was a math and science teacher until he founded Roger Wagner Publishing, Inc., a company dedicated to the Apple II family of computers and to creating software that helps individuals make computers do what they want to do.

An Apple II Success Story

Commedia uses the versatile Apple II to 'bring the drama' back to the theater



Everyone is familiar with the saying "the show must go on," but not many of us incorporate the sentiment into our daily lives. George and Kurt Herman, a father-and-son team that runs Commedia, Inc., in Portland, Oregon do, however. The company they founded in 1983 publishes original plays; a catalog of published works; and instructional manuals written for high school, college-level, and amateur and professional thespian groups and drama clubs. The Hermans have since started a second business, Theatrends, which produces seminars and workshops for teachers or anyone interested in learning about the theater or theatrical production.

George Herman, a playwright and former college professor at Villanova University, writes many of the plays published by Commedia, Inc. on an Apple II GS, and also develops and conducts the seminars. His original play "A Company of Wayward Saints" is highly regarded, and is produced many times each year by high

school and college drama departments, and drama clubs and organizations around the country.

His son, Kurt, handles the actual production of the plays and instruction manuals — also on an Apple IIGS. “I use my computer to format and lay out the copy for final printing,” Kurt says. “We’re well known for publishing plays that are very easy for actors to follow and use, directly from the printed page. The IIGS, a LaserWriter printer, and our AppleWorks GS word processor and Paintworks Plus creativity software give us all the flexibility we need to produce such a finished product.”

Kurt also uses his Apple IIGS and a Sonic Blaster digitizer to record, amplify, edit and play back sounds in stereo during plays, which are produced as part of the seminars and workshops. Using a MIDI device and the Music Studio music-creation program, he also orchestrates the musical scores his father writes for many of the plays published by Commedia, Inc.

In addition to George Herman, the company has an award-winning playwright under contract. Her name is Jenelle Riley, a Portland high school student whose one-act play “Just Julie” was recently published by Commedia, Inc. after she entered it in and won a competition judged by the Hermans. “Jenelle’s play was very well written,” says Kurt. “She has a lot of talent, and we hope to further her ambitions as a playwright and, through such activities, also help advance the theater as a profession.” Jenelle is currently working on a second play, for which Commedia, Inc. will give first-refusal rights to a larger publishing company — in hopes of advancing Jenelle’s career.

If a major publishing opportunity does not present itself, the Hermans will publish the play themselves on their Apple IIGS, which alone may guarantee Jenelle’s success.

Please see the “Third-Party Products” listing in the Information Resources section for more information about third-party products mentioned in this Apple II success story.

Communication Strategies

The Apple II is a personal computer, but it can become an interpersonal productivity tool when connected to the world beyond. In the coming decade, personal computers will become increasingly important communication tools, supporting groups of people with joint goals, common interests, and information to share.

Computers communicate easily today via networks of dedicated cables. The “Telecommunication” article in the Understanding the Basics section introduced you to ubiquitous telephone lines that can be used for communicating over longer distances. This section explains how to use your Apple II for communication through networking. It also explains how to make sure that the information you want to share is in a form that others can use, even if they’re not using an Apple II computer.

Networking

Connect your Apple II to the world beyond your desk

by Emile Schwarz

A single computer can do a lot. But it can do even more when it's connected to other computers and to devices like printers — that is, when it's part of a network. To build a network, you need cables and a way to manage the flow of information through those cables. You also need to know a few basic networking concepts.

A network is a group of computers and peripheral devices linked by cables that carry information. When you connect your computer to a network, you can share printers with other users on the network. You can share information and applications without carrying a disk from one computer to another. You can even exchange mail.

If you have an Apple IIe or an Apple IIGS, you can take advantage of Apple's network system. This system has three components — AppleTalk, LocalTalk, and AppleShare.®

AppleTalk — The rules that make communication possible

AppleTalk is Apple's network architecture. It's the rules for exchanging information. These rules are called *protocols*, and they are built into the ROM in the Apple IIGS computer, the Macintosh computer, and the LaserWriter printer. You can also use a special interface card to add these protocols to an Apple IIe, an ImageWriter printer, or even an MS-DOS-compatible computer.

AppleTalk conforms to the OSI — Open Systems Interconnection — standard for networks, so you can connect not only Apple computers and devices, but other types of computers, as well.

LocalTalk — The cables that connect

To build a network, you need one or more LocalTalk Locking Connector Kits, which include all the cables and connectors necessary to link devices to the network. You need one kit per computer or printer.

LocalTalk is a type of network. The AppleTalk network system includes several types of networks, such as LocalTalk and EtherTalk®. All of these use the AppleTalk protocols. So when you plug your computer into the network, you can access all of the network's services, regardless of the network type.

When you connect your computer to a network, it becomes a *workstation*. If your network is large, it may be subdivided into *zones*. Zones make access to the network and services more convenient. Your network can also be connected to other types of networks. This larger system of networks is called an *internet*.

AppleShare — The software that provides the services

To share information on a network, you need an AppleShare file server. A file server is a computer that is equipped with special software and one or more mass storage devices, such as hard disks. The software allows computer users in a network to store and share applications, documents, and other information. In an AppleTalk network, the server computer is usually a Macintosh. The special software is AppleShare.

An AppleShare file server can have several storage devices — hard disks and CD-ROMs. Each disk is known as a *volume*. By contrast, the disks connected directly to your workstation may be called *local disks*.

When you select a file server volume, its icon appears on your desktop. You can open the icon just as you would open any other disk icon, and you can use the file server volume the same way you use other disks — to create folders, open applications, and save documents, for example. The main difference between a server volume and a local disk is that many people can have access to a server volume at the same time.

Of course, you may not want everyone on the network to have access to all your files. So AppleShare provides a security system to make sure that only the appropriate people have access to the information stored on file server volumes. This security system defines two kinds of users: *registered users* and *guests*. Registered users have a user name that is assigned by the network administrator. When you log on to the network as a registered user, your user name identifies you to the file server. Registered users also have passwords. You use your password to confirm that you are who you say you are. Guests, by contrast, have a standard user name, <Any User>, and no password.

The AppleShare file server software has a feature called *access privileges* that lets you restrict access to information in particular folders if you're a registered user. When you create a folder or a file server volume, the folder is automatically set up as a private folder and you, as a registered user, are its owner. You control access to the folder. You can limit access to yourself or to a *group* of registered users that your network administrator has set up — people who need access to the same information. You can also limit what others do with the information. You can let them view folders only, view folders and files, or make changes to the contents of a folder or file.

In addition to an AppleShare file server, you may need a print server if you want to be able to store files from several different users to be printed as the printer becomes available. You can use the same computer as both the file server and print server, if you have both the AppleShare File Server and AppleShare Print Server software.

AppleShare Aware — Applications that can be shared on a network

You can share applications as well as information on a network if:

- you have a multi-use license for the applications (or the applications are in the public domain)
- the applications are AppleShare aware

An application is AppleShare aware if it can be used safely with an AppleShare file server. With such an application, you should be able to launch the application from the file server and store the documents on the file server so that other users can simultaneously access those documents without inadvertently destroying each other's work.

For More Information

Now that you know a little about how networks work and how you can use them to work more effectively with other computer users, you may want more detailed instructions for setting up and using an Apple network. You'll find these instructions in the following guides:

AppleTalk Network User's Guide for the Apple IIGS

LocalTalk Cable System Owner's Guide

AppleShare File Server Administrator's Guide

Emile Schwarz works in the Product Marketing Group in Apple Computer France, writes for two Apple II magazines, and has written one Apple II book, with a second book currently underway.

Data Exchange

How an Apple II can trade data with a Macintosh computer

by Emile Schwarz

Have you ever wanted to use a MacPaint image on your Apple II? Or write a book on your Apple II, but format and print it on a Macintosh? Have you been using an Apple II for years to manage your accounting, but have recently decided to move all your accounting to a Macintosh? There are lots of reasons for Apple II and Macintosh computers to trade data. And it's possible — with the right tools. Some of those tools are described here.

Apple currently sells two lines of computers — Apple II and Macintosh. Each has its own operating system. The differences in these two operating systems mean that an Apple II cannot directly read files created by a Macintosh and vice versa. But that doesn't mean they can't exchange data.

When you want to exchange data between the two machines, you must first get the information from one machine to the other. To do so, you can:

- carry the information from one machine to the other on a disk
- use a file server as the intermediary between computers that are connected via an AppleTalk network
- send the file from one computer to the other via a telephone line

Once you get the information transferred, you must translate it. The logical organization of data in a file is different in Apple II and Macintosh applications. So your Apple II applications can't directly read files created by Macintosh applications and vice versa.

Several software programs are available to help you transfer information between Apple II computers and Macintosh computers and then translate files to be used with applications on those machines. These include Apple File Exchange, AppleShare, and telecommunication software as well as file translators.

Apple File Exchange — Using disks to exchange data

Apple File Exchange (AFE) is a Macintosh application that comes on the Macintosh utilities disks. It is designed to convert information on Apple II disks to a format that the Macintosh can read and vice versa. Even if your Apple II computer uses a 3.5-inch disk, you can't simply insert this disk in a Macintosh and read it directly, because the data is organized differently on the two disks. Apple File Exchange solves this problem.

To use Apple File Exchange to transfer data from an Apple II to a Macintosh, you begin by storing the Apple II data on a ProDOS 3.5-inch disk. If your data is stored in DOS 3.3 format or Pascal UCSD format, you can use one of the following programs to translate it to ProDOS format:

- Apple II System Utilities
- Copy II Plus
- ProSel

To transfer data on either a 3.5-inch disk or a 5.25-inch disk from DOS 3.3 or Pascal UCSD format to ProDOS format, you also need the following hardware:

- Apple IIe with a UniDisk® 3.5-inch disk drive and its interface card
- Apple IIc with a UniDisk 3.5-inch disk drive
- Apple IIGS with a 3.5-inch disk drive and a 5.25-inch disk drive

All the copy utilities for the Apple II can copy from a 5.25-inch disk to a 3.5-inch disk.

Once you have your information stored on a 3.5-inch ProDOS disk, you follow these steps to transfer and translate the files:

- **Open Apple File Exchange on the Macintosh computer.**

Your Macintosh now accepts the 3.5-inch ProDOS disk that it would normally eject with an error message such as “This is not a Macintosh disk.”

- **Specify the source disk and the destination disk.**

The *source disk* is the disk with the files you want to translate. The *destination disk* is a disk you select to receive translated files. If you are transferring data from an Apple II to a Macintosh, the source disk is your 3.5-inch ProDOS disk. You can also select a particular folder on the destination disk where you want to save the translated files.

- **Select the files you want to translate from the source disk.**

- **Choose the type of translation you want from one of the translation menus.**

Apple File Exchange has several translation menus for different types of translations. For example, one of the menus is the ProDOS to Mac menu. This menu lists the translators that you can use with the ProDOS files you select. When you choose the translator you want, Apple File Exchange performs the translations.

For more details about each of these steps, see Chapters 7 and 8 of the *Macintosh Utilities User's Guide*.

AppleShare — Using a file server to exchange data

Another way to transfer data between an Apple II and a Macintosh is to use an AppleShare file server on a network. The file server is a computer dedicated to storing and managing files and applications that are shared by several users, each with their own computer. Some of the computers may be Apple II computers and some may be Macintosh computers. All of them can store files and folders on the file server.

The file server may have one or more disks, known as volumes. Apple II computers store their data on ProDOS volumes, while Macintosh computers store their data on Macintosh volumes. With the AppleShare software, a Macintosh can directly open a text file on a ProDOS volume, and Apple II computers can read text files from a Macintosh volume. No translation is necessary.

If you want to share nontext files, however, you can use Apple File Exchange to translate the files as described above. You simply specify the ProDOS and Macintosh volumes as the destination and source disks and then select the files you want to translate.

For more information about using networks to share data, see the "Networking" article earlier in this section.

Telecommunication Software — Using a serial connection to exchange data

A variety of telecommunication software makes it possible to exchange data via a serial connection such as a telephone line or a direct serial connection. To use a direct serial connection to transfer data from an Apple II to a Macintosh or vice versa, you need:

- a serial cable connecting the modem ports of the two machines
- communication software

For the Apple IIe you also need an Apple Super Serial Card. (Be sure that the jumper is in the Modem position.) For the Apple IIc and the Apple IIGS, you simply connect the cable to the modem port.

Once the computers are connected, you can transfer data by following these steps:

- **Start the communication programs on both the Apple II and the Macintosh.**
- **Set one computer to receive and the other to send.**

All communication programs have options for both sending and receiving information. You can set these options to transfer data in either direction.

■ **Set the communication parameters.**

Before you send data over a serial link, you must set several parameters. In general, you should use these settings:

On the Apple II	On the Macintosh
TTY terminal	TTY terminal
LF+CR	Line feed
8 bits	8 bits
XON/XOFF	XON/XOFF
9600 baud	9600 baud
No parity	No parity
Half duplex	Half duplex
Automatic return	Automatic return
	80 columns
	In line
	Auto wrap around
	Modem connection

■ **Send the data.**

You can now use the software's commands for sending data. As with AppleShare, you can read text files directly without a translator. For other files, you must use Apple File Exchange to translate the files once they are transferred.

File Translation — Exchanging text, spreadsheets, and graphics

If you have transferred untranslated Apple II files to a Macintosh — or vice versa — you can use a variety of translators to translate them to the correct format. Apple File Exchange comes with a couple of built-in translators. You can also add translators to the Apple File Exchange folder, or you can use a free-standing translation program to perform the conversions.

DIF Data Interchange Format. DIF files can be spreadsheet or database files. A file in this format contains information about the size of each record, in addition to the actual data.

Apple File Exchange Apple File Exchange can convert spreadsheets, database files, and word processing files from Apple II to Macintosh formats. As a rule, it's best to convert all spreadsheet files to DIF files and all database files to text files. Most corresponding Macintosh applications can then read these files and convert them to the proper format. You can also use MacWrite II to open files from Apple II word processing applications. In addition, a Works-to-Works translator is available for use with Apple File Exchange; you can use it to convert AppleWorks files to Microsoft Works files.

The Graphic Exchange With the Graphic Exchange Software, you can read Macintosh disks and import MacPaint files directly from those disks. You can also create a graphics file and convert it to MacPaint format on a ProDOS disk. You can then transfer the graphics files to a Macintosh disk using Apple File Exchange. The Graphic Exchange is published by Roger Wagner Publishing, 1050 Pioneer Way, Ste. P, El Cajon, CA 92020.

SHRConvert This shareware program is designed especially for the Apple IIGS. It converts graphics created on a Macintosh and other computer platforms to Apple II formats. It comes with built-in help instructions. You can order it from developer Jason Harper, 1480 Michelle Ct., Apt. A, Colorado Springs, CO 80916.

Once you have translated your files, be sure to open them and see what they look like. The accuracy and completeness of translation varies, depending on three factors:

- the differing structures of the source and destination operating systems
- the similarities and differences between the source and destination applications
- the quality of the translation software

As you become familiar with Apple File Exchange, as well as the translators and applications you're using, you'll find that nearly all the information you need is translated intact from computer to computer.

Emile Schwarz works in the Product Marketing Group in Apple Computer France, writes for two Apple II magazines, and has written one Apple II book, with a second book currently underway.

An Apple II Success Story

High-tech mom masters
Apple II-to-Mac and
electronic communications



Carol S. Holzberg of Shutesbury, Massachusetts is one of the premier Apple II/Macintosh free-lance writers in the country. Her feature stories, columns, and software and hardware product reviews have appeared in a number of prominent mass-market and trade-association computer publications, including the *Apple IIGS Buyer's Guide*, *Booklist*, *Classroom Computer Learning*, *Compute*, *Computer Buyer's Guide*, *inCider*, *Macintosh Buyer's Guide*, *Macintosh News*, *PC Games*, *VAR Business*, and many, many more.

Carol's writing career did not begin because of any deep-seated interest in computers, however. Her discovery of what a valuable tool a computer could be occurred rather innocently several years ago. She was working in a business office and using an Apple II for word processing. "At the time, I hadn't given much thought to the machine's educational capabilities," she says. "One day we got a home plug-in cartridge system made by Magnavox that worked with

a TV set. A light bulb went off in my head when I saw my 3-year-old son's total fascination with the letters he was 'typing' on the TV screen using the system's rather strange-looking keyboard. I realized then and there that the technology was something special."

Today, Carol has an Apple IIGS and a Macintosh SE sitting side by side in her office at home. She can put a Macintosh software program through its paces on the SE and write a review about it on the IIGS or vice versa, saving lots of time and providing fresh, spontaneous commentary about the product. On the Apple IIGS, she uses AppleWorks GS for word processing and the Point-to-Point telecommunications program, which allows her to send her articles electronically via telephone lines to the intended publication through a DataLink 1200-baud modem and the MCI Mail system. "This way is faster than regular mail, less expensive than special overnight deliveries, and flexible enough to allow minor edits and major copy revisions to be made the same day. It's wonderful," she says.

Carol also works as a consultant one day each week at the Shutesbury Elementary School. She helps teachers and students learn how to use software programs, set up hardware, and solve computer-related problems. "All the teachers have Apple IIs in their classrooms," she says, "but they are often too busy to learn about new applications or how to use certain software programs, so I provide that assistance and information." Also, because of understandable budget constraints, part of Carol's job is to recommend the best, most cost-effective products to add to the school's software and hardware libraries.

Considering Carol's expertise as reviewer of software and hardware for national magazines, it's safe to say that the computer department at the Shutesbury Elementary School is in excellent hands.

Please see the "Third-Party Products" listing in the Information Resources section for more information about third-party products mentioned in this Apple II success story.

Troubleshooting

If you turned to this section, you probably have a question or two about your Apple II computer. This section will help you deal with the unexpected. When you're using your computer, things may not always happen as you expect. Don't think of unexpected events as mistakes — think of them as learning opportunities. The more adventurous you are, the more likely you are to come across new situations — and to learn from them.

As you read this section, keep in mind that Apple provides many resources for your Apple II. If this section does not answer your questions, you might begin by reading the troubleshooting section in the manual that came with your computer. If you don't have a manual, you can purchase the appropriate Apple II computer hardware manual through the service department of your authorized Apple dealer. Also, your authorized Apple dealer, your local user group, and on-line services can be a valuable source of information about your Apple II computer. To find a dealer, user group, or on-line service, please check the Information Resources section.

Questions? You're Not Alone

Commonly asked technical questions — and answers — about the Apple II

Be aware that the cardinal troubleshooting rule is don't panic! Instead, observe and analyze. Every Apple II user needs answers to questions at one time or another. Following these general troubleshooting tips may help you out. Of course, there are thousands of questions, and we couldn't answer them all here. So, it may be helpful to ask questions of a friend or user group member who is familiar with the program you are trying to use. Also, you can check your software manuals for tips. Some software companies even have a telephone hotline to help you with questions about their software.

Why can't I see anything on the screen?

If nothing appears on the screen when you switch on the power, make sure the computer and monitor are plugged into a power source. If the computer and monitor are plugged into a power strip, make sure the power strip is switched on. Make sure the monitor is connected to the computer. Make sure the computer and monitor are switched on. Check the monitor's contrast and brightness setting.

If you are working with a TV set, is the RF modulator properly installed and is the switch properly set? If your TV set has a built-in video jack, check the switch on the back of the TV. Is it set to "TV" or to "Video?"

If you're working with an RGB card in an Apple IIe, is the card properly installed and is the cable properly connected? Make sure the card is not in slot 3.

Why doesn't the computer respond to my typing?

If the computer doesn't respond when you type something, check your typing or press the "Return" key. The computer is very literal. If you type RYN for RUN, it will respond with an error message, as it will if you type the letter l instead of the number 1, or the letter O instead of the number 0.

You might want to press Caps Lock down. Very old software programs designed for earlier models of the Apple II accept entries only in uppercase.

If you are working on an Apple IIGS computer, be sure that the keyboard is plugged into the computer and the mouse is plugged into the keyboard.

Why does my computer stall when I turn it on?

Sometimes, if you switch the power off and back on without pausing a few seconds, you can cause the computer to stall. This is actually a feature in the Apple power supply that protects the circuitry from voltage overloads. If this happens, turn the computer off and wait at least one minute before turning it back on.

What does it mean when I see only a square bracket and the cursor on my screen?

When trying to restart the computer by pressing Command-Control-Reset, you released Command and Control too soon after pressing and releasing Reset. Try again, being sure to release Reset first.

You may be using a public domain program or one written by a friend that isn't self starting. Ask the friend who gave it to you how to start it.

Why can't I save when I see the message: DISK WRITE PROTECTED?

The program needs to write something on a disk, but it can't because you've covered the write-enable notch with a write-protect tab on a 5.25-inch disk, or the disk was write protected by the manufacturer to keep you from altering it. On a 3.5-inch disk, you have moved the write-protect tab to uncover the rectangular hole in the upper-right corner of the disk.

If the disk is write protected, try to remember why you (or the manufacturer) chose to protect this information. To be on the safe side, you might remove the write-protected disk and insert another formatted disk for saving your data.

Why do I see garbage (lots of funny letters and symbols) on the screen?

If you see garbage on the screen, the first program wasn't entirely erased from memory when you turned the system off. Wait a full minute before turning on your computer. Better yet, switch from one program to another by pressing -Control-Reset. Be sure to release Reset before you release the other two keys.

How can I quit from my program?

Most programs give you an easy way out. If your program doesn't have a Quit option on the menu, try these escape methods until you find one that works. Press Q for quit. Press Esc for escape. Press Control-C. Press Control-C, then press Return. Press Control-Reset. Press -Control-Reset. Or turn off the power.

Why does my Apple IIc Plus go so fast?

If you have trouble with the timing of an application — if messages appear and disappear before you have time to read them — this may be caused by the special accelerator in the Apple IIc Plus. Try restarting by holding down the Esc key and pressing Command-Control-Reset. Release the Reset key, and when you see the word Normal on the screen release the Esc key; then release the other keys. If you don't see the word Normal, try again. If the application works correctly, you've found the problem. To turn the accelerator back on for other applications, just restart the computer without pressing the Esc key.

What should I do when I see the message "Unable to Load ProDOS?"

The system files on the startup disk may be missing or incomplete. Try a different startup disk. (If you are using a hard disk as a startup disk, you need to install the latest System File update on the hard disk.)

If the System Speed option in the Control panel of the Apple IIGS computer is set to Fast, it may be interfering with the application. Some older Apple IIe software applications must run in the Normal mode on the Apple IIGS computer. Use the Text Control Panel to change the System Speed setting to Normal.

What do I need to know to format, partition, and use my hard-disk drive effectively?

Hard-disk drives offer a great combination of power and convenience. You can store your favorite applications (word processors, database managers, spreadsheet programs, and so on) as well as your data. However, there are some basics you need to understand to use your hard drive effectively.

ProDOS (the operating system that most IIe and IIc owners use) and GS/OS (the Apple IIgs operating system when using ProDOS disks), function under a size limitation. Today, the largest volume that ProDOS 8 can access is 32 MB. How can you use an 80 MB drive with an Apple II? The answer is partitioning, or dividing your hard drive into two or more volumes of manageable size that your Apple will read as separate drives in the slot to which your hard drive is attached.

If your drive uses an Apple standard SCSI (small-computer system interface) card, the Apple IIgs computer includes a utility (Adv.Disk.Util) that can create as many as seven partitions. ProDOS normally recognizes only two, while GS/OS will see up to 32 partitions.

If you're going to be using mostly ProDOS applications, make sure you keep all the data for those programs in the first two partitions of your hard drive. Otherwise, you will not be able to access the data from inside your ProDOS 8 program.

Installing GS/OS on your hard drive is simple. Set up your hard drive according to the manufacturer's instructions, then use the Advanced Disk Utility on the System Tools disk to format your drive under GS/OS. At this point, you must decide on the number and size of your partitions. After partitioning your hard drive, use the Installer to install the system software onto the first partition of your hard drive. Finally, check your slot assignments in the Control Panel. If your hard-drive controller card is in slot 7, the Startup Slot can either be "7" or "Scan." If your SCSI card is in another slot, change the Control Panel accordingly.

The key to happy hard drive ownership is organization. Before you open the box of your new multimegabyte hard-disk drive, sit down and think carefully about how you use your Apple. What applications do you use? Do you have lots of small data files or a few large ones? The answers to these questions will tell you a lot about how you want to format and partition your hard drive.

How do the slots work on the Apple IIGS Control Panel?

Each slot on the Control Panel has two or three options. One of these options is “Your Card,” because you can always stick a card in one of the Apple IIGS’ seven slots. When you’re not busy using one of the slots, the Apple has specific things in mind for them. For example:

Slot 1: Printer. On the IIGS, a printer plugged into the external jack takes up this slot (Appletalk in ROM 03 only)

Slot 2: Modem. On the IIGS, a modem plugged into the external jack takes up this slot

Slot 3: Text display

Slot 4: Mouse port

Slot 5: Smart port (e.g., your Apple 3.5-inch disk drive)

Slot 6: Disk port (your 5.25-inch disk drive)

Slot 7: AppleTalk. If you have a hard drive, it usually goes here, unless you also want to be connected to an AppleTalk network (ROM 01 only)

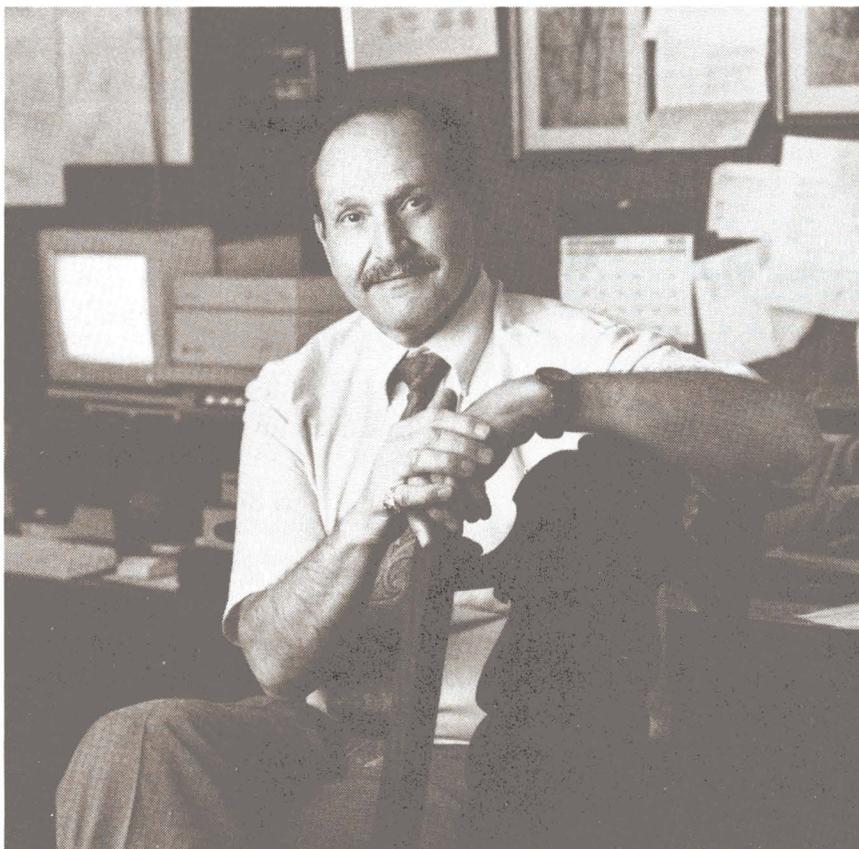
Startup slot: If you assign a startup slot, the Apple will look there first. If you select “Scan,” it will start looking in slot 7 and count down until it finds a valid startup device (or gives you an error message).

What’s the deal with “daisy chaining” disk drives?

Don’t let the flowery language confuse you. What “daisy chaining” amounts to is connecting several drives in a series, “head to tail.” This feature eliminates the need for a card, like the old Disk II controller — with as many plugs as you have drives. Be sure you connect your Apple 3.5 Drive, then the UniDisk (Apple II 3.5 drive), then the Apple 5.25 Drive, in that order. If you have more than one of any of these units, keep them together. The maximum for daisy-chained devices is four.

An Apple II Success Story

Computers used to make this entrepreneur 'nauseous,' now they run his business



California entrepreneur James Plotkin, who owns the Pasadena Vacuum and Sewing Center (two locations) and rental properties in Pasadena, bought his first Apple IIGS three years ago for his children. "You couldn't make me touch a computer then," he says. "The thought of using one made me nauseous. However, I saw how much the kids liked the machine, so I decided to give it a try to solve some of my business problems."

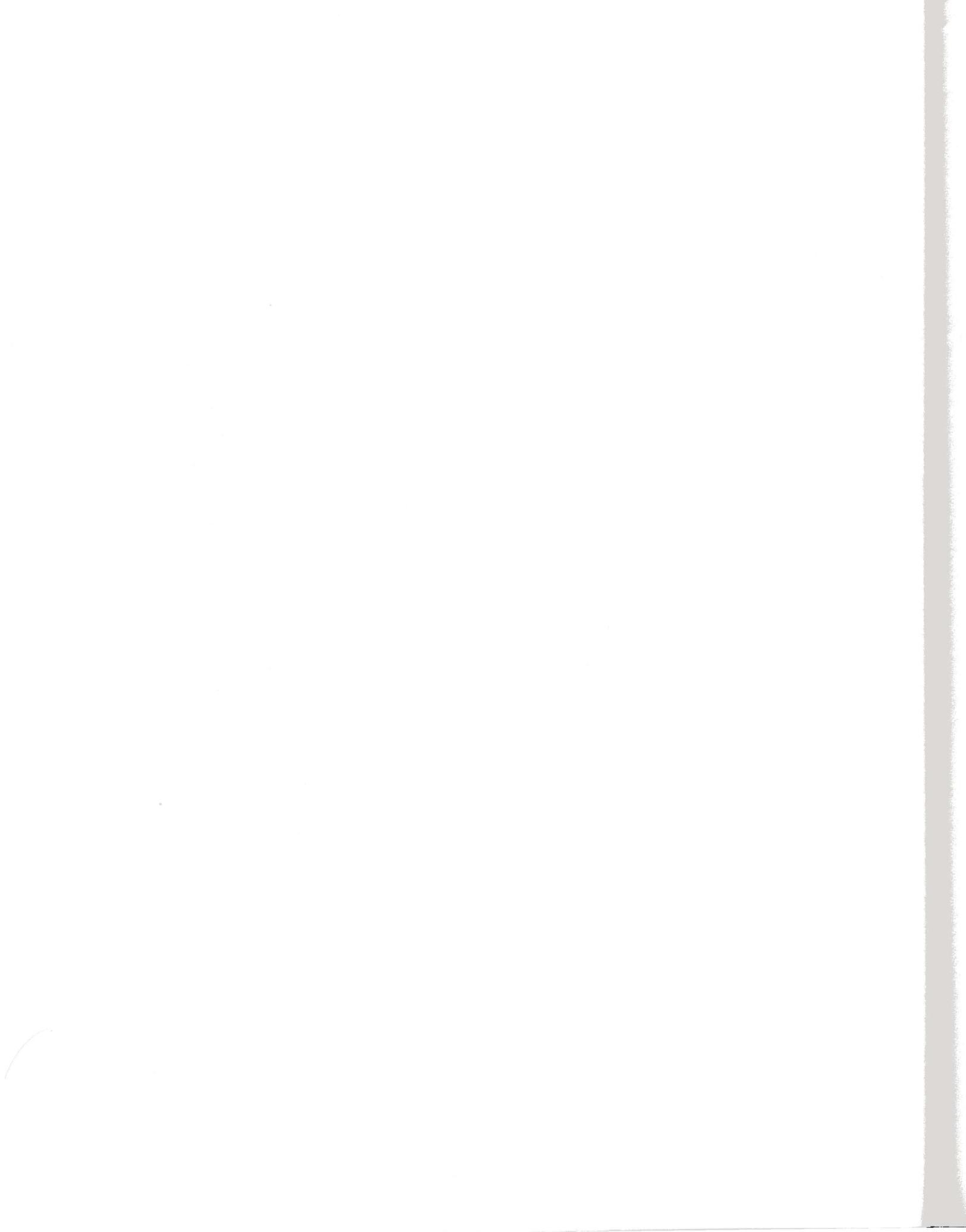
James wanted a way to better control his retail business' sales and inventory records and produce useful reports. He was having no luck searching through a maze of database applications, including those made for MS-DOS machines, when he spotted an ad in *InCider/A+* magazine for DB Master Professional. He purchased the program, and is now able to design databases specifically tailored to meet his business' needs. "For instance, I can do accounts receivable with aging and get detailed reports instantly," he says.

Keeping track of inventory and re-ordering merchandise is also much easier to do with the Apple II and DB Master Professional. The software allows James to quickly determine the exact number of a particular brand of vacuum cleaner or sewing machine he has sold during the past year. "If a factory salesman is in my office asking me to order 1,200 of a particular model for next year, I can call up a report of my sales figures from a database with just a few keystrokes," he says. "If I discover that I only sold 12 of those models last year, I certainly don't want to re-order a 10-year supply!" James also uses DB Master Professional for invoicing, preparing mailings to customers, and to record and track information regarding his rental holdings and 30 tenants.

For a guy who once disliked computers, James now owns two Apple IIGS systems — one at home and one at work. The IIGS at work is equipped with an Apple 40 MB hard drive, two Apple 3.5-inch drives, and two Apple 5.25-inch drives. The home system has an 80 MB hard drive made by CMS Enhancements, Inc., and an Apple 20 MB hard drive. In addition to DB Master Professional, James also uses WordPerfect for the IIGS for word processing and AppleWorks GS for preparing newsletters for his customers and the Pasadena business and retail associations of which he is a member.

"I love my Apple II computers. They've made me more efficient," he says. "I wouldn't give them up."

Please see the "Third-Party Products" listing in the Information Resources section for more information about third-party products mentioned in this Apple II success story.



Apple Sales, Service, and Support

Apple supports you by supporting the people who sell and service Apple II products, as well as those who develop software and peripheral devices for Apple II computers. All these people are partners in Apple's effort to help you do more with your Apple II — inspire learning, boost creativity, and help you work more efficiently.

When you buy an Apple II computer — or a printer, disk drive, or expansion card — a variety of warranty, service, and upgrade programs are available. This section helps you learn how to tap these resources through authorized Apple dealers. You will also learn how you can join a local user group to share up-to-date information about Apple II computers, related products, and a host of other services. And if you're curious about how Apple helps third-party developers bring you great products for your Apple II, take a look at the article about "Apple Developers."

Dealers

How Apple makes Apple II computers available to buyers

When you are ready to buy an Apple II, you also want a reliable resource for additional Apple II products and support, including training, software, and other third-party products, as well as service.

There are more than 1,200 authorized Apple dealers who sell Apple II computers in the United States. Authorized dealers assure that you get the best possible help when you buy an Apple II product or when you need service. Authorized dealers receive special training and up-to-date product information from Apple — and that knowledge gets passed on to you in the form of better answers to your questions and better service for your Apple II.

You may enjoy dropping by and browsing around your local dealership. Or you may prefer to call a dealership ahead of time to be sure they carry and support Apple II products. (Authorized Apple dealers choose specialization areas such as business, networking and communication, desktop publishing, education, and other fields. Not all Apple dealers carry the Apple II product line.) You will probably want more from your dealership after your initial computer purchase, so be sure to ask questions about service policies and timelines, third-party software and hardware availability, Apple II training, and other computer-related issues to assist you in your purchase decision and dealer selection.

If you are interested in locating the authorized Apple dealer nearest you, please refer to the “Dealer Listings” article in the Information Resources section. You may also call (800) 538-9696 for the name and phone number of an authorized Apple dealer who carries the Apple II computers. This 800 number operates 24 hours a day, seven days a week.

Customer Service and Support

Apple makes it easy to maintain your Apple II computer

When you count on your computer — whether it's to write a report on time or pay bills on time — you want assurances. You want to know what to do if something goes wrong. You want to know how to avoid unexpected repair bills. You want to know that someone is there to help in an emergency. Apple's customer service and support provides these assurances.

Apple Computer offers service, support, and training through a wide range of support organizations. These providers include authorized Apple resellers (dealers), authorized Service Providers, authorized Training Providers, as well as other members of the Apple community. Apple is committed to offering these providers products, programs, and tools to ensure a high level of customer satisfaction.

Apple is working to ensure the availability of service options that are tailored to meet the unique needs of every possible customer. As part of Apple's commitment to quality service, Apple offers hardware troubleshooting and system software training, superior diagnostic tools, and documentation, technical support, and upgrades to its service providers. Apple is committed to high-quality service parts and the timely delivery of new and replacement parts.

Support Products for All Apple Customers

Customer Assistance Center 800 Number Starting October 29, 1990, the Assistance Center will provide customers with a toll-free number, (800) 776-2333, to call when their support provider hasn't been able to resolve their problems or questions. Customers will be able to talk with trained staff members. The Assistance Center is not a technical support line, but is a way for customers to resolve issues about Apple policies, programs, and products.

Warranty Every Apple hardware product purchased after January 1, 1990 carries a one-year limited warranty against defects in workmanship.

Apple Care Apple Care is an extended maintenance agreement that covers Apple products once the warranty has expired. Customers can purchase Apple Care coverage at any time while they own the product. Any out-of-warranty equipment must be inspected by an authorized Apple reseller before the Apple Care service agreement begins.

Software Update Program The Software Update Program provides subscribers with all updates and documentation released during the subscription period for various Apple system, networking, and communications software. Subscriptions include right-to-copy licenses.

Apple Technical Bulletins Apple Technical Bulletins are bimonthly publications designed to give support providers timely technical information about Apple products. Each bulletin includes feature articles about new products, compatibility and connectivity issues, "power user" features, and product updates and upgrades. Annual subscriptions are available for two editions: the *Macintosh Technical Bulletin* and the *Education (Apple II) Technical Bulletin*.

Technical Information Source The Technical Information Source is a CD-ROM-based technical support product that provides diagnostics, system utilities, a system software archive, a technical support database, technical reference stacks, and training stacks. A Macintosh HyperCard front end, search and feedback capabilities, and on-line documentation provide information quickly and easily.

Apple II Upgrade Programs

Apple II Upgrade Programs provide a solution to intermittent problems that were identified after the initial product shipped. These upgrade programs are usually provided at no cost to the customer. Contact the service department of your authorized Apple dealer.

All of the following programs are currently in effect. However, they are subject to change at any time. If you think that you are experiencing a problem that might be covered by the programs listed below, contact your dealer and ask about the following upgrade programs.

Video Graphics Controller and IIgs ROM Upgrade A new Video Graphics Controller (VGC) chip and a new ROM are available to upgrade Apple IIgs systems produced through mid-January 1987. The new Video Graphics Controller corrects video display problems that may occur in double high-resolution and standard text modes. The new ROM corrects minor bugs and provides enhancements for future software releases. It is required for system software 4.0 or later.

Apple IIc ROM Revision Some communication software applications on older models of the the Apple IIc may not operate properly. The most common occurrence will be garbage on the screen or no action when using the Terminal Mode if a modem is connected to the serial port. A ROM exchange may be needed.

Apple IIe Revision A to Revision B Logic Board Upgrade Purchasers of early, unenhanced Apple IIe system may have a revision A logic board. You may want to upgrade to an unenhanced revision B logic board if you want to:

- take advantage of the system's double high-resolution feature
- use a card designed for slot 7 that does not work in your revision A board because of the absence of the "ColorRef" and "SYNC" signals
- enhance your system by purchasing the Apple IIe ROM Enhancement Kit, as the enhancement ROMs are incompatible with the unenhanced revision A logic board

Apple 3.5 Drive Daisy Chain Problem In certain configurations, a spinning problem may occur when Apple 3.5 Drives and UniDisk 5.25 Drives are daisy-chained. This causes no permanent damage to any part of the drive or the media; however, the data in RAM is lost because of the power down.

The spinning problem is intermittent and only occurs on Apple 3.5 Drives with revision A Daisy Chain interface Boards and the following configurations:

- An Apple IIGS with one or more Apple 3.5 Drives attached and one or more UniDisk 5.25 Drives daisy-chained to one of the Apple 3.5 drives
- An Apple IIGS with one or more Apple 3.5 Drives attached and a DuoDisk daisy-chained to one of the 3.5-inch drives

ROM Upgrade for UniDisk 3.5 A new ROM may be required to use a UniDisk 3.5 with older models of the Apple IIc.

Apple II SCSI Card and Profile Interface Card ROM Upgrade Apple IIGS users who upgrade to Apple IIGS system software Version 4.0 or greater must use the latest revisions of both the Apple II SCSI Interface Card and the ProFile Interface Card. Apple revised the ROM on the Apple II SCSI card to make it compatible with the Apple CD SC and Apple IIGS system software.

Apple IIGS Memory Expansion Card Exchange Some Apple IIGS Memory Expansion Cards were built with RAM chips with the wrong refresh cycle. A symptom of the wrong refresh cycle is that memory intensive applications such as AppleWorks crash, and causes the system to display an error code. If you have this symptom, please contact your Apple dealer.

Apple II 256K Memory Expansion Kit Exchange Some of the Apple II 256K Memory Expansion Kits used with the Apple IIGS Memory Expansion Cards have the wrong refresh cycle. If you have the symptoms described for the Apple IIGS Memory Expansion Card above, please contact your Apple dealer for a free exchange.

User Groups

What user groups are and what they can do for you

by Craig Elliott

If you want to find out how to get peak performance from your Apple II, get together with the people who have the answers — Apple user groups. Here's the information you need to make this important connection.

User groups are organizations of people who want to make the most of their Apple II computers — and have fun in the process. User groups provide an opportunity to share information, get support, and gain insights. Wherever you are and whatever your interests, there's probably an Apple user group nearby.

Knowledge — User groups provide a forum for sharing facts, ideas, experience

Apple user groups provide an open forum for questions, answers, and ideas. Most groups publish newsletters, hold regular meetings, and provide speakers and opportunities for discussions. At these meetings, you can get help with specific problems. You can learn how to use your Apple II computer to its fullest. You'll also enjoy user group meetings for the sheer enthusiasm and mental stimulation their members offer.

User groups typically support special-interest groups, conduct seminars, provide public-domain software libraries, and maintain on-line bulletin board systems to answer your questions and keep you apprised of the latest Apple-oriented news.

Many user groups have formed within corporations, government agencies, and universities. These groups usually cater to the specific work-related needs and interests of their members.

User groups have a long-standing and well-deserved reputation as friendly havens for computer users of all skill levels. If you are a novice and have questions about your new Apple II system, you can be sure that someone else has had the same questions — and probably has the answers you need.

Software — User groups have advice, demos, and public-domain software

User groups are an excellent source of information about software. Publishers often demonstrate new products at user group meetings. More experienced users can give you advice about the best packages for your specific needs.

Most user groups also maintain collections of demonstration software and public-domain software. These range from simple utilities and games to well-developed applications for business and education.

Support — The Apple User Group Connection provides user group support

Apple supports user groups with an organization called the Apple User Group Connection. This organization is dedicated exclusively to the Apple user group community and offers several services:

AppleLink Registered user groups have their own bulletin board on AppleLink, Apple's electronic mail and information system. AppleLink has special folders where you can discuss questions about hardware, software, and peripherals with Apple, with developers, and with other user groups. Also, information about new Apple and third-party products is routinely reported on AppleLink. In addition, you'll find conference announcements, classified ads, and much more.

Regular communications User groups registered with the Apple User Group Connection receive regular mailings from Apple, including data sheets for new products, technical notes, and development hints. The bimonthly *Quick Connect* newsletter and a quarterly videotape keep user groups in touch with news from one another and from Apple.

System software updates User groups can become licensed distribution agents for Apple system software. This service makes it even easier for you to get the latest Apple IIGS system software.

Special purchase programs Registered user groups are eligible for discounts on select Apple products that can enhance the groups' services — products that help with producing a newsletter, for example, or maintaining an electronic bulletin board system.

Forums Apple sponsors events that bring together user group leaders and members to discuss issues of importance to the user group community.

Speaker assistance Registered Apple user groups receive notices about Apple and third-party representatives who are available to speak about new products or other issues. You can also post requests for speakers on AppleLink.

Startup — Making a user group happen

If you live in an area without an Apple II user group or if you want to meet with people who have a particular interest in the Apple II, you can start a new user group. But don't take the job lightly.

Launching and running a user group requires a lot of time and effort. Before getting started, make sure that you're really positioned for success. Get some help. You may want to start by calling the nearest computer resellers — an authorized Apple dealer, campus bookstore, or other sales contact. See how these people respond to the idea of a local user group. What do they think the interest will be? What would they like the group to offer? How would they get involved? And so on. Maybe they would like to participate in founding the group or becoming part of the staff — in helping the group take any of the first steps toward getting started.

You can also find help by advertising in a local computer publication or community newsletter, contacting a local community college's computer science department, getting air time (sometimes available at no charge for community-service messages) on a local radio station or community talk show, or placing a notice on company or community bulletin boards. Chances are, there's someone out there who is thinking along the same lines as you. Maybe they, too, are looking for some help.

What you get when you join a user group

Wide variety of general-interest and specialized groups

- Meets the needs of nearly everyone — from novice to advanced users — including users in communities, universities, K-12 schools, government agencies, and corporations

More than 1,000 groups in the United States

- Provides you with a wealth of experience in one convenient source

Apple support

- Makes it likely that there's a user group near you
- Gives user groups the resources they need to help their members
- Provides a conduit between you and the experts at Apple

Access to training and technical support

- Helps you maximize the use of your Apple II computer

Access to up-to-date product information

- Keeps you informed about the newest and most popular hardware and software products
-

The Phone Number — (800) 538-9696, extension 500

Apple will help you find the user group nearest you. It will also help you find groups that specialize in subjects that interest you or even tell you how to start your own user group. For information, call the toll-free number for the Apple User Group Connection. Or write to:

The Apple User Group Connection
Apple Computer, Inc.
20525 Mariani Ave., M/S 36AA
Cupertino, CA 95014

Craig Elliott manages the User Group Connection. He has worked with user groups across the country, developed programs for dealers, and worked with marketing teams on networking and communications.

Apple Developers

How Apple works with
developers

by Elizabeth Lynott

If you own an Apple II, you're almost certainly using software developed by an independent developer. You might be interested to know how Apple works with these independent developers to bring you lots of great software.

Apple's commitment to its products extends beyond selling personal computers. Apple measures its success by your ability to use your Apple II productively and creatively, whether you're working on something as specialized as video or performing basic word processing functions.

To make sure your personal computer helps you do all the things you want to do, Apple works with independent software and hardware developers. The goal is to ensure that you have a broad range of innovative software applications and peripheral products from which to choose. The larger your choice of products, the more power you have to make your Apple II work for you.

Apple Developer Group

Apple's approach to working with third-party software and hardware developers is a global one. Corporate headquarters in Cupertino and Apple subsidiaries throughout the world have dedicated groups committed to working with developers in several ways.

Apple representatives may work one-on-one with selected developers to provide technical and marketing advice specific to their product. In working closely with this limited number of developers, Apple can help guide these developers into the most innovative development directions.

Support programs and services meet the needs of the larger developer base. Although programs differ from country to country, a common feature among most developers programs is the regular flow of information from Apple to developers. Such information might include samples of programming code or information about the marketing directions Apple is anticipating. This flow of information keeps developers in step with Apple's technical and marketing directions and, ultimately, means great products for you.

Apple's Developer Support Programs

Apple's developer landscape is diverse. Our developers range from the largest in the industry to enthusiasts interested in programming for personal satisfaction. Apple operates three programs in the U.S., which meet the varying needs of these developers. The most experienced, established, and skilled developers use the Partners and Associates Programs, which provide services such as technical support via electronic mail (Partners Only), a developers hotline, a developers monthly mailing, and AppleLink Electronic Communications.

The Apple Programmers and Developers Association — APDA™ — is a mail order distribution service available to any serious Apple user or developer who is writing programs or doing development work. It's Apple's entry-level source of development tools and documentation for development customers worldwide.

Apple developer programs are administered by the Developer Programs group and can be contacted by writing:

Apple Computer, Inc.
 Attn: Developer Programs
 20525 Mariani Ave., M/S 75-2C
 Cupertino, CA 95014
 (408) 974-4897

Elizabeth Lynott has worked in Developer Programs at Apple for nearly two years. She manages Apple's communication with developers, including the publication of The Developer Handbook.

An Apple II Success Story

Boston Computer Society's
Apple Group – More than a
User's Group



Any organization that has been around for 13 years and attracts 28,000 members in a metropolitan area must be doing something right. And when the organization's focus is computers, it's even more impressive. That's the story of the Boston Computer Society (BCS).

An organization like BCS is commonly referred to as a user's group, a moniker that really does not adequately describe its true scope and impact. Take one microcosm of the BCS — Apple/Boston — for example. If your children are learning to use a computer in a Boston area school, their teachers probably learned how to use the same computer system at a Apple/Boston monthly meeting or weekend seminar. "Half of the members who regularly attend our monthly meetings are educators. So we decided to start a special interest group for educators within Apple/Boston," says Al Willis, co-director of Apple/Boston. "Teachers pick up a lot of useful information during the educators session and bring it back into the schools."

Al probably knows the value of computers in education better than anyone. In fact, his success with computers in school is quite likely responsible for his success today as a computer consultant. Al started using an Apple II in high school in 1979, while working on a science fair project about DNA. He decided to write an educational, teaching program about DNA on the school's sole Apple II. He entered his project in the Boston Science Fair in 1980 and won first prize. Al's latest project is desktop publishing. Using his home computer system — an Apple IIGS with 1.75 MB memory, an Apple Color Monitor, Apple 5.25-inch and 3.5-inch drives, a CMS 40MB hard drive, and AppleWorks GS software — he's doing the layout for a book titled "The African Meeting House," which will be published by the Museum of Afro-American History in Boston.

Apple/Boston has about 2,000 members and meets in the Beaver Country Day School in Chestnut Hill, Mass. The monthly meetings feature speakers from the computer industry, who demonstrate new products or discuss technological trends. Before each meeting a special session is called for beginners only, which allows Apple novices to ask basic questions without the fear of embarrassment. The meetings are simulcast on America Online, an on-line service for Apple II and Macintosh users nationwide. "We usually have 15 to 20 people join us interactively on-line," says Al. "The simulcast is an integral part of Apple/Boston. In fact, one of our members, Tim Barwick, who is now a forum producer for America Online, got his start in the group. Apple/Boston was even selected to beta test the service."

Apple/Boston also offers members a library of public domain software as well as the latest Apple System Software, and runs a computer bulletin board service (BBS) called the Apple/Boston Connection.

All in all, Apple/Boston seems more like a hotbed of job skills training and professional development, than simply a user's group.

Please see the "Third-Party Products" listing in the Information Resources section for more information about third-party products mentioned in this Apple II success story.



Understanding Technical Information

Personal computing with the Apple II minimizes your need for an in-depth understanding of technical concepts. Still, a vast amount of technical expertise — which interests many hackers and non-hackers alike — has gone into making the Apple II easy to use.

This section covers the more technical aspects of the Apple II, including the history of the Apple II hardware and its operating system. You'll also find practical and not-too-technical information in an overview of the features of the new Apple IIGS system software, Version 5.0.

The Hardware

How the Apple II began
and how it grew

by Allen Watson

Have you ever wondered what DRAM is? Or what's double about Double Hi-Res? Or why your Apple II uses a 6502-type microprocessor instead of an 8080-type processor — and what difference it makes? If you have ever asked questions like these, read on. (If you're new to computing, start by reading "The Fundamentals" article in the Understanding the Basics section.)

Today's computer is, in essence, a microprocessor, some memory chips, an input device, and a video display. This simple listing of components, however, belies the myriad of decisions that went into the design of the Apple II. Which microprocessor do you use and how do you evaluate its performance against others? What kind of memory chip do you use, and how do you best take advantage of its benefits? How do you add new features to new models and still keep all the old features?

Every feature of the Apple II grew out of such questions and their answers.

The Microprocessor — Why it's a 6502, not an 8080

chip The active component inside a computer. These rectangular plastic objects with lots of little metal pins are called **chips** because each one contains a small chip of silicon with microcircuits embedded in it. Another name is **IC**, short for integrated circuit.

In 1975, Steve Wozniak was thinking about building his own microcomputer. He decided to use a 6800 microprocessor instead of the then fashionable 8080 used in most microcomputers. But there was one problem: money. The going price for a single 6800 or 8080 was about \$275, which, in those days, was more than he wanted to pay for a microprocessor.

Then Wescon, the annual electronics trade show, came to San Francisco. One of the companies at the show was MOS Technology, a small IC manufacturer that had just introduced the 6502 microprocessor, which was similar to the 6800. The MOS Technology representative at the show was selling 6502s for \$30 each. By the time Wozniak left the show, he had bought one.

Since then, all Apple II computers have used the 6502 or one of its two descendants, the 65C02 and the 65C816. The 6502 and 65C02 are 8-bit microprocessors. The 65C816 is a 16-bit microprocessor. The bit numbers refer to the largest increment of data the microprocessors can handle in a single instruction. The size of a microprocessor determines its cost and processing speed, not its functionality. Even the smallest microprocessor can compute large numbers, handle large databases, or manipulate large documents — it just takes a little longer.

clock speed The number of cycles (ticks) the microprocessor clock makes in a second. Expressed in megahertz (MHz), which stands for a million cycles per second.

Performance is also related to clock speed. All microprocessors have a clock, but this clock doesn't tell time. Rather, it controls the execution of instructions and synchronizes the microprocessor to the rest of the hardware. The relationship between clock speed and performance has been a source of confusion in comparisons between 6502-type processors and 8080-type processors — the 8080, 8088, and 8086.

For computers of comparable cost, the clock speed of a 6502 is generally slower than that of an 8080. But the 6502 does more work during each clock cycle. The effective performance of a 6502-based computer is the same as that of an 8080-based computer whose clock speed is about 2.5 times as fast. In other words, a 6502 computer running at 1 megahertz (MHz) is about as powerful as an 8080 computer running at 2.5 MHz. The Apple IIc Plus, with its 4 MHz clock, can be compared to an 8080-based machine with a clock speed of 10 MHz.

Memory — That's *D*-RAM, and the *D* makes all the difference

The memory chips used in the Apple II are DRAM chips. (The acronym is not a unit of liquid measure — it's pronounced *dee*-ram, short for Dynamic Random Access Memory.) Nowadays almost all microcomputers use DRAM, but at the time Wozniak designed the first Apple computer, microcomputers all used static RAM (SRAM, pronounced *ess*-ram).

I/O Input and Output Input is information transferred to a computer from an external source, such as a keyboard, mouse, disk drive, or modem. Output is information transferred from the computer to an external destination, such as a video display, printer, or modem.

Yes, Virginia, there was an Apple I

You may have wondered whether or not there was an Apple I. Actually, there was, although it was called the Apple computer. The machine that inspired the myth was built in a garage and funded by selling a programmable calculator and a VW van to get money to buy parts.

In 1975, when Wozniak was designing that first Apple computer, computer hobbyists were building small computers from kits. Those kit computers resembled the minicomputers of the time. Their only built-in input/output (I/O) consisted of binary lights and switches on the front panel. A technician or programmer could use the lights and switches for stepping through a program or repairing the computer. For a user running an application, however, the computer was connected to an external terminal, typically a Teletype.

Memory on those kit computers came in increments of 1 kilobyte — that's one thousandth of a megabyte — and most of those computers had less than 8 kilobytes of RAM. For program and data storage, small computers used either audio cassettes, which were frustratingly slow, or the then standard 8-inch floppy disks, which were expensive.

The first Apple computer was an assembled and tested circuit board. It was not a kit, but some assembly was required. To make a complete system, the purchaser added a power transformer, a keyboard, a video monitor, and an appropriate case or box.

Two important innovations set the first Apple computer apart from the other small computers of its time:

- It contained built-in circuits for a video terminal. The user needed only a keyboard and TV monitor, while other small computers required an external terminal.
- It provided 8 kilobytes of built-in RAM, using DRAM. Other small computers required plug-in boards with 1 kilobyte or 4 kilobytes of SRAM.

By building all the electronics onto a single board and using advanced technology, Wozniak had produced a computer for hobbyists for about \$1,000 — a price much lower than that of competing machines.

In a RAM chip, each bit is stored as an electrical charge in a small capacitor. Because the storage device for each bit is smaller than the equivalent static RAM device, DRAM technology can pack more bits into each chip, and the price per bit is lower. What's more, its capacitors do not dissipate power, so DRAM uses less power than SRAM, and the computer's power supply can be smaller and cheaper.

bit The smallest unit of information in a computer.

Wozniak's decision to use the 4-kilobit DRAM chips when he designed the first Apple computer was well informed. He knew that the 4-kilobit chips would soon be followed by 16-kilobit chips that used the same size package, the same pin arrangement, and the same kind of memory refresh. By the time the Apple II was introduced, the 16-kilobit chips had become available, and Wozniak could offer a computer with four times as much memory as his first machine.

byte A byte is 8 bits.

kilobyte A kilobyte is 1024 bytes.

The original Apple II had three rows of RAM chips, eight in each row. Each chip had one output pin, so it took eight chips in parallel to store data by the byte. With 4-kilobit chips, each row could store 4 kilobytes, and the maximum memory size was 12 kilobytes. With the 16-kilobit chips, the maximum memory size was 48 kilobytes. At the time Wozniak designed the Apple II, 48 kilobytes was an enormous amount of RAM for a microcomputer. More recent Apple II models use larger RAM chips. In some models, each RAM chip has more output pins — usually four or eight — so it no longer takes eight chips to make a bank of RAM.

DRAM presented one problem to Wozniak — impermanence. DRAM is called dynamic because the charges in the capacitors aren't permanent. Over time, the charges leak away, so they must be renewed periodically by a process known as *memory refresh*. Refreshing memory requires additional circuitry that makes the computer more complicated. When Wozniak was designing the first Apple computer, he realized that the advantages of low power and low cost more than made up for the additional complexity required for memory refresh. Besides, he had devised a method to perform the memory refresh almost for free, by combining it with the video display.

The Video Display — The circuitry solves two problems at once

The image on a video display is redrawn 60 times every second. A computer generating a video display has to keep sending data to the display even when the data isn't changing, continually refreshing the image on the screen.

In the Apple II, specific areas of RAM called the *display pages* are connected to special-purpose hardware that generates the signals that drive the video monitor. There are four display pages in all Apple II computers: two for text and Lo-Res graphics and two for Hi-Res graphics. The Apple IIGS has a Super Hi-Res display page. The display hardware generates addresses that cycle through the selected display page over and over again. The display hardware reads the data at those addresses and converts it into the video signals that produce patterns of dots on the display screen.

By an interesting coincidence, the process of refreshing the video display is similar to the one used to refresh the memory in DRAM chips. To perform memory refresh, the computer must send a sequence of addresses to each chip. Wozniak took advantage of this similarity and designed the display hardware in the Apple II to refresh the memory in the DRAM chips at the same time that it refreshes the display. That way, the Apple II gets the benefits of dynamic RAM without needing additional circuitry to refresh it.

The Text Display — How it was doubled

The original Apple II and the Apple II Plus had a 40-column text display made up of 24 rows with 40 characters in each row — all in uppercase. At first, this limited display was acceptable, but as more people used Apple II computers for more purposes, the 40-column display began to seem too limited. Third-party developers produced expansion cards that provided 80 columns, with lowercase, but the cards were expensive and not well integrated with all applications. By the time Apple started to design the Apple IIe computer, it was obvious that the 80-column display should be built in.

source listing The version of a program written in assembly language or a high-level language rather than machine language.

BASIC Beginners' All-purpose Symbolic Instruction Code. BASIC became the world's most popular programming language, available for all microcomputers.

Integer BASIC The version of BASIC that was included with early Apple IIs.

hexadecimal A number system with base 16. Values in this system are represented by the digits 0 through 9 plus the letters A, B, C, D, E, and F, for a total of 16 unique values. In hexadecimal machine language, each hexadecimal digit represents four bits of binary information.

assembler A program that translates a program written in assembly language into a program in machine language.

interpreter A program that enables a computer to execute instructions in a high-level language — one that is easy for the programmer to understand.

Why there was no source listing for Integer BASIC

The original Apple II came with the Integer BASIC interpreter as a permanent feature of the system ROM. As people began to develop applications, they started asking for the source listing for BASIC so they could get information about the inner workings of the interpreter. They hoped to be able to use some of its routines as subroutines in their applications, thus making the applications smaller. (Remember that RAM was expensive and cassette I/O was slow, putting a premium on compact programs.)

Whenever a developer asked for the source listing for Integer BASIC, Apple always refused. You'll see why when you learn how Integer BASIC came to be written.

The year was 1975. The event — a meeting of the Homebrew Computer Club held at Stanford University. The speaker was Steve Wozniak, who was demonstrating a single-board computer he had designed for himself — the machine that became the Apple I.

So how did Wozniak demonstrate his new machine? He ran small programs using his homebrew BASIC interpreter. And how did he load the interpreter? He typed it in, in *hexadecimal machine language*, from the keyboard. He had to type it, because he didn't have tape or disk storage yet. He had to type it in hexadecimal because there was no assembler or interpreter built into that first computer. Woz had written his BASIC interpreter in machine language on a bare piece of hardware!

The designer of the 80-column display on the Apple IIe had three goals:

- minimize the added cost
- keep the existing graphics displays
- keep the 40-column text display for the sake of compatibility

To see how the designer accomplished these goals, you have to see how the 40-column display works.

pixel A contraction of the phrase **picture element**. A pixel is a dot on the screen.

A video display is made up of dots — or *pixels* — arranged in horizontal lines that are drawn one after another, very rapidly. For the display used in the Apple II, it takes 40 microseconds for the video display to sweep across each horizontal line on the screen. The hardware for the 40-column display reads data from the computer's text display at the rate of one byte per microsecond. Each byte contains one character, so 40 microseconds is just time enough to generate 40 characters:

$$40 \text{ microseconds} \times 1 \text{ character per microsecond} = 40 \text{ characters}$$

Each row of characters is eight video lines high, so the hardware scans the text data for each row eight times and generates eight horizontal lines before going on to the next row of text.

address A number that specifies the location of a specific byte of memory.

To double the number of columns in the text display without changing the existing displays, the designer decided to double the existing text page by using two banks of RAM with the same addresses and reading from both banks at the same time. The hardware in the Apple IIe thus generates addresses in the display page at the same rate as before, but now it reads two bytes of display data — one from each bank — during each microsecond:

$$40 \text{ microseconds} \times 2 \text{ characters per microsecond} = 80 \text{ characters}$$

One advantage of this approach is low incremental cost: The display hardware requires only slight changes from the original 40-column design. The main changes were the addition of memory to double the column width of the text page and a character generator that had to run twice as fast. (The character generator is the hardware that converts bytes of data into dots on the screen.) The other display hardware could remain much the same as before.

Another advantage of this approach is its compatibility with applications written for the 40-column display. The hardware for the 40-column display is still there in the newer models, so older applications need not be changed to run on newer machines.

One of the problems with doubling the column width of the text page was how to store different display data in the two banks. Software can't store display data in the auxiliary text page in the normal way — just using different addresses — because the addresses are the same in both banks. To handle this problem, the designer added a bank-select switch that can be changed by the software. Once this software switch was available, it became possible for the Apple IIe to use parallel banks of RAM not only for the display page but for the entire 64-kilobyte address space, thereby doubling the amount of RAM in the system.

The original 80-column Text Card for the Apple IIe was a low-cost option containing only enough auxiliary RAM to double the text page — 1 kilobyte. It was soon followed by the Extended 80-column Text Card with 64 kilobytes of auxiliary RAM, giving the Apple IIe a total of 128 kilobytes of RAM.

Graphics — Doubled text leads to Double Hi-Res

Once the designer of the Apple IIe had made the changes necessary to double the column width of the text display, it took only minor changes to double the Hi-Res graphics display as well. The result was Double Hi-Res. That display not only has double the number of dots for graphics, it can also generate more colors. The old Hi-Res graphics displayed six colors. Double Hi-Res has 16, the same 16 colors formerly available only in Lo-Res graphics.

At first, no one seemed to want Double Hi-Res. The marketing people had recognized the need for doubling the text display, but they didn't see any need for another graphics mode. The developers didn't see a market for Double Hi-Res because the extended 80-column card was optional and applications couldn't depend on having it. An added disincentive for developers was Apple's failure to promote Double Hi-Res or to provide graphics subroutines for it.

The breakthrough came with the introduction of the Apple IIc, which has the second 64 kilobytes of RAM built in. (A similar version of the Apple IIe came later and is often referred to as the enhanced Apple IIe.) With Double Hi-Res no longer optional, developers began to write applications for it, even though they still had to write their own graphics subroutines.

Good Ideas — They keep coming

Good ideas didn't stop with the older Apple II models. The newest Apple II models have their share of interesting features. To name just two:

- A high-speed cache on the Apple IIc Plus provides improved performance without compromising the operation of older programs.
- Memory shadowing on the Apple IIgs is an efficient way to use its larger memory while still allowing older programs to use memory for input/output (I/O).

If you have found these explanations interesting, you might enjoy browsing through Apple's *Technical Introduction to the Apple IIgs*, available from Addison-Wesley Publishing Company. (This book is listed in the "Articles, Books, and Publications" article in the Information Resources section.)

Allen Watson, who has a degree in mathematics, bought an Apple II with 8K of RAM in December 1977 and has been writing about the Apple II ever since. His work has appeared in Apple technical manuals for Apple IIe, Apple IIc, and Apple IIgs, as well as for Macintosh computers.

The Operating System

How the Apple II hardware talks to your applications — and how communication has changed over the years

by Matt Deatherage

Apple II users have seen lots of operating systems over the years — DOS 3.1, ProDOS, ProDOS 8, ProDOS 16, GS/OS, and most recently the Apple IIGS system software, version 5.0. If the alphabet soup of system names leaves you hungry for more meaningful communication, this history of the Apple II operating systems should satisfy your appetite.

Nearly everyone has heard the adage that “hardware is nothing without software,” which is true. Without software, your Apple II computer might as well be turned off. Its microprocessor doesn’t do anything of its own accord. It simply executes instructions, one after another, until someone disconnects the power. It’s always running a program, even if the program is just looking to see if you’ve pressed a key yet.

If you’re like most people, you’re probably interested primarily in *application* programs, such as word processors and database managers. While different application programs generally perform different tasks, there are certain tasks that every application has to handle. For example, all applications have to communicate with you. Most use the keyboard and the computer screen for this purpose.

Because you like to keep information where you can get to it easily, most applications also need to talk to storage devices. The most popular storage device is the disk drive. However, a disk drive is pretty difficult to communicate with. It responds to basic commands such as “look here,” “read some information,” and “write some information.” Application programs like to issue commands, however, such as “read a file” and “write a file.” To assure that disk drives follow these commands, a program has to group raw bits of information into bytes, group bytes into larger chunks for easier management, and then group all of that information into files. Such a program is called a *disk operating system*, or DOS for short.

A DOS is a specialized control program known more generically as an *operating system*, or OS. An operating system is usually working in your computer's memory at the same time as an application, so the application can ask it to perform tasks such as reading and writing files or communicating with you via the keyboard and screen.

When you switch your computer on, the ROM looks for a miniature program that's stored on an interface card attached to a storage device and uses it to load another program from disk. This second program then uses the miniature programs on the interface card (known as *firmware* because they run on a hardware card) to load the rest of the operating system. It's kind of like bringing yourself up by your bootstraps, which is why it's called *booting* the system. And the process still works the same way today as it did in 1978, when Steve Wozniak invented the Disk II, the first floppy disk drive for the Apple II. (Apple IIc and IIGS computers have built-in ports where you can plug in disk drives without using interface cards. The computer pretends there's an interface card there anyway, so the operating system knows how to boot itself.)

DOS 3.1 — Designed to work with the Disk II disk drive

While Wozniak was working on the Disk II disk drive, he and other Apple engineers were also busy at work on an operating system to go with it. They released their first effort, DOS 3.1, in the summer of 1978. (Versions earlier than 3.1 were never released to the public because they didn't work well enough.)

The firmware on the Disk II interface card expected every disk to be a 5.25-inch disk, divided into 35 parts, called *tracks*. Each track was further divided into 13 sectors, each with 256 bytes of data. If a disk wasn't organized this way, it couldn't be booted. DOS 3.1 worked with this disk organization.

Apple engineers made several changes to the operating system in the months after its initial release. In mid-1979, DOS 3.2.1 was released as the most stable version.

DOS 3.3 — An upgrade to accommodate Pascal, higher storage

At the same time, another group of Apple engineers was working on an implementation of the Pascal programming language to complement the BASIC language built into the Apple II. When it was released in 1979, UCSD Pascal for the Apple II — or Apple II Pascal — came with its own disk operating system. This system didn't organize disks the same way as DOS 3.2.1 and its predecessors. Instead of 13 sectors, it divided the disk's 35 tracks into 16 sectors, each with 256 bytes, boosting the total storage per disk from 113K under DOS 3.2.1 to 140K.

Because the disk organization had changed, Apple had to upgrade the Disk II controller card to boot the new Pascal disks. It also modified the disk operating system to use the new 16-sector-per-track storage capability, calling the new version DOS 3.3.

Upgrading to the new system was not without drawbacks:

- DOS 3.3 could not directly read disks formatted by DOS 3.2.1 or earlier versions. To remedy this problem, Apple included a utility called MUFFIN, which read files from the older disks.
- The new hardware wouldn't boot the older disks. Again, Apple supplied a utility called BOOT13 to boot 13-sector-per-track disks.
- DOS 3.3 functioned best if 32K or more was present, even though it only occupied about 10K itself.

DOS 3.3 wasn't easy for applications to use, either. The interface between DOS 3.3 and the application program was not well defined. Programmers had to work around DOS to perform some necessary tasks, or sometimes they had to call routines inside DOS to do things that DOS itself would not do. As a result, enhancing and fixing bugs in DOS 3.3 became troublesome — any minor change could easily move routines that applications depended on.

patch An alteration to a program that patches right over existing program instructions just as a clothing patch is sewn over torn fabric.

Apple III The Apple III was a business computer that Apple sold from 1980-1984. It is best remembered today as the machine for which early versions of ProDOS and AppleWorks were written.

The main drawback of DOS 3.3, however, was that it was designed to support the Disk II disk drive. As time went by, other storage devices became accessible to microcomputers — devices such as hard disks and 3.5-inch disk drives. DOS 3.3 could not talk to these devices without patches.

ProDOS — Power, sophistication à la SOS

Apple wanted to bring a more powerful operating system to the Apple II — one similar to the operating system used on the more expensive Apple III. This system was called SOS — Sara’s Operating System, named after engineer Dick Huston’s daughter. (It was also called the Sophisticated Operating System.)

SOS featured device drivers — small programs used to communicate with storage devices. Device drivers could tell SOS how to access any given storage device; the system didn’t have to have that knowledge built in as DOS 3.3 did. SOS also provided communication with nonstorage devices such as printers.

SOS also featured a hierarchical directory structure so you could create special kinds of files called *subdirectories* that contained other files. For example, you could create a subdirectory named “Taxes” and keep all your tax-related files in that subdirectory for easy access. Subdirectories could be nested as deep as you wanted, the only constraint being disk space. DOS 3.3, by contrast, had only one level of file organization.

Not all of the power of SOS could be harnessed for the Apple II because the Apple II had a maximum of 64K of RAM at that time. SOS required 256K. However, engineer Dick Huston did bring the hierarchical file system and advanced programming interface of SOS to the Apple II and called it *ProDOS* — for Professional Disk Operating System. While DOS 3.3 expected all programs to work with files the way BASIC did, ProDOS gave programmers the flexibility to work with files in new, more powerful ways.

Apple's ProDOS-compatible devices

The following Apple devices have firmware interfaces to ProDOS:

RAM disk A cross between a disk and random-access memory. Like a disk, it must be initialized before you can put files on it, and it must be addressed by its volume (disk) name or its slot number. Like RAM, it offers fast access to information but cannot store information permanently. Everything is erased from the RAM disk when you switch off the computer's power.

UniDisk™ 3.5	Apple's first 3.5-inch disk drive for the Apple II
Apple II Memory Expansion Card	Works as a RAM disk for the Apple II under ProDOS
Apple IIc Memory Expansion Card	Works as a RAM disk for the Apple IIc under ProDOS
Apple II SCSI Card	Connects Small Computer System Interface (SCSI) hard drives to the Apple II. Revision C of the original card added CD-ROM support
Apple II High Speed SCSI Card	Connects any SCSI device to the enhanced Apple IIe and the Apple IIGs
Apple II ProFile Interface	Allows ProDOS to work with 5 MB or 10 MB ProFile hard disks

ProDOS did not have the ability to handle any storage device through a driver as SOS did, but it could access any storage device whose firmware followed guidelines published by Apple. By designing an interface card to be ProDOS compatible, third-party developers could create storage devices that were compatible with ProDOS from the moment they were plugged in. Apple also released several ProDOS-compatible devices and interfaces of its own.

ProDOS was released in January 1984. At the same time, Apple announced that all future development would be in ProDOS and that DOS 3.3 would never be changed again — that is, there would be no enhancements and no bug fixes. Apple encouraged third-party developers to move to ProDOS as well, and many did. However, running a BASIC program under ProDOS required about 16K more memory than running under DOS 3.3. Also ProDOS was a more complicated programming environment than DOS 3.3, and users who were unfamiliar with subdirectories found it more complicated. So some people chose to stay with DOS 3.3. Even today, people still use educational software that runs under DOS 3.3. Although no hardware change was required for ProDOS, it couldn't read DOS 3.3 disks directly. Apple supplied a program called CONVERT to do the task and later built the capability into the Apple II system utilities, which shipped with every Apple IIc and Apple II disk controller card from 1985 through the present.

8-bit microprocessor A microprocessor that can handle 8 bits of data in a single instruction. A bit is one binary digit.

16-bit microprocessor A microprocessor that can handle 16 bits of data in a single instruction.

ProDOS 16 — A new system for the 16-bit Apple IIGS

The advent of the Apple IIGS in September 1986 made some extraordinary demands on the operating system. The Apple IIGS had a 16-bit microprocessor, while older Apple IIs had 8-bit microprocessors. The new microprocessor made it possible to create faster and more powerful software, and the operating system had to meet the challenge. But ProDOS could not be modified to do so and remain compatible with older Apple II computers. So a new operating system was born — ProDOS 16.

The original ProDOS became ProDOS 8 and was available for 8-bit computers (including the Apple IIGS, in 8-bit mode). The new ProDOS 16 made it possible for Apple IIGS applications to communicate with storage devices without entering 8-bit mode. In effect, ProDOS 16 was simply an easier way for applications to use ProDOS 8 — most ProDOS 16 calls were translated into ProDOS 8 calls made by ProDOS 16.

When will ProDOS 8 use bigger volumes?

Many people have asked Apple when ProDOS 8 will be modified to recognize more than two drives per slot. Or when it will support more than 32 MB per volume. Or when some other ProDOS restriction will be lifted. The answer is: These restrictions won't be lifted. Here's why.

Application programs get ProDOS 8 to do work for them by making calls to ProDOS 8's machine-language interface, or MLI. When a program calls the MLI, it passes along a command and some memory to be used for the results. For example, if a program wants to read 50 bytes of data from a file, it tells the MLI what file to read and where to put the information in memory.

The size of these data structures is limited. If you want to know the size of a file in ProDOS 8, you give ProDOS 8 three bytes in which to return the file's size. The largest value that can be returned in three bytes is a value of 16 megabytes, which is ProDOS's maximum file size. The ProDOS file system, which dictates how files are stored on disk, only keeps three bytes for this value, so it can't be any bigger. Similarly, the number of drives in a given slot is stored as a 1-bit value, where a 0 means one drive and a 1 means two drives. The bit is either 0 or 1; it can't be anything else. ProDOS also stores a volume's size in a 2-byte field that represents how many 512-byte blocks are on the disk. The maximum value is 65,536 blocks of 512 bytes each, or 32 megabytes.

All of these fields are an integral part of how ProDOS works. To change them now would introduce incompatibilities with nearly every ProDOS application ever written. A change would also create a new disk storage format that the current ProDOS implementation (either ProDOS 8 or GS/OS's ProDOS FST) could not read. Apple feels that no one really wants a new operating system that doesn't work very well with any existing applications. So, no changes.

device driver A program that handles the transfer of data to and from a peripheral device, such as a printer or disk drive.

The engineers for the Apple II GS had a bolder move in mind, however. The successes of SOS, of ProDOS, and of the Macintosh Operating System had already shown them the power of including some kind of device driver — either as a short program or included with the hardware — in the operating system. Device drivers meant that the operating system didn't have to have built-in knowledge of every kind of storage device. However, the operating system still had to have built-in knowledge of the disk storage format. ProDOS knew only how to work with ProDOS disks (and SOS disks, since the formats were the same). It couldn't work directly with DOS 3.3 disks, for example.

Nevertheless, the experience with device drivers led to a new question. Why not create a kind of driver that knows how the disk format works? Then, when the operating system asked this special “translator” for a file on disk, the translator would figure out how the file was stored on the disk and ask device drivers to read the appropriate bytes from the disk. With such a system, people could use ProDOS disks or DOS 3.3 disks or any kind of disk for which a translator existed.

GS/OS — File system translators (FSTs) for different disk formats

character device A device such as a printer or modem that deals with characters rather than chunks of data as in disk drives and tape backup units.

The idea worked well. The engineers built a new native operating system for the Apple II GS, known as GS/OS. It included as integral components a set of translators for disk formats known as *file system translators* — or FSTs.

GS/OS was released in September 1988 and originally shipped with three FSTs — one for ProDOS disks, one for character devices, and one for the CD-ROM international standard (ISO 9660 and its predecessor, High Sierra).

GS/OS also allowed device drivers to be loaded from disk at boot time instead of residing on the device hardware. A driver that is stored in memory and written specifically for the Apple II GS can be more efficient than a driver that is attached to hardware and has to run on all Apple II computers. For example, Apple's driver for revision C of the Apple II SCSI Card was five times faster than the driver on the card.

GS/OS also eliminated restrictions in the design of ProDOS 8. ProDOS 8 could support only two storage devices in any slot. GS/OS has no such limit. ProDOS 8 was limited to 16 MB per file and 32 MB per volume. The comparable limits for GS/OS are 256 times bigger per file and at least 128 times bigger per volume. (However, to be compatible, the ProDOS file system translator has to stay within the limits of ProDOS.)

Apple IIgs System Software, Version 5.0 — A look at the future

AppleShare FST An acronym for AppleShare File Server File System Translator. This device driver for the Apple IIgs changes Apple II files into files that can be stored on an AppleShare file server.

ProDOS 8 is now a mature system. It probably won't change much in the future. But GS/OS has already been expanded with the release of Apple IIgs system software, version 5.0. Among its new features is an AppleShare FST that allows the operating system to use AppleShare file servers as disks. See "The Apple IIgs System Software, Version 5.0" in this section for more details.

You can expect more of this kind of expansion for GS/OS in the future. Early versions of device drivers for the Apple Scanner and Apple Tape Backup unit are already available to developers. You can expect to see additional FSTs for GS/OS as well, giving your existing software the capability to read disks it currently can't understand. And, of course, Apple intends to deliver performance enhancements wherever possible so that equipment you already own works better for you. The power of Apple II operating systems has grown over the years, and more power is yet to come.

Matt Deatherage works in Apple's Developer Technical Support group, where he was the technical lead for Apple IIgs System Software 4.0 through 5.0.2. He has written dozens of technical notes as well as articles for APDalog and Call -A.P.P.L.E. magazines. He hopes his friend Michael Opitz will read this book and fall into uncontrollable laughter at the sight of the word "dadoddapadudy," for some cosmically unexplained reason.

The Apple IIGS System Software, Version 5.0

The latest system software
can enhance your Apple IIGS

by Emile Schwarz

The latest version of the Apple IIGS system software is version 5.0. It's a major step forward for the Apple IIGS, with improvements in performance, graphics, and file operations. The new version supports hard disks with a capacity of 32 MB or more and introduces file system translators to maintain compatibility with other systems. Whether you're a user who wants to get the maximum power from the operating system or someone who just wants to take advantage of performance benefits, spend a few minutes reading this overview and take a look at the suggestions for using some of the features of version 5.0.

In May 1989, Apple introduced the Apple IIGS system software, version 5.0 — a significant upgrade of the system software. The upgrade package includes two disks and a 216-page manual. An October 1989 update, version 5.0.2, fixes some initial bugs. (Plans for version 5.0.3 are underway for release in late 1990.)

SCSI An acronym for Small Computer System Interface, pronounced "SKUH-zee." SCSI devices include hard disks and other devices that require high-speed communication with your computer.

To use the system software version 5.0.2, you need to make sure you have ROM 01 or ROM 03 installed in your Apple IIGS. You need a minimum of 512K of memory to run the system software. For best performance, it's strongly recommended that you have at least 768K. If you plan to use AppleShare or SCSI devices, you need 768K of memory (Version 5.0.3 will require 1 MB of memory).

If you are using the original Apple II SCSI Card, you must have an updated ROM (version C) installed on the card so that the system software can recognize it. For details about this Apple II upgrade please see the "Customer Service and Support" article in the Apple Sales, Service, and Support section.

Performance — The new system software is faster, easier

Apple IIGS system software, version 5.0, improves your computer's performance by 5 to 8 times — on the average — over version 4.0.

RAM cache A portion of RAM reserved for a special purpose, such as file operations.

The graphics routines have been optimized, so the time required to write to the screen is reduced by half. Disk access and file operations are faster, too. And new printer drivers reduce printing time by a factor of four in version 5.0.3.

An Installer program simplifies installation. This program comes on the *Apple IIGS System Tools* disk. With it, you can add or remove capabilities from your startup disks.

FSTs — A way to translate data from one computer world to another

The new system software includes file system translators — FSTs — that let you use the new operating system with other file systems or file servers. For example, if you've created a file under ProDOS, a file system translator can automatically determine how the file was saved on your disk and then open it correctly. Version 5.0 includes four such FSTs:

Char.FST	Manages writing to the screen and reading from the keyboard
Pro.FST	Manages reading from and writing to ProDOS
HS.FST	Manages reading from High Sierra and ISO 9660 CD-ROMs
AppleShare.FST	Manages reading from and writing to AppleShare file servers

Apple plans to make additional FSTs available in the future. See "The Operating System" in this section for more details.

SCSI system cable SCSI devices like the AppleCD SC are connected to your computer via a SCSI cable. You connect the first device to the computer with a SCSI system cable. Additional devices can be connected with SCSI peripheral interface cables.

CD-ROM — Volumes of information and music, too

You can use the AppleCD SC — an optical compact disc reader — with your Apple IIGs. You simply install a SCSI card in one of the expansion slots and run a SCSI system cable from the slot to the AppleCD SC. Then all you need to do is turn on the AppleCD SC, turn on your computer, and insert the CD-ROM disc in the AppleCD SC.

A CD-ROM disc called *CD-ROM Explorer* comes with the AppleCD SC. The disc is organized in three partitions, one each for Apple IIGs, Apple II, and Macintosh. These partitions are designed to take advantage of the particular capabilities of each of these computers.

A disc that contains the CD Remote desk accessory also comes with the AppleCD SC drive and the Apple II High Speed SCSI Card. You can use this desk accessory to play music from a digital audio disc in your AppleCD SC drive. When you use the Apple IIGs Installer to install CD-ROM software, the CD Remote desk accessory is automatically installed.

The CD Remote desk accessory reads digital audio discs,



so you can play music from the desktop of your Apple IIGs.

About version numbers

Version numbers for system software can be confusing because system software actually includes numerous files, each of which has its own version number. Here are the version numbers for some of the major files in the Apple IIgs system software, version 5.0.2:

GS/OS 3.1p

BASIC.System 1.4

ProDOS 8 version 1.8

Finder 1.3

Cache Manager Apple IIgs system software that allocates a certain part of the computer's random access memory (RAM) for storing information that is frequently read from a disk.

Control Panel A desk accessory that lets you change certain system parameters, such as speaker volume, display colors, and configuration of slots and ports. It is available on the Apple IIgs as either a new or a classic desk accessory.

The Cache — Faster file operations

GS/OS uses a RAM cache and the Cache Manager manages it. The Cache Manager temporarily stores copies of frequently used information in the cache. The operating system can then get the information from memory rather than accessing the disk each time it needs the information. Because it's faster to get information from memory than from disk, GS/OS can perform such operations as copying and moving files faster than previous versions. The time saved is particularly significant if you store files in nested folders.

You can change the size of the RAM cache with the RAM Cache option in the graphic Control Panel. (You can also use this option to change the memory allocation for a RAM disk.)

Finder The program that helps you to manage the way information is stored on disks and lets you move quickly from one application to another. The Finder is the part of the Apple IIGs operating system, GS/OS, that you see.

dialog box A box that the Apple IIGs displays to request information or ask you to confirm an action. In many cases, dialog boxes contain warnings and are accompanied by a beep.

new desk accessory (NDA) A mini-application that you can use without leaving your main application. New desk accessories are available from the Apple menu whenever you're using the Finder or any graphics-based application that supports the Apple menu.

classic desk accessory (CDA) A mini-application that is available from the Desk Accessories menu, which you can reach by pressing Command-Control-Esc.

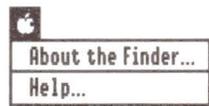
The Menus — They look a little different

The new Finder™ version in Apple IIGS system software, version 5.0, is Finder 1.3. The menus in this new version have been changed a bit for consistency among Apple computers. Some commands have keyboard shortcuts — a combination of the command key and a character. These shortcuts appear in the menu beside the command name.

Some commands have been moved or changed. The following is a summary of these changes.

The Apple menu This menu lists the new desk accessories (NDAs) installed on your Apple IIGS. These include the graphic Control Panel and the CD Remote desk accessory, if you've installed it. In the new version, the RAM Cache command no longer appears in the Apple menu. You set the size of the RAM cache in the graphic Control Panel.

Finder 1.2



Finder 1.3



The File menu The Icon Info command, which used to appear in the File menu, now appears in the Special menu. The Rename command has been removed, but you can use the Duplicate command to create a file copy with a new name.

Finder 1.2

File	
Open	⌘O
Print	
Close	
Close All	
New Folder	⌘N
Get Info	⌘I
Duplicate	⌘D
Put Back	
Rename	
Quit	⌘Q

Finder 1.3

File	
New Folder	⌘N
Open	⌘O
Print	
Close	⌘W
Close All	

Duplicate...	⌘D
Put Away	
Validate	

The Edit menu The Select All command has been moved from the Special menu to the Edit menu.

Finder 1.2

Edit	
Undo	⌘Z
Cut	⌘X
Copy	⌘C
Paste	⌘V
Clear	
Show Clipboard	

Finder 1.3

Edit	
Undo	⌘Z

Cut	⌘X
Copy	⌘C
Paste	⌘V
Clear	
Select All	⌘A

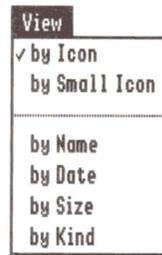
Show Clipboard	

The View menu This menu is the same in both versions of the Finder.

Finder 1.2



Finder 1.3



The Disk menu This menu did not exist in the previous version of the Finder, but its commands should all be familiar — they used to be in the Special menu. (The Initialize Volume command is now the Initialize command.)

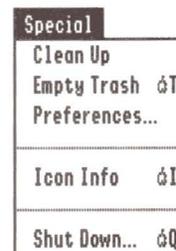


The Special menu As already noted, the Select All command has been moved to the Edit menu. The Remove command has been *removed!* Eject, Erase, Initialize Volume, and Verify are now in the Disk menu. Icon Info, which used to be in the File menu, now appears here.

Finder 1.2



Finder 1.3



In addition to these menu changes, a number of new features, commands, and options have been added to version 5.0. The rest of this article summarizes some of these features and how you use them.

ExpressLoad — How to be sure it's loaded

ExpressLoad is designed to improve the performance of the loading process with Apple IIGS system software.

- To determine whether ExpressLoad is loaded, hold down the Option and Command keys for several seconds as you start your computer.

The "Welcome" window appears as usual. The message "ExpressLoad" appears on the screen below the thermometer if you had enough memory to load ExpressLoad. ExpressLoad loads on all systems with more than 512K of memory.

BASIC.System — A new monitor command

With the new version of BASIC.System in version 5.0 of the system software, a new monitor command has been added — MTR. You can now use this command instead of the notorious CALL-151.

The syntax for the MTR command is

```
] MTR
or
] 10 PRINT CHR$(4);"MTR"
```

System Files — You can deactivate them selectively

You can now prevent some system files from being loaded when you start your system. The type of files that can be deactivated are shown in the following table.

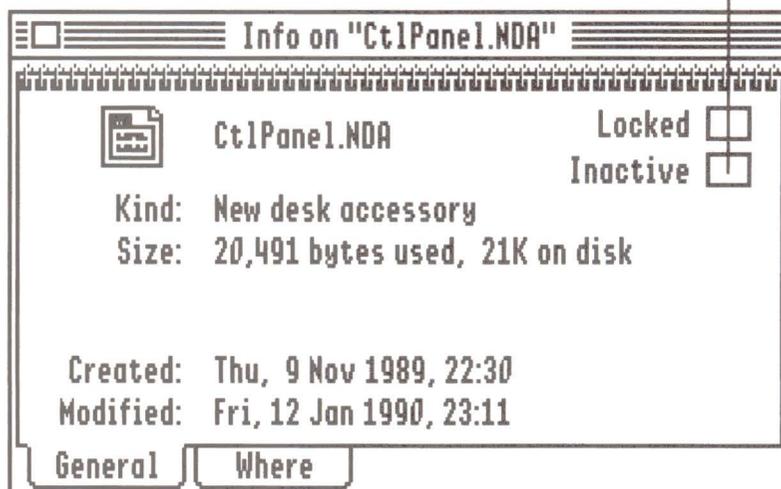
File	Folder	Type
Permanent initialization file	:System:System.Setup:	\$B6
Temporary initialization file	:System:System.Setup:	\$B7
New desk accessory	:System:Desk.Accs:	\$B8
Classic desk accessory	:System:Desk.Accs:	\$B9
Device driver	:System:Drivers:	\$BB
GS/OS file	:System:FSTs:	\$BD
Control Panel document	:System:CDEV:	\$C7

Here's how to deactivate one of these files.

- Select the system file you want to deactivate.
- Choose Icon Info from the Special menu. Or hold down the Command key and press I.

The Inactive option appears on the General card in the information window for the file.

The file is deactivated when the Inactive option is checked.



The Icon Info command displays information about the selected file.

If the file is already deactivated, clicking the Inactive option reactivates it.

■ **Restart your system.**

Files are not deactivated or reactivated until you restart your system.

Disk Space — How to gain a little more

If you are working without a hard drive, you may be feeling cramped for disk space, particularly when you want to use an extra font or desk accessory. Although Apple recommends a hard disk as the best way to get the space you need, you can remove some system files to gain a little extra space. These are the files you can remove:

In the System:Drivers: folder

- | | |
|----------------|--|
| AppleDisk 5.25 | Removes the 5.25-inch disk driver |
| Modem | Allows printing through the modem port |

In the System:System.Setup: folder If you have ROM version 01, you can remove TS3. If you have ROM version 03, you can remove TS2.

In the System:CDEVs: folder You can remove all the files in the CDEVs folder except Alphabet, DirectConnect, RAM, and Printer. However, it's best to keep all the CDEVs.

Other files The files P8, BASIC.Launcher, and BASIC.System are only required if you are running applications under ProDOS 8 or using AppleSoft BASIC. As with the CDEV files, it's best to keep these files on your system disk. However, if you never use any ProDOS 8 application, you can get rid of them to gain some space for installing fonts and desk accessories.

CDEV A category of options in the graphic Control Panel. For example, the RAM cache options in the Control Panel are managed by a CDEV file.

Another way to gain some disk space is to use a shareware NDA called Font-DA Installer. (You can get this file from CompuServe or some bulletin board systems [BBSs], but be sure to pay the shareware fee if you use it.) You copy the Font-DA Installer in the :System:Desk.Accs: folder and restart your computer. Next, you delete all the files in the :System:Fonts: folder except FastFont and Shaston 16. Then, when you need a font, you load it from another disk using the Font-DA Installer.

Print Quality — Use double-size fonts for higher quality

When you're using an ImageWriter II printer with the Apple IIGS, you can improve your print quality by installing double-size fonts in the font file. That is, if you are printing in 12-point Geneva, install 24-point Geneva, too.

On the Apple IIGS screen, as in ImageWriter output, images are formed from a group of small dots. The more closely these dots are grouped, the greater the resolution — the crispness — of the image. Resolution is usually expressed in dots per inch (dpi). The greater the dpi, the better the resolution.

The resolution of ImageWriter output is 144 dpi, which is twice that of an image displayed on the screen. When you're printing a text document in Best quality, the Apple IIGS looks first for the font that is twice the size of the one displayed on the screen. This font contains twice as much information about the shape of the characters as the font displayed on the screen. The Apple IIGS can use this additional information to produce a smaller image with twice the resolution. Of course, you can print your text even if you don't have the double-size font. But the image won't be as sharp.

Startup — How to do it faster

The way you use your system software files and folders can slow you down or save you time when you switch on your Apple IIGS. Here are some time-saving guidelines:

■ **Avoid frequent changes to the Fonts folder.**

Each time you start the font manager, it reads the files in the Fonts folder and saves the description of the fonts in the Font.Lists file if the folder's contents have changed since the last startup.

■ **Avoid frequent changes to the CDEV folder.**

When you boot your system, the graphic control panel reads the contents of the CDEV folder and saves some parameters in the CDEV.DATA file if the folder has been changed since the last startup or even the last time you opened the graphic Control Panel.

■ **Remove the drivers you don't use from the Drivers folder.**

■ **Remove the desk accessories you don't use from the Desk.Accs folder.**

For More Information

If you want more information about using the new system software on your Apple IIGS, take a look at these resources:

Apple IIGS System Software User's Guide, Version 5.0

Apple IIGS Owners Guide

Emile Schwarz works in the Product Marketing Group in Apple Computer France, writes for two Apple II magazines, and has written one Apple II book, with a second book currently under way.

An Apple II Success Story

Tyler Weisman may not be the ultimate Apple II 'power user,' but he's close



With the possible exception of Apple II inventor Steve Wozniak, perhaps no one in America gets more personal enjoyment and satisfaction from the Apple II computer than Tyler Weisman of Gainesville, Florida. Tyler, who is halfway through the master's program in health occupation at the University of Florida, was once a licensed paramedic. His ultimate career goal is to one day work as a county director of emergency or health services in Florida or serve in the same capacity with the state government. "I don't know if I have the political savvy for such a position yet," he admits, "but I'm working on it." While that assessment may or may not be true, there's no denying that Tyler Weisman has about as much computer savvy and experience as a layperson can get.

He got into personal computing as a hobby eight years ago when he purchased an Apple II Plus — at the urging of a close friend who is a computer dealer. "I was hooked on the Apple II right away," he says.

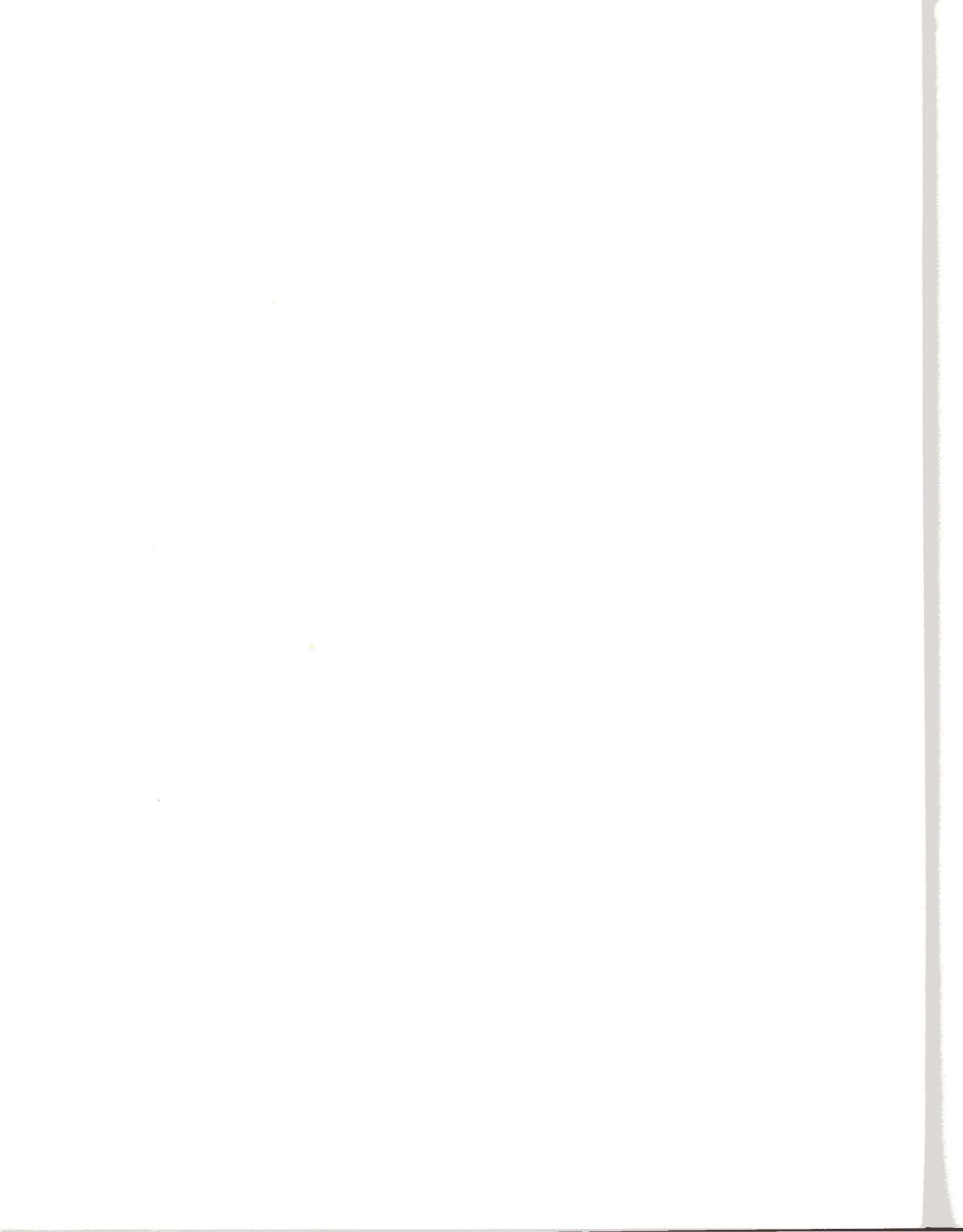
"I couldn't get enough of it." Tyler's passion for the computer grew throughout the 1980s, and he updated in sequence to an Apple IIc, Apple IIe, Apple IIGS (ROM version 1), and Apple IIGS (ROM version 3), which he currently uses. "In addition to the computers, I have also used about every Apple II peripheral Apple Computer ever made, with the exception of a laser printer," he says. "And it's not that I don't want a laser printer, it's that I can't justify the cost at the moment."

Tyler's current collection of Apple II hardware and software is most impressive, resembling a small computer store. His hardware ranges from the Apple Video Overlay Card to the Apple MIDI Interface to assorted joysticks and game paddles. Tyler's most-often-used software includes Point-to-Point, for telecommunications; AppleWorks GS, for word processing, and spreadsheet and database functions; Music Studio, "for fun"; HyperStudio; Paintworks Gold; and Publish-It!

Tyler does a lot more than college assignments and play games and music on his Apple II. He and his wife, Leah, a special educator at the Lake City, Florida, Middle School, have started a business in Gainesville. P&L Industries offers accounting, database management, data processing, desktop publishing, word processing, and audio and video taping services to departments and colleges at the University of Florida, and to other clients. Tyler is also a freelance writer for Apple II national newsletters and magazines, and a library SYSOP (system operator) for the GENIE national on-line electronic information service, which is owned by General Electric Information Services Co. "I keep pretty busy," he says, "but, whatever I do, I'll always have an Apple II with me."

People who know Tyler know he isn't kidding.

Please see the "Third-Party Products" listing in the Information Resources section for more information about third-party products mentioned in this Apple II success story.



Information Resources

A guide such as this can only begin to provide the kind of information you need to use your Apple II computer to its fullest extent. It's fortunate that other resources abound.

In addition to computers listed in the Understanding the Basics section, the resources introduced in the Apple Sales, Service, and Support section, and third-party products referred to in our Apple II success stories, there are many other products and resources to help you use your Apple II more effectively.

This section includes a wealth of information about Apple II products, user groups, dealers, resource centers for people with disabilities, as well as lists of third-party products, articles, books, publications, and on-line services.

We hope this section helps you find the resources you need so you can do more with your personal productivity partner, the Apple II.

Apple Product Information

Dozens of products to expand and enhance your Apple II

In addition to the computers, Apple produces a wide assortment of hardware for the Apple II, including monitors; storage devices; expansion cards; printers; and modems, cables, and connectors.

Monitors **Apple Monochrome Monitor IIe**

This is a 12-inch monochrome monitor for the Apple IIe. It displays 80-column text and high-resolution graphics.

AppleColor Composite Monitor IIe

This is a 14-inch color monitor for the Apple IIe. It displays 80-column black and white text and high-resolution color graphics.

Apple IIGS RGB Color Monitor

This is the recommended color monitor for the Apple IIGS personal computer because it takes full advantage of the computer's advanced graphics capabilities. It displays graphics in up to 256 colors at a time from a palette of 4,096 colors. For text-intensive applications, it can also display crisp, clear 80-column text.

Apple Monochrome Monitor IIc/IIGS

This is a lower cost 12-inch monochrome monitor for the Apple IIc which also works well with the Apple IIGS. It displays 80-column text and high-resolution graphics.

Storage Devices **Apple Hard Disk 20, 40, 80, 120, 160SC**

The SC Hard Disk is available in 20, 40, 80, 120, and 160 MB sizes and can be used with the Apple IIe and Apple IIgs. ProDOS and AppleSoft BASIC can only address up to 32 MB. However, larger disks can be divided into partitions of 32 MB or smaller. The SC Hard Disk requires a SCSI card.

Apple 5.25 Drive

This disk drive works with all Apple II personal computers. It uses standard 5.25-inch disks and provides 140K storage capacity on each disk.

Apple 3.5 Drive

This drive for the Apple IIgs, Apple IIc Plus, and all Macintosh computers reads 3.5-inch 800K disks. This drive is indispensable if you are using GS/OS.

UniDisk 3.5 Drive

This disk drive works with all Apple II personal computers. It uses standard 3.25-inch disks and provides 800K storage capacity on each disk.

UniDisk 3.5 Accessory Kit (Apple II+ or Apple IIe)

This is a controller card for the UniDisk 3.5. You need the card for the first UniDisk drive you connect to an Apple IIe or Apple II Plus.

AppleCD SC

This peripheral device reads CD-ROMs. You can use it with an Apple IIe or Apple IIgs. It comes with headphone and audio outputs, as well as a CD-ROM disk with sets of applications for the Apple IIe and Apple IIgs. The disks also contain software for playing audio compact discs — CD Remote for the Apple IIgs and CDREMOTE.OBJ for the Apple IIe. The AppleCD SC requires a SCSI card for use with the Apple II.

Expansion Cards 64K Extended 80-Column Card

This memory expansion card for the Apple IIe or Apple II Plus increases the total memory to 128K and supports the 80-column display.

Apple IIGS Memory Expansion Card

This memory expansion card for the Apple IIGS adds 256K of memory. Using 256K kits, you can expand the memory on this card to 512K or 1,024K. (You cannot use the card with 786K.)

Apple II Memory Expansion Card

This memory expansion card for the Apple IIe adds 256K of memory. Using 256K kits, you can expand the memory on this card to 512K or 1,024K. (You cannot use the card with 786K.)

Apple II 256K Memory Expansion Kit

This kit contains eight 32K RAM chips for installation on the Apple IIGS or Apple IIe Memory Expansion Card. You can install one or three kits for a total of 512K or 1,024K. The components in this kit are 100 percent compatible with the Apple IIGS, which may not be true of non-Apple kits.

Super Serial Card

This card provides a serial (RS-232) port for the Apple II, Apple II Plus, and Apple IIe personal computers. A serial port is necessary for using serial devices such as the Apple Data Modem 2400 and the ImageWriter II printer. The card comes with an installation manual and a tool for attaching the RS-232 connector.

Apple II High-Speed SCSI Card

With this card, you can connect your Apple IIe or Apple IIGS to any device that uses the Small Computer System Interface (SCSI), such as hard disk drives and CD-ROM drives. It requires an Apple IIGS with a minimum of 768K of RAM or an enhanced Apple IIe.

Apple IIe Workstation Card

This card expands the capabilities of the Apple IIe to reach devices connected through AppleTalk networks. With the Workstation card, Apple IIe users can share printers and documents with other Apple IIe, Apple IIGS and Macintosh users across LocalTalk networks. Workstation software is included.

Apple II Video Overlay Card

This card offers owners of Apple IIe and Apple IIGS computers the ability to merge two powerful channels of communication — video and computing. With it, you can superimpose Apple II screen images on video from a variety of sources, including VCR, videodisc, video camera, or television. You can display the combined images on an RGB or composite monitor and record them on videotape using a VCR. The VideoMix software, which you use to control the merging of graphics and video images, comes with the card.

Printers **ImageWriter II**

This impact dot-matrix printer prints in color or black and white. Its features include:

- | | |
|----------------|--|
| Printing modes | <ul style="list-style-type: none"> □ Draft: 240 characters per second at 10 characters per inch (2-1/2 pages per minute) □ Standard: 180 characters per second (2 pages per minute) □ Near-letter-quality: 45 characters per second (1/2 page per minute) |
| Paper feed | <ul style="list-style-type: none"> □ Single sheets or continuous form □ Multiple carbon copies — original plus three copies □ Optional sheet feeder for automatically feeding up to 100 cut sheets |

- Character sets
- 96 ASCII characters
 - 32 MouseText characters
 - 28 international characters
 - Two banks of personalizable characters so you can define your own character set and download it to the printer

You can add an optional LocalTalk card to allow access by multiple users for cost-effective printing.

ImageWriter II Cut Sheet Feeder

A sheet feeder for automatically feeding up to 100 single sheets. Note that the sheet feeder and forms tractor cannot be mounted on the ImageWriter II at the same time. You must remove one to install the other.

ImageWriter II 32K Memory Option

This card increases the plug-in memory for the ImageWriter.

Personal LaserWriter NT with Toner Cartridge and Letter Cassette

This PostScript laser printer works with the Apple IIe and Apple IIGS, using a LocalTalk connection. The Apple IIGS uses a LocalTalk cable connected to the modem port. On the Apple IIe, the LocalTalk cable connects to the Apple IIe Workstation Card.

LaserWriter IINT with Toner Cartridge and Letter Cassette

This PostScript laser printer, with a 68000 CPU, works with the Apple IIe and Apple IIGS, using a LocalTalk connection. The Apple IIGS uses a LocalTalk cable connected to the modem port. On the Apple IIe, the LocalTalk cable connects to the Apple IIe Workstation Card.

LaserWriter IINTX with Toner Cartridge and Letter Cassette

This PostScript laser printer, with a 68020 CPU, works with the Apple IIe and Apple IIGS, using a LocalTalk connection. The Apple IIGS uses a LocalTalk cable connected to the modem port. On the Apple IIe, the LocalTalk cable connects to the Apple IIe Workstation Card.

LaserWriter IINTX Upgrade Kit

This kit upgrades the LaserWriter IINT to a LaserWriter IINTX by replacing the electronics.

LaserWriter II Envelope Cassette

You can add this bin to the LaserWriter IINT or LaserWriter IINTX to feed envelopes automatically.

Modems, Cables, and Connectors

Apple Personal Modem

This is a compact 1200/300-baud modem that provides a cost-effective data communications solution for any Apple personal computer system. It is compatible with both tone and pulse phone systems. To use it, you need the following cables:

Computer	Accessory
Apple IIGS and Apple IIc Plus	Apple System Peripheral-8 Cable
Apple IIe, Apple II and, Apple II Plus	Apple IIe Modem-8 Cable and Apple Super Serial Card
Apple IIc	Apple IIc Peripheral Cable

Apple Data Modem 2400

This is a 2400-bps high performance modem that enables users to exchange information with other standard data modems. This modem uses the same cables as the Apple Personal Modem.

Apple SCSI Cable System

This cable connects any SCSI peripheral device to the SCSI card of an Apple IIe or Apple IIgs.

Apple SCSI Peripheral Cable

This cable connects one SCSI peripheral device to another.

Apple SCSI Cable Extension.

This cable is an extension for the SCSI peripheral cable.

Apple SCSI Cable Terminator

This is an impedance adaptor for SCSI peripheral devices such as Apple hard disks and the AppleCD SC.

Apple System Peripheral – 8 Cable

This cable connects an Apple IIgs or Apple IIc Plus to serial port peripheral devices such as modems and printers.

Apple II Modem – 8 Cable

This cable connects an Apple IIgs, Apple II Plus, or Apple IIe to a modem via a connection to the Apple Super Serial Card.

Apple IIc Peripheral Cable

This cable connects an Apple IIc to serial port peripheral devices such as modems and printers.

Apple MIDI Interface

With this interface device, you can connect instruments that use the MIDI standard to an Apple IIGS and then use MIDI software to manage these instruments. The MIDI IN and MIDI OUT connectors are standard 5-pin DIN connectors. The connection is made via an 8-pin DIN miniconnector. The MIDI interface comes with two MIDI connecting cables, one serial connecting cable, and the user's manual.

LocalTalk Locking Connector Kit – DB9

This kit provides a connector box that connects to an AppleTalk network, a LaserWriter, LaserWriter Plus, LaserWriter IINT, LaserWriter IINTX, or an ImageWriter equipped with the LocalTalk Option. It includes the connection box and a 2-meter cable with a connector.

LocalTalk Locking Connector Kit – din8

With this cable you can connect any of the following to an AppleTalk network:

- Apple IIGS CPU
- ImageWriter II printer
- LaserWriter IINT printer
- LaserWriter IINTX printer

It includes a 2-meter (6½ foot) cable with connector and a connection box.

LocalTalk Locking Cable Kit – 10-Meter

This cable connects to LocalTalk connector boxes up to 10 meters (about 33 feet) apart. The cable comes with a connector.

LocalTalk Locking Cable Kit – 25-Meter

This cable connects two LocalTalk connector boxes up to 25 meters (about 83 feet) apart. The cable comes with a connector.

LocalTalk Locking Cable Kit – 100-Meter

With this kit, you can make up to 10 LocalTalk cables of custom lengths. The kit includes:

- 100-meter roll of LocalTalk cable
- Four connector boxes
- 20 LocalTalk sockets, each with a few centimeters of cable
- 20 assembly boxes

In addition to the contents of this kit, you need a LocalTalk DB9 Kit or a LocalTalk DIN 8 Kit for each device you want to connect.

User Group Referral

Apple II opportunities are waiting for you at a local user group

There are more than 1,000 user groups that have formed within communities, schools, corporations, government agencies, and universities throughout the country.

The Apple User Group Connection supports user groups in many ways, from regular communications to special purchase programs and forums — including helping you locate a user group that is in your local area or a user group that specializes in subjects of interest to you. Apple also provides information to help you start your own user group!

For more information about user groups — what they are, and what they can do for you — please see the “User Groups” article in the Apple Sales, Service, and Support section.

For more information, please call the Apple User Group Connection toll-free number, (800) 538-9696, extension 500. Or write to:

The Apple User Group Connection
Apple Computer, Inc.
20525 Mariani Avenue, M/S 36AA
Cupertino, CA 95014

Dealer Listings

Where to buy Apple II products and where to get them serviced

The following authorized Apple dealers specifically requested to be included in The Apple II Guide. We feel these dealers will be your most knowledgeable resource for answering questions of any kind about your Apple II.

In order to locate the dealer nearest you, please check the dealer listings that follow. This list is alphabetical by state, alphabetical by city within each state, and alphabetical by dealer name within each city.

Please note that the end of each dealer listing details additional support services if available, including repair/service (R), software (S), training (T), and third-party products (3). Please refer to the key at the bottom of every other page.

If you don't find a dealer in your area listed here, please call (800) 538-9696 for the name and phone number of the nearest authorized Apple dealer who carries the Apple II.

Authorized dealers assure that you get the best possible help when you buy an Apple II product or when you need service. Authorized dealers get special training and up-to-date product information from Apple — and that knowledge gets passed on to you in the form of better answers to your questions, better service for your Apple II.

Alabama

Kemp's Office Center/Connecting
Point
1201 Noble St.
Anniston, AL 36201
(205) 236-6396
Fred Kemp
R S T 3

AC3
105 Vulcan Rd.
Birmingham, AL 35902
(205) 879-7015
R S T 3

- R** Repair/Service
- S** Software
- T** Training
- 3** Third-Party Hardware

Alaska

ComputerLand
4240 Old Seward Hwy.
Anchorage, AK 99503
(907) 561-5191 or (800) 478-5191

R S 3

The Computer Store-Anchorage
811 W. 8th
Anchorage, AK 99501
(907) 279-1515

R S T 3

ComputerLand
3403 Airport Way
Fairbanks, AK 99709
(907) 479-6502 or (800) 478-6580

R S 3

Juneau Electronics
8111 Glacier Hwy.
Juneau, AK 99801
(907) 789-1400

Dave Belzak

R S T 3

Arizona

Mesa Computer Mart, Inc./
Connecting Point
1153 E. Main St.
Mesa, AZ 85203
(602) 833-1155
James L. Tanner

R S T 3

ComputerLand of Arizona (Phoenix)
15002 N. 25th Dr.
Phoenix, AZ 85023
(602) 351-2700
Stacy Kolczak/Roxanne Tohr

R S T 3

ComputerCraft - Tempe
1734 E. Southern Dr., #1
Tempe, AZ 85282
(602) 820-5590
David Lowe/Lee Balderex

ComputerLand of Arizona (Tucson)
6153 E. Broadway
Tucson, AZ 85711
(602) 790-8505
Kevin Treanor

R S T 3

MicroAge Computer Center
362 W. 32nd St.
Yuma, AZ 85364
(602) 344-4440
Bob Cassidy

R S T 3

Arkansas

MegaByte/Connecting Point
1061 Joyce St.
Fayetteville, AR 72703
(501) 443-0007
John Burtness

R S T 3

Micro Computer Center
3712 S. University
Little Rock, AR 72204
(501) 565-3481
Mary Carle

R S T 3

Micro Computer Center
3712 S. University
Little Rock, AR 72204
(501) 565-3481
Mike Pridmore

R S T 3

Connecting Point
2301 W. Walnut
Rogers, AR 72756
(501) 631-8422
Bob Taylor

R S T 3

California

Sun Computers
 2400 S. Wible Rd., #14
 Bakersfield, CA 93304
 (805) 837-2400
 Mike Passaglia
R S T 3

Sun Computers
 20925 S. Bonita St.
 Carson, CA 90746
 (213) 329-8373
 Paul Paz
R S T 3

MicroAge Computermart
 315 S. Diamond Bar Blvd., Stes. C&D
 Diamond Bar, CA 91765
 (714) 861-7505
 Robert Mondier
R S T 3

Sun Computers
 23701 El Toro Rd.
 El Toro, CA 92630
 (714) 859-1818
 Mike Hamilton
R S T 3

Online Connecting Point - Fresno
 6789 N. Blackstone
 Fresno, CA 93701
 (209) 432-4324
 Gary Murphy/Doug Gaither
R S T 3

Computer Center of Hayward, Inc.
 23951 Mission Blvd.
 Hayward, CA 94554
 (415) 538-7368
 any salesperson
R S 3

Sun Computers
 16775 Beach Blvd.
 Huntington Beach, CA 92647
 (714) 848-5574
 Craig Deutsch
R S T 3

Sun Computers
 5200 Jackson Dr.
 La Mesa, CA 92041
 (619) 462-8882
 Norm Wain
R S T 3

Software Service and Computers
 23062 Lake Forest Dr., Ste. D-1
 Laguna Hills, CA 92653
 (714) 583-1000
R S T 3

A. V. Computer Center
 44519 N. 10th St. W.
 Lancaster, CA 93534
 (805) 945-0747 FAX (805) 949-7670
 Grant Michael
R S T 3

Computer Plus
 4500 El Camino Real
 Los Altos, CA 94022
 (415) 948-4500
 Cherie Hackworth
R S T 3

Wolf Computer
 105 N. Santa Cruz Ave.
 Los Gatos, CA 95030
 (408) 354-1210
 Jeff Cable
R S T 3

ComputerCraft - California/Monterey
 411 Pacific St., #100
 Monterey, CA 93940
 (408) 373-2772
 John Jones/Key Reger

Sun Computers
 428 South Atlantic Blvd., #102
 Monterey Park, CA 91754
 (818) 570-0901
 John Liu
R S T 3

- R** Repair/Service
- S** Software
- T** Training
- 3** Third-Party Hardware

Napa Computer Center
 721 Lincoln Ave.
 Napa, CA 94558
 (707) 257-7790
 Aaron Smith

R S T 3

ComputerCraft - California/Palo Alto
 2675 El Camino Real
 Palo Alto, CA 94306
 (415) 326-9999
 Bob Selin/Margaret Waddle

A.V.C. Computers, A MicroAge
 Affiliate
 2821 Zinfandel Dr.
 Rancho Cordova, CA 95670
 (916) 638-2242
 Mike Ostrow

R S T 3

Software Service and Computers
 6667 Indiana Ave.
 Riverside, CA 2506
 (714) 787-4833

R S T 3

Peninsula Office Equipment
 231 Main St.
 Salinas, CA 93901
 (408) 424-2525
 Greg Mainis/Jan Nator/Carolyn
 Keeler/Randy Scherer

R S T 3

ComputerLand of San Diego
 4237 Convoy St.
 San Diego, CA 92111
 (619) 560-9912

R S 3

ComputerLand of San Diego
 5710 Ruffin Rd.
 San Diego, CA 92123
 (619) 560-9910

R S T 3

Inacomp Computer Centers, Inc.
 6256 Greenwich Dr., Ste. 100
 San Diego, CA 92122
 (619) 452-0600
 FAX: (619) 452-3674

R S T 3

Sun Computers
 9005 Complex Dr.
 San Diego, CA 92123
 (619) 565-1881
 Dan Devries

R S T 3

Sun Computers
 5810 Miramar Rd.
 San Diego, CA, 92123
 (619) 535-9888
 Moses Rangel

R S T 3

Computer Plus
 25 First St.
 San Francisco, CA 94105
 (415) 546-5646
 William Taylor

R S T 3

ComputerCraft - San Francisco
 465 California St., Ste. 100
 San Francisco, CA 94104
 (415) 989-3741
 Comer Marshall/Valerie Edson

ComputerCraft - California/San Jose
 3610 Stevens Creek Blvd.
 San Jose, CA 95117
 (408) 244-8100
 Kathie McLaughlin/Jennifer DeToy

ComputerLand of San Luis Obispo
 1422 Monterey St.
 San Luis Obispo, CA..93401
 (805) 541-4884
 Scott Baty

R S T 3

ComputerCraft - California/San Rafael
 1300 4th St.
 San Rafael, CA 94901
 (415) 454-3600
 Tim Meadows/Dave Voorhees

ComputerLand of Santa Barbara
 3931 State St.
 Santa Barbara, CA 93105
 (805) 967-0413
 Harry Houppis
R S T 3

ComputerLand
 1775 S. Broadway
 Santa Maria, CA 93454
 (805) 928-2239
 Kevin DeKorte
R S T 3

ComputerLand of Santa Maria
 1775 S. Broadway
 Santa Maria, CA 93454
 (805) 928-1919
 Debra Ervin
R S T 3

MicroAge Santa Monica
 2020 Santa Monica Blvd., Ste. 100
 Santa Monica, CA 90404
 (213) 828-4911
R S T 3

ExecUtron Computers
 2735 Santa Rosa Ave.
 Santa Rosa, CA 95407
 (707) 528-8881
R S T

Santa Rosa Computer Center, Inc.
 353 College Ave.
 Santa Rosa, CA 95401
 (707) 528-6480
 Bill Parkhurst/Steve Wilder
R S T 3

Candid Computers
 4390 Cochran St.
 Simi Valley, CA 93065
 (805) 522-3823
 FAX: (805) 522-4678
 Jeff Billau/Greg Sadowski
R S 3

Computer Base
 1950 Lake Tahoe Blvd.
 South Lake Tahoe, CA 95731
 (916) 544-6502
R S T 3

ComputerLand
 4343 Pacific Ave., Ste. A1
 Stockton, CA 95207
 (209) 473-1241
 Matthew Piatt
R S T 3

Computer Plus
 1328 S. Mary Ave.
 Sunnyvale, CA 94087
 (408) 735-1199
 Cathy Barradas
R S T 3

Sun Computers
 18607 Ventura Blvd.
 Tarzana, CA 91356
 (818) 708-9988
 Nick Deascantis
R S T 3

Sun Computers
 3511 Pacific Coast Hwy.
 Torrance, CA 90717
 (213) 325-6200
 Kari Johnson
R S T 3

Software Service and Computers
 13828 Redhill Ave.
 Tustin, CA 92680
 (714) 544-0299
R S T 3

- R** Repair/Service
- S** Software
- T** Training
- 3** Third-Party Hardware

Ukiah Computer Center
 295 N. State St.
 Ukiah, CA 95482
 (707) 463-2556
 Ranky Hust

R S T 3

Computer Village, Inc.
 1413-D S. Victoria Ave.
 Ventura, CA 93003
 (805) 644-5220

R S 3

ComputerLand of San Buenaventura
 1839 Knoll Dr.
 Ventura, CA 93003
 (805) 650-8808
 Aaron Baker

R S T 3

Computer Connexion
 12370 Hesperia Rd., Stes. 2 & 3
 Victorville, CA 92345
 (619) 241-7108

R S T 3

ComputerCraft - California/
 Walnut Creek
 1655 N. Main St.
 Walnut Creek, CA 94596
 (415) 934-9181
 Randy Aikawa/Alvin Burns

Computer Connexion
 2731 E. Valley Blvd.
 West Covina, CA 91792
 (818) 965-6543
 any salesperson

R S T 3

Sun Computers
 11901 Santa Monica Blvd.
 West Los Angeles, CA 90025
 (213) 477-6538
 John Tronowsky

R S T 3

Bowden Computer
 57490-B 29 Palms Hwy.
 Yucca Valley, CA 92284
 (619) 365-0643
 Gloria Stricklin

R S T 3

Colorado

Ebert Personal Computers/
 Connecting Point
 4122 S. Parkers Rd.
 Aurora, CO 80014
 (303) 693-8400

R S 3

DMA Connecting Point
 515 S. Tejon
 Colorado Springs, CO 80903
 (719) 475-2488

R S 3

DMA Connecting Point
 1806 Dominion Way
 Colorado Springs, CO 80918
 (719) 548-8656

R S T 3

Adam's Computers,
 Denver's Apple Center
 747 S. Colorado Blvd.
 Denver, CO 80220
 (303) 744-3533
 Glenn Owens

R S T 3

Connecting Point of Fort Collins
 2401 Research Blvd.
 Fort Collins, CO 80526
 (303) 493-5000
 Herb Murphy

R S T 3

ComputerLand Western Colorado
644 Main St.
Grand Junction, CO 81501
(303) 245-2373
Stephen Hillman/Diana Beltz

R S T

Connecting Point of Greeley
2401 17th St.
Greeley, CO 80631
(303) 356-7224
Rick Berry

R S T 3

The Neighborhood Computer Store
13045 W. Alameda Pkwy.
Lakewood, CO 80228
(303) 988-9140
Andy Gold

R S T 3

Adam's Computers,
Denver's Apple Centers
8500 W. Crestline Ave., #G5
Littleton, CO 80123
(303) 979-6554
Murry Huizingh

R S T 3

Connecticut

ComputerLand
132 Federal Rd.
Danbury, CT 06811
(203) 748-2300
Jon Orkin

R S T 3

ComputerLand
207 Pitkin St.
East Hartford, CT 06108
(203) 528-2114

R S T 3

Shoreline Computers
545 Main St.
East Haven, CT 06512
(203) 467-0191
Donna Vaccaro

R S T 3

Connecting Point of Pueblo
809 Desert Flower Blvd.
Pueblo, CO 81001
(719) 545-7781

R S T 3

MicroAge
1835 W. Fortino Blvd.
Pueblo, CO 81008
(719) 545-2277
Chuck Sekera

R S T 3

Connecting Point
427 W. Main
Sterling, CO 80751
(303) 522-7677
Mark Pelton

R S T 3

Colorado Computer
Systems/Connecting Point
3039 W. 74th Ave.
Westminster, CO 80030
(303) 426-5880
Jed W. King

R S T 3

OMNI Computer
145 Cherry St.
New Canaan, CT 06401
(203) 966-7200
Brian Shahan/Erik Apotheker/
Joseph Klanko

R S T

UNICOM/ MicroAge
50 Washington St.
Norwalk, CT 06854
(203) 838-3617 or
(800) 999-8978

Jean Muccini

R S T 3

Shoreline Computers
590 Boston Post Rd.
Old Saybrook, CT 06475
(203) 388-9999 or
(800) 648-3282 (in Connecticut)
Lisa Odell

R S T 3

- R** Repair/Service
- S** Software
- T** Training
- 3** Third-Party Hardware

A M Computer Products, Inc.
941 Queen St.
Southington, CT 06489
(203) 621-8945
Faye Gooding/Barbara Kane

R S T 3

Computer Resources Inc., A MicroAge
Affiliate
683 Silas Deane Hwy.
Wethersfield, CT 06109
(203) 563-9000

R S T 3

Delaware

ComputerLand of Dover
2145 S. DuPont Hwy.
Dover, DE 19901
(302) 697-0333
Jim Payne

R S 3

Computerware Inc./CPA
4723B Kirkwood Hwy.
Wilmington, DE 19808
(302) 999-1830
FAX: (302) 999-7386

R S 3

ComputerLand of Delaware
208 Astro S/C
Newark, DE 19711
(302) 738-9656

R S T 3

Florida

ComputerLand of Brandon
210 S. Kings Ave.
Brandon, FL 33511
(813) 689-0840

R S 3

ComputerLand of South Florida
9709 W. Sample Rd.
Coral Springs, FL 33065
(305) 755-5500
FAX: (305) 755-5778

R S T 3

ComputerLand of Clearwater
30331 U.S. Hwy. 19 N.
Clearwater, FL 34621
(813) 785-5579

R S 3

Computer Systems
7120 N. University Dr.
Ft. Lauderdale, FL 33321
(305) 722-2220 or (305) 432-2189

R S T 3

Ray's Computer Center
18350 U.S. 19 N.
Clearwater, FL 34624
(813) 535-1414 FAX: (813) 535-7500

R S 3

ComputerLand of South Florida
5703 N. Andrews Way
Ft. Lauderdale, FL 33309
(305) 928-0444 FAX: (305) 928-0452

R S T 3

Connecting Point
3815 N. U.S. 1, Ste. 102
Cocoa, FL 32802
(407) 633-6018

R S T 3

Inacomp Computer Centers
4460 Cleveland Ave.
Ft. Meyers, FL 33901
(803) 939-2050 or
(813) 566-1778 (Naples)

R S T 3

MicroAge Computer Centers
2111 Ponce De Leon Blvd.
Coral Gables, FL 33134
(305) 448-5960
FAX: (305) 446-1545
Victor L. Bigio

R S T 3

Williams Computers, Inc.
9866-1 Baymeadows Rd.
Jacksonville, FL 32256
(904) 642-4406 or (904) 642-4407

R S T 3

Connecting Point
262 N. Wickham Rd.
Melbourne, FL 32935
(407) 254-9399

R S T 3

Inacomp Computer Centers
1727 N.E. 163rd St.
North Miami Beach, FL 33162
(305) 947-9929
Roby Sherman

R S T 3

Inacomp Computer Centers
6979 S. Tamiami Trail
Sarasota, FL 34231
(803) 922-1897

R S T 3

ComputerLand of Seminole
9430 Seminole Blvd.
Seminole, FL 34642
(813) 397-0411

R S 3

MicroAge Computer Centers
2571 Exec. Cnt. Cir.,
E. Howard Bldg., #101
Tallahassee, FL 32301
(904) 877-1430

R S T 3

Georgia

Connecting Point
3220 Cobb Pkwy., Ste. 200
Atlanta, GA 30339
(404) 952-0337
Roger Larson

R S T 3

AIS Computer Store
570 W. Lanier Ave.
Fayetteville, GA 32014
(404) 461-2147
FAX: (404) 461-8628

R S T 3

ComputerLand of Tampa
1520 E. Fowler Ave.
Tampa, FL 33612
(813) 971-1680

R S 3

MicroComputer Systems, Inc.
3616 W. Cypress
Tampa, FL 33607
(800) MAC-INFO or (813) 875-0406
Bob Rivera

R S T 3

Southern Photo & News
1515 Marion St.
Tampa, FL 33602
(813) 228-8594 or
(800) 282-2701

R S T

Megaport Computer Center
1209 Rt. 41 By Pass S.
Venice, FL 34292
(813) 484-4787

R S T 3

Computertown
543 Roberts Court
Kennesaw, GA 30144
Richard Ricks
(404) 421-1006

R S 3

Connecting Point
Northlake Sq. Shpg. Ctr.,
4135 LaVista Rd., M/S 510
Tucker, GA 30084
(404) 496-0067
FAX: (404) 938-6803
Paul Olson/Sue Thompson/
Barbara Blair

R S T 3

- R** Repair/Service
- S** Software
- T** Training
- 3** Third-Party Hardware

Hawaii

MicroAge Computer Centers
680 Ala Moana Blvd.
Honolulu, HI 96813
(808) 524-6652

R S 3

Computerworks - Hawaii
74-5565 Luhia St.
Kailua-Kona, HI 96704
(808) 329-7922

Michael Miereanu

R S T 3

Idaho

Alpine Computing
2179 E. 17th St.
Idaho Falls, ID 83404
(208) 523-9904

Kathleen Jose

R S T 3

Illinois

Nabih's, Inc.
133 E. Palatine Rd.
Arlington Heights, IL 60004
(708) 253-1972

R S T 3

Kappel's Computer Store, Inc.
125 E. Main
Belleville, IL 62220
(618) 277-2354

Mike Kappel

R S T 3

Connecting Point Computer Center
1226 Towanda Plaza
Bloomington, IL 61701
(309) 829-6806

R S T 3

MicroAge Computer Centers
44 E. Main St.
Champaign, IL 61820
(217) 351-1171

Gary Warren

R S T 3

Chicago Computer
Company/Connecting Point
150 S. Wacker Dr. - Lower Arcade
Chicago, IL 60606
(312) 372-7360

Bob Greene

R S T 3

Computer Bay
22 Crystal Lake Plaza
Crystal Lake, IL 60014
(815) 455-2223

Barb Giese

R S T 3

MicroAge Computer Centers
1101 N. Water
Decatur, IL 61820
(217) 429-4429

Randy Fenrick

R S T 3

Education Alliance
816 W. Lincoln Hwy.
DeKalb, IL 60115
(815) 756-4433

Education Consultant

R S T 3

Nabih's Inc.
515 Davis St.
Evanston, IL 60201
(708) 869-6140

R S T 3

MicroAge Computer Centers
755 N. Henderson St.
Galesburg, IL 61401
(309) 342-7177 or
(800) 369-7177

Floyd Ragsdale/Jan Perlstein

R S T 3

Education Alliance
 123 Skokie Valley Rd.
 Highland Park, IL 60035
 (708) 831-0424
 Terry Shevelenko

R S T 3

Inacomp Computer Center of Joliet
 3105 W. Jefferson St.
 Joliet, IL 60435
 (815) 744-1414

R S T 3

Ideal Connecting Point
 101 S. Schuyler Ave.
 Kankakee, IL 60901
 (815) 935-8505
 Cheri Hoff

R S T 3

Pace System, Inc./ Micro City
 Computers
 630 E. Ogden Ave.
 Naperville, IL 60563
 (708) 420-8813

R S T 3

MicroAge Computer Centers
 1540 E. College Ave.
 Normal, IL 61761
 (217) 452-8665

R S T 3

Oak Brook Computer Centre/
 Connecting Point
 17W512 22nd St.
 Oakbrook Terrace, IL 60181
 (708) 941-9005
 John Gibson/Gary Davis

R S T 3

MicroAge Computer Centers
 8752 W. 159th St.
 Orland Park, IL 60462
 (708) 349-8080

R S T 3

Connecting Point Computer Center
 4722 Sheridan Rd.
 Peoria, IL 61614
 (309) 685-9100

R S T 3

MicroAge Computer Centers
 3000 N. Sterling Ave.
 Peoria, IL 61604
 (309) 685-7876
 Ross Johnston, Loyd Wenger/
 Sandy Hubbard

R S T 3

MicroAge Computer Centers
 3000 N. Sterling Ave.
 Peoria, IL 61604
 (217) 685-7876
 Randy Fenrick/Lloyd Wenger

R S T 3

Rock Valley Computer,
 Inc./Connecting Point
 2583 N. Mulford
 Rockford, IL 61111
 (815) 877-7600
 Bob Ruud

R S T 3

Computers And Software
 Company/Connecting Point
 353 W. Golf Rd.
 Schaumburg, IL 60195
 (708) 310-0440
 Kermit Lattimore

R S T 3

microPOWER Connecting Point
 923 S. Fifth
 Springfield, IL 62703
 (217) 544-4108
 Tammy Pritchett

R S T 3

- R** Repair/Service
- S** Software
- T** Training
- 3** Third-Party Hardware

Indiana Micro Computer Systems, Inc./
Connecting Point
2644 E. Tenth St.
Bloomington, IN 47408
(812) 333-9797

R S T 3

Micro Computer Systems, Inc./
Connecting Point
2626 Eastbrook Plaza
Columbus, IN 47201
(812) 372-2600

R S T 3

Micro Computer Systems, Inc./
Connecting Point
4606 Vogel Rd.
Evansville, IN 47715
(812) 473-4004

R S T 3

ComputerLand
5450 N. Coldwater Rd.
Ft. Wayne, IN 46825
(219) 483-8107
Marme Peet

R S 3

Education Alliance
2945 Jewett St.
Highland, IN 46322
(219) 972-1393
Vincent Vrotney

R S T 3

Iowa Beacon MicroCenter/
Connecting Point
213 Lincoln Way
Ames, IA 50010
(515) 233-4807
Mike Morford

R S T 3

The Computer Tree
219 W. Montgomery
Creston, IA 50801
(800) 622-6619

R S T 3

The Computer Center
417 Main St.
Jasper, IN 47546
(812) 634-1550
Todd Bessenger

R S T 3

ComputerLand of Northern Indiana
719 W. McKinley
Mishawaka, IN 46545
(219) 256-5688
Patricia Bell

R S T 3

Forsythe Computers
6331 S.R. 23
South Bend, IN 46635
(219) 277-4972
Megan McGinnis

R S T 3

ComputerLand of West Lafayette
1020 Sagamore Pkwy.
West Lafayette, IN 47906
(317) 463-3546

R S T 3

Rick's Computers
Hwy. 175
Danbury, IA 51019
(712) 883-2248

R S T 3

MicroAge Computer Center/
Cinarco-Elliott
234 W. Third St.
Davenport, IA 52801
(319) 324-0639

R S T 3

Iowa Computers Solutions, Inc.
 155 Marion Blvd.
 Marion, IA 52302
 (319) 377-8688
 Herb Staub/Gary Braksiek

R S T 3

ECI Connecting Point
 24 W. Main
 Marshalltown, IA 50158
 (515) 753-6676 or (800) 733-6675

R S T 3

Beacon MicroCenter
 124 W. State St.
 Mason City, IA 50401
 (515) 424-8205

R S T 3

Beacon MicroCenter/
 Connecting Point
 124 W. State St.
 Mason City, IA 50401
 (515) 424-8205

Mary Beth Johnson

R S T 3

Meyer's Connecting Point
 Computer Center
 322 E. Main
 Ottumwa, IA 52501
 (515) 683-1636

R S T 3

Kansas

ComputerLand of Hays
 1506 Vine St.
 Hays, KS 67601
 (913) 625-4123

R S T 3

Iowa Computers Solutions, Inc.
 15 S. Marion Ave.
 Washington, IA 52353
 (319) 653-5046 or
 (800) 373-5046

George Coles/Mike Roth

R S T 3

TEAM Connecting Point
 602 Ansborough Ave.
 Waterloo, IA 50701
 (319) 235-6507

Dave Kubalsky

R S 3

Beacon MicroCenter/
 Connecting Point
 Governor Sq., 2700 University Ave.
 West Des Moines, IA 50265
 (515) 223-5010

Bob DeYoung

R S T 3

Computer Emporium/
 Connecting Point
 Governor Sq., Ste. 200,
 2700 University Ave.
 West Des Moines, IA 50265
 (515) 224-1992

Dennis Dawson

R S T 3

Connecting Point
 419 Delaware
 Leavenworth, KS 66048
 (913) 651-2052

R S 3

- R** Repair/Service
- S** Software
- T** Training
- 3** Third-Party Hardware

The Bottom Line - Computers, Inc.
12136 W. 95th St.
Lenexa, KS 66215
(913) 888-3343

R S T 3

Connecting Point Computer Center
1115 Westloop Shopping Ctr.
Manhattan, KS 66502
(913) 537-0801
Rob Satterlee

R S 3

Haddock Computer Center
2020 N. Wodlawn
Wichita, KS 67208
(316) 683-5211
Norm Sailer/Randy Oakley/Lu Ross

R S T 3

ComputerLand
1535 Carter Ave.
Ashland, KY 41101
(606) 329-8667
Richard Chambers

R S T 3

Kentucky

Lexington Computer Store
2909 Richmond Rd.
Lexington, KY 40509
(606) 268-1431

R S 3

Graham Computer Bay
11350 Bluegrass Pkwy.
Louisville, KY 40299
(502) 267-9813
Lori Sosh

R S T 3

Computer Source, Inc.
211 Broadway
Paducah, KY 42001
(502) 442-9726

R S T 3

Louisiana

Bluechip Computer Center
3728 S. MacArthur Dr.
Alexandria, LA 71301
(318) 442-9866
FAX: (318) 442-6007
Roger Jones

R S T 3

Interstate Companies of Louisiana
1835 Riverside N.
Baton Rouge, LA 70802
(318) 442-9866
Sabrina Hester

R S T 3

Entre Computer Center
613 W. Prien Lake Rd.
Lake Charles, LA 70601
(318) 477-8870

R S T 3

Computer Shoppe, Inc.
2125 Veterans Blvd.
Metairie, LA 70002
(504) 833-5100
Edward Calvin

R S T 3

MicroAge Computer Center/ dba
Business Center Computer
800 Brashear Ave.
Morgan City, LA 70380
(504) 385-6917
Terry Pangle/Henry Landry

R S T 3

Computer Solutions
823 W. California Ave.
Ruston, LA 71270
(318) 255-2555
FAX: (318) 255-2577
Rhonda Reed

R S T 3

Computer Solutions
7853 Youree Dr.
Shreveport, LA 71105
(318) 797-6507

R S T 3

Maine

Capitol Computers
151 Water St.
Augusta, ME 04330
(207) 632-2700
Jim Rastrom

R S T 3

Microage/Costal Computer Center
487 Forest Ave.
Portland, ME 04101
(207) 774-0741

R S T 3

Maryland

Microcomputer Center/
Connecting Point
7668 Belair Rd.
Baltimore, MD 21236
(301) 668-2600
Therron Brown

R S T 3

ComputerLand Mid-Atlantic
9636 Ft. Meade Rd.
Laurel, MD 20707
(301) 953-1110

R

ComputerLand Mid-Atlantic
6443 Old Alex Ferry Rd.
Clinton, MD 20735
(301) 856-2500
Steve Okeefe/Sharon Stead

R S 3

Towson Computer
8131 Ritchie Hwy.
Pasadena, MD 21122
(301) 544-7676

R S T 3

ComputerLand Mid-Atlantic/
School-Educator Sales Branch
7477 Old Alex Ferry Rd.
Clinton, MD 20735
(301) 599-9555

S 3

ComputerLand Mid-Atlantic
12204 Rockville Pk.
Rockville, MD 20852
(301) 881-2810
Tony Enton

R S

Frederick Computers Plus
5726 Industry Ln.
Frederick, MD 21701
(301) 694-8884

R S T 3

The Computershop, Inc./
Valcom Business Center
734 S. Salisbury Blvd.
Salisbury, MD 21801
(301) 543-8200

R S 3

Sunrise Computers/Connecting Point
164 N. Burhans Blvd.
Hagerstown, MD 21740
(301) 790-3060

Bob Socks

R S T 3

Towson Computer
409 Washington Ave.
Towson, MD 21204
(301) 337-2750

R S T 3

- R** Repair/Service
- S** Software
- T** Training
- 3** Third-Party Hardware

Massachusetts

Capitol Computers, Inc. AESC
 151 Water St.
 Augusta, MA 04330
 (207) 623-2700
 Russell H. Jack
R S T 3

University Computers
 660 Beacon St.
 Boston, MA 02215
 (617) 236-7464
 Laura Elliott-Smith
R S 3

J.L. Hammett Co.
 One Hammett Pl.
 Braintree, MA 02184
 (800) 628-2686 or (617) 848-1000
R S T 3

MicroAge Computer Centers
 211 Alewife Brook Pkwy.
 Cambridge, MA 02138
 (617) 354-5030
 Issac Simon
R S T 3

UNICOM/ MicroAge
 890 Providence Hwy.
 Dedham, MA 02026
 (617) 329-7440 or (800) 678-6426
 Grace Campia
R S T 3

The Small Computer Company
 10 Center Sq.
 East Longmeadow, MA 01028
 (413) 525-6663
R S T 3

Connecting Point - Datatronic
 415 Federal St.
 Greenfield, MA 01301
 (413) 772-2183
 Dianne McGilvray
R S T 3

Personal Resources, Inc.
 (PCR Computer)
 2100 Washington St.
 Hanover, MA 02339
 (617) 871-5396
 FAX: (617) 871-3623
R S T 3

Connecting Point of Cape Cod
 106 Bassett Ln.
 Hyannis, MA 02601
 (508) 775-8531
R S T 3

Computer Systems and Software
 111 Sack Blvd.
 Leominster, MA 01453
 (508) 537-1202
 FAX: (508) 534-6806
 Rick Dagenais
R S T 3

Computers Etc.
 216 Newbury St.
 Peabody, MA 01960
 (508) 535-5252
 Joan Gelpy
R S T 3

Orchard Computer, Inc.
 179 Parkingway
 Quincy, MA 02169
 (617) 479-4028
R S T 3

Michigan

AC3 Computer Center
 413 E. Huron
 Ann Arbor, MI 48104
 (313) 994-6344
R S 3

The Learning Center, Ltd.
 381 N. Maple Rd.
 Ann Arbor, MI 48103
 (313) 996-1616
R S T 3

Computers Plus
710 N. Washington Ave.
Bay City, MI 48708
(517) 894-2776
Barb Story

R S T 3

Olson Anderson Co.
106 S. McLellan St.
Bay City, MI 48708
(517) 893-9568
John Jill/John Harris/Jan Knop

R S T 3

Connecting Point Computer Center
29316 Orchard Lake Rd.
Farmington Hills, MI 48018
(313) 626-3240

R S 3

Heath/Zenith Computers
29433 Orchard Lake Rd.
Farmington Hills, MI 48108
(313) 553-4171

R S 3

Connecting Point Computer Center
28251 Ford Rd.
Garden City, MI 48135
(313) 422-2570

R S 3

Alternate Computer Supply
17256 Robbins Rd.
Grand Haven, MI 49417
(616) 842-1891

R S T 3

Advanced Management Systems
3083 28th St.
Grand Rapids, MI 49508
(616) 956-6686

R S T 3

ComputerLand
3109 Broadmoor, S.E.
Grand Rapids, MI 49512
(616) 942-2931

R S 3

Advanced Management Systems
716 Chicago Dr.
Holland, MI 49423
(616) 396-6821

R S T 3

Advanced Business Equipment, Inc.
127 S. Stephenson Ave.
Iron Mountain, MI 49801
(906) 774-6096
Gene Jandrey

R S T 3

Computer City
110 W. 12 Mile Rd.
Madison Heights, MI 48071
(313) 544-1216

Advanced Management Systems
2838 Henry St.
Muskegon, MI 49441
(616) 739-3395

R S T 3

MicroAge Computer Center
39831 Grand River
Novi, MI 48375
(313) 473-0530

R S T 3

Olson Anderson's Computers Plus
42150 Grand River
Novi, MI 48375
(313) 349-7666
Gerald Perrett/Elanna Broder/
Ian Brown

R S T 3

Advanced Management Systems, Inc.
2160 W. Grand River, Ste. 1
Okemos, MI 48864
(517) 349-9540

R S T 3

Connecting Point Computer Center
29934 Southfield Rd.
Southfield, MI 48076
(313) 443-0350

R S 3

- R** Repair/Service
- S** Software
- T** Training
- 3** Third-Party Hardware

The Computer Haus/
Connecting Point
1045 S. Airport Rd. W.
Traverse City, MI 49684
(616) 946-1045
Tim Watson

R S T 3

MicroAge Computers - Troy
797 E. Big Beaver Rd.
Troy, MI 48083
(313) 528-3535

R S 3

Minnesota

Computer 1
307 N.W. 8th St.
Brainerd, MN 56401
(218) 828-4650

R S 3

HCI Connecting Point
14017 Grand Ave. S.
Burnsville, MN 55337
(612) 892-6611

R S T 3

TEAM Connecting Point
Computer Center
Village Mall,
2220 Mountain Shadow Dr.
Duluth, MN 55811
(218) 722-2409

R S T 3

HCI Connecting Point
8017 Glen Ln.
Eden Prairie, MN 55344
(612) 944-1356

R S T 3

Inacomp Computer Centers
10371 W. 70th St.
Eden Prairie, MN 55344
(612) 828-9550

R S T 3

ComputerLand - Edina
7025 France Ave. S.
Edina, MN 55435
(312) 920-6100

R S T 3

Omicron Electronics
11240 E. Nine Mile Rd.
Warren, MI 48089
(313) 757-8192
Mike Tattan

R S T 3

UMI Computers
1200 Lyndale Ave. N.
Faribault, MN 55021
(507) 332-2241
Scott Lang

R S T 3

Rolandson Computer Center
201 W. Lincoln Ave.
Fergus Falls, MN 56537
(218) 736-6548
Dale Wick

R S T

TEAM Connecting Point
Computer Center
Central Square Mall
Grand Rapids, MN 55744
(218) 326-6683

R S T 3

Heath/Zenith Computers
101 Shady Oak Rd.
Hopkins, MN 55343
(312) 938-6371

R S T 3

HCI Connecting Point
555 Third Avenue N.W.
Hutchinson, MN 55350
(612) 587-2940

R S T 3

ComputerLand - Minneapolis
109 S. 7th St., Roanoke Bldg., Ste. 222
Minneapolis, MN 55402
(312) 333-3151

R S T 3

First Tech
2640 Hennepin Ave. S.
Minneapolis, MN 55408
(612) 377-9000

R S T 3

ComputerLand - Minnetonka
11319 Hwy. 7, Country Village Ctr.
Minnetonka, MN 55343
(312) 933-8822

R S T 3

HCI Connecting Point
13540 Wayzata Blvd.
Minnetonka, MN 55343
(612) 591-9115

R S T 3

ComputerLand of Minnesota
14010 23rd Ave. N.
Plymouth, MN 55447
(612) 559-1984
Pat deJager

R S T 3

ComputerLand - Rochester
1201 S. Broadway, Crossroads Ctr.
Rochester, MN 55904
(507) 281-0968

R S T 3

ComputerLand - Roseville
2471 N. Fairview Ave.
Roseville, MN 55113
(312) 636-2366

R S T 3

TEAM Electronics
7166 10th St. N.
St. Paul, MN 55128
(612) 738-1243

Dave Schroeder

R S T 3

ComputerLand - St. Cloud
240 2nd Ave. S.
Waite Park, MN 56387
(612) 259-0590

R S T 3

Mississippi

BESCO
1213 Hwy 45 N.
Columbus, MS 39701
Jaimie Lancaster

R S T 3

Missouri

ComputerLand
2121 William St.
Cape Girardeau, MO 63701
(314) 335-4171

R S T 3

Connecting Point
609 Locust
Chillicothe, MO 64601
(816) 646-0090

R S T 3

Mid-Missouri Computer Services, Inc.
301 Stadium Blvd., Biscayne Mall
Columbia, MO 65203
(314) 445-4496

R S 3

Connecting Point Computers
7115 N.W. Barry Rd.
Kansas City, MO 64152
(816) 741-8013

Bob Wolfe

R S T 3

The Bottom Line - Computers, Inc.
4722 N.E. Vivion Rd.
Kansas City, MO 64119
(816) 452-8588

R S T 3

- R** Repair/Service
- S** Software
- T** Training
- 3** Third-Party Hardware

The Bottom Line - Computers, Inc.
 14260 Manchester Rd.
 Manchester, MO 63011
 (314) 391-0301

R S T 3

DataPro Computer Systems/
 Connecting Point
 1024 Highway 63 S.
 Rolla, MO 65401
 (314) 364-0035

R S T 3

Database Systems of Springfield, Inc.
 1550 E. Battlefield Rd., Ste. C
 Springfield, MO 65804
 (417) 883-5665

R S T 3

Connecting Point
 510 N. Belt
 St. Joseph, MO 64506
 (816) 233-6822

R S T 3

Montana

Computech
 1301 11th Ave. S.
 Great Falls, MT 59405
 (406) 761-8954
 Mary Nicholson

R S T 3

ValCom Computer Center
 1112 Helena Ave.
 Helena, MT 59601
 (406) 449-7816
 Michael M. Marlow

R S T 3

Nebraska

The Computer Works
 1706 Galvin Rd.
 Bellevue, NE 68005
 (402) 291-7809

R S T 3

Fremont Office Equipment
 2313 13th St.
 Columbus, NE 68601
 (800) 223-0393
 Brenda Licari

R S T 3

Advent Computers
 1130 S. Brentwood Blvd.
 St. Louis, MO 63117
 (314) 863-8181

R S T 3

The Bottom Line - Computers, Inc.
 790 N. Hwy. 67
 St. Louis, MO 63031
 (314) 837-1200

R S T 3

Computer Junction/ Connecting Point
 214 Elm St.
 Washington, MO 63090
 (314) 239-7544

R S T 3

Vester, Inc./ComputerLand of Helena
 25 S. Last Chance Gulch
 Helena, MT 59601
 (406) 443-3200
 Tom Bohn

R S T 3

Fremont Office Equipment
 648 N. Broad St.
 Fremont, NE 68025
 (800) 333-6586
 Dick Klebe

R S T 3

Computer Hardware, Inc.
 325 N. St. Joseph
 Hastings, NE 68901
 (402) 463-3456

R S T 3

Computer Hardware, Inc.
2315 2nd Ave.
Kearney, NE 68847
(308) 234-9335

R S T 3

Computer Systems
400 N. 48th St.
Lincoln, NE 68504
(402) 467-5571

R S T 3

OFFICE CONNECTION
1909 Vicki Ln.
Norfolk, NE 68701
(402) 379-2692
Dallas Goeller

R S T 3

Team Electronics
801 S. Dewey
North Platte, NE 69101
(308) 534-4645

R S T 3

Database Systems
2819 S. 125th Ave., Ste. 276
Omaha, NE 68144
(402) 330-3600

R S T 3

Connecting Point
1912 Broadway
Scottsbluff, NE 69361
(308) 632-5514

R S T 3

Nevada

Computer Base
1213 S. Carson St.
Carson City, NV 89701
(702) 885-9000

R S T 3

Computerite
1601 E. Sahara Ave.
Las Vegas, NV 89104
(702) 369-0322
Audrey Jordan

R S T 3

ComputerLand of Las Vegas
1370 Flamingo, Ste. K
Las Vegas, NV 89119
(602) 351-2700
Lisa Lisciarelli

R S T 3

Computer Base
1290 E. Plumb Ln.
Reno, NV 89502
(702) 827-9200

R S T 3

ComputerCraft - Nevada/Reno
4084 S. Kietke Ln.
Reno, NV 89502
(702) 826-8080
Diane Kennedy/John Coddington

New Hampshire

Diversified Computers, Inc.
141 Winchester St.
Keene, NH 03431
(603) 357-4360
Diane/Francie/Floyd/Heather/
Gene/Bonnie

R S T 3

Computer Mart of N.H.
669 E. Industrial Park Dr.
Manchester, NH 03103
(603) 625-1474

R S T 3

- R** Repair/Service
- S** Software
- T** Training
- 3** Third-Party Hardware

Electronic Education Center
669 E. Industrial Dr.
Manchester, NH 03103
(603) 625-1474 or (800) 344-3102
Diane Houle

R S T 3

Computer Mart of N.H.
139 Daniel Webster Hwy.
Nashua, NH 03060
(603) 888-1190

R S T 3

New Jersey

World of Computers, A Connecting
Point Store
520 Main St.
Boonton, NJ 07005
(201) 335-1470
Mike Migliaccio/John Melchior

R S T 3

Computer Workshop
900 Haddonfield Rd.
Cherry Hill, NJ 08002
(609) 665-4404

R S 3

The MDI Computer Store,
A MicroAge Affiliate
Rt. 130 & Princeton Rd.
East Windsor, NJ 08520
(609) 443-0900

R S T 3

Computerware Inc./CPA
1723 Rt. 27-Tops Shopping Plaza
Edison, NJ 08818
(201) 248-9100
FAX: (201) 248-9361

R S 3

American Business Products
155 N. Dean St.
Englewood, NJ 07631
(201) 569-0853

R S T 3

Computer Mart of N.H.
2800 Lafayette Rd.
Portsmouth, NH 03801
(603) 433-8876

R S T 3

Computer Town, Inc.
304 S. Broadway
Salem, NH 03079
(603) 893-8812
Thomas Jacobs

R S T 3

Computer Madness, Inc./
CMI Systems
270 Rt. 9N
Englishtown, NJ 07726
(908) 462-9696
John Nelson/Zvi Biener/Joyce
Nussbaum/Dorothy Jablonka

R S T 3

Computerware Inc./CPA
2940 Brunswick Pk.
Lawrenceville, NJ 08648
(609) 883-6660
FAX: (609) 883-6708

R S 3

Jonathan's Computer Centers
444 W. Rt. 70
Marlton, NJ 08053
(609) 983-0668

R S 3

Essex Computers/ Connecting Point
One Gateway Ctr.
Newark, NJ 07102
(201) 622-3020
Oscar West-Crews

R S T 3

Boise Office Equipment
136 Somerset St.
North Plainfield, NJ 07060
(201) 755-5544

R S T 3

Jonathan's Computer Centers
254 Tilton Rd.
Northfield, NJ 08225
(609) 383-1200

R S 3

The Computer Ark
1921 New Rd.
Northfield, NJ 08225
(609) 641-4300 FAX: (609) 641-2356
Tommi Dilliplane/Larry Dilliplane

R S T 3

Computer Corner of New Jersey
439 Rt. 23 S.
Pompton Plains, NJ 07444
(201) 835-7080

R S 3

The MDI Computer Store, A
MicroAge Affiliate
432 Broad St.
Shrewsbury, NJ 07701
(201) 747-6745

R S T 3

Stonehenge Systems
89 Summit Ave.
Summit, NJ 07901
(201) 277-1020

R S T 3

Computer Campus
537 Greentree Rd.
Turnersville, NJ 08012
(609) 232-0166
Joe Valentino

R S T 3

TransNet Corporation
1945 Rt. 22 W.
Union, NJ 07083
(201) 688-7800

Steve Morse

R S T 3

New Mexico

Computerworks
823 New York
Alamogordo, NM 88310
(505) 437-2911

R S T 3

Connecting Point
5901 Pan American Fwy. N.E.,
Ste. D-7
Albuquerque, NM 87109
(505) 345-7888
Veronica Steimle

R S T 3

Rocky Mountain Computers
2109 Wyoming N.E.
Albuquerque, NM 87112
(505) 292-2775
Roxann Morris

R S T 3

Computerworks
512 N. Main
Clovis, NM 88101
(505) 762-3064

R S T 3

The Micro Connection
Connecting Point - Farmington
3501 E. Main St.
Farmington, NM 87401
(505) 326-9148

Franklin Woodis

R S T 3

Computerworks
1616 Mesilla Valley Mall
Las Cruces, NM 88001
(505) 522-0024

R S T 3

Southeastern Business Systems, Inc.
117 W. Third
Roswell, NM 88201
(505) 624-0732

R S T 3

- R** Repair/Service
- S** Software
- T** Training
- 3** Third-Party Hardware

New York

BusinessLand
Stuyvesant Plaza
Albany, NY 12203
(518) 438-0010
Kathryn Kuhrt

R S T 3

NYNEX Business Centers
59 Wolf Rd.
Albany, NY 12205
(518) 458-2222
David Polley

R 3

The Computer Factory
1492 Central Ave.
Albany, NY 12205
(518) 869-3818
Ron Ben-Yishay

R S T 3

Computer Systems
4891 Transit Rd.
Depew, NY 14043
(716) 668-6756

R S T 3

Custom Computer Specialists
1775 Express Dr. N.
Hauppauge, NY 11788
(516) 582-6699

R S T 3

Adwell Communications
158 Main St.
Hempstead, NY 11550
(516) 485-7100
Alison Wells

R S T 3

Data Place, Inc.
943 Sunrise Hwy.
Lynbrook, NY 11563
(516) 593-8300
Leslie Kirkgasser

R S T 3

Byte Shop
1732 Sunrise Hwy.
Merrick, NY 11566
(516) 379-2983

R S T 3

The Computer Edge, Inc./
Connecting Point
41 S. Moger Ave.
Mt. Kisco, NY 10549
(914) 666-6337
Tony Garone/Carole Epstein

R S T 3

The Computer Outlet Business
Center/MicroAge
63 S. Main St.
New City, NY 10956
(914) 638-2158

R S T 3

Microcomputer Publishing Center, Inc.
4 W. 20th St.
New York, NY 10011
(212) 463-8585
Kyra Freeburg

R

P.C.S.I.
26 W. 23rd St.
New York, NY 10010
(212) 475-8977
Frank Costa/Frank Conti

R S 3

Sonocraft Corp.
360 W. 31st St.
New York, NY 10001
(212) 760-9300
FAX: (212) 564-9488
Damian A. Costanzo

R S T

Blumenthal's Connecting Point
234 N. Union St.
Olean, NY 14760
(716) 375-4600

R S T 3

Computer Emporium
356 Windsor Hwy.
Vails Gate, NY 12584
(914) 562-3131

R S T 3

Micro World Computer Store Inc.
1905 Vestal Pkwy. E.
Vestal, NY 13850
(607) 757-0500

R S T 3

The Computer Factory
2361 Central Park Ave.
Yonkers, NY 10710
(914) 793-1300
Patrick W. Cercone

Carolina Biological Supply Company
2700 York Rd.
Burlington, NC 27215
(919) 548-0067

R S T 3

North Carolina

Carolina Computer Stores
Cary Village Sq.,
700 Western Blvd. Ext.
Cary, NC 27511
(919) 469-5555

R S 3

Carolina Computer Stores
5236 E. Independence Blvd.
Charlotte, NC 28212
(704) 467-1555

R S 3

The Computeroom, Inc.
3601 E. Independence Blvd.
Charlotte, NC 28205
(704) 532-1600

R S T 3

Carolina Computer Stores
4125 Chapel Hill Blvd.
Durham, NC 27707
(919) 493-5466

R S 3

Byte Shop
2604 Battleground Ave.
Greensboro, NC 27408
(919) 288-0018
David Skeels

R S T 3

Computer Shoppe
615 Guilford-Jamestown Rd.
Greensboro, NC 27409
(919) 299-4843

R S T 3

Carolina Computer Stores
North Hills Shopping Plaza,
4421 Six Forks Rd.
Raleigh, NC 27609
(919) 782-5555

R S 3

North Dakota

Rolandson Computer Center
3301 13th Ave. S.
Fargo, ND 58103
(701) 234-0772
Kevin Kruger

R S T

- R** Repair/Service
- S** Software
- T** Training
- 3** Third-Party Hardware

Ohio

Wyse Book & Office Supplies, Inc.
P.O. Box 157, 1409 S. Defiance St.
Archbold, OH 43502
(419) 446-2757

R S T 3

Vere Smith/ Connecting Point
16 W. Union St.
Athens, OH 45701
(614) 593-7708

R S T 3

Personal Computer/ Connecting Point
7178 West Blvd.
Boardman, OH 44512
(216) 758-6607

Alex R. Sabo

R S T 3

Cincinnati Computer Store
11711 Princeton Pk.
Cincinnati, OH 45246
(513) 671-6440

R S 3

Cincinnati Computer Store
7338 Kenwood Rd.
Cincinnati, OH 45236
(513) 793-8220

R S T 3

ComputerLand
333 E. Kemper Rd.
Cincinnati, OH 45246
(513) 671-7211

Judy Moore

R S T 3

Heath/ Zenith Computers
28100 Chagrin Blvd.
Cleveland, OH 44122
(216) 292-7553

R S 3

J.R. Holcomb & Company
3205 Harvard Ave.
Cleveland, OH 44105
(216) 341-3000

R S T 3

Microcenter - Perscom Dept.
1555 W. Lane Ave.
Columbus, OH 43221
(614) 481-4409 or (614) 481-4411

R S 3

Micro Computer Center
1520 State Rt. 725
Dayton, OH 45459
(513) 435-9355

Leo Chico

R S

Abacus II/ Connecting Point
332 S. Main St.
Findlay, OH 45840
(419) 424-0222

R S 3

The Computer Connection
1206 W. Robb Ave.
Lima, OH 45801
(419) 222-6464

Bill Christiansen/David Miller

R S T 3

ComputerLand of Mansfield
695 N. Lexington-Springmill Rd.
Mansfield, OH 44906
(419) 529-8009

Cay Bientz

R S 3

Computers 'n Such
1118 Lincoln Way E.
Massillon, OH 44646
(216) 832-7467

John Keener

R S T 3

CBM Computer Center
7673 Mentor Ave.
Mentor, OH 44060
(216) 946-1722

R S T 3

Heath/Zenith Computers
 131 W. Kemper Rd.
 Springdale, OH 45246
 (513) 671-3932
 Richard Mills
R S 3

Abacus II/ Connecting Point
 4751 Monroe St.
 Toledo, OH 43623
 (419) 471-0082
R S 3

Oklahoma

Enid Data Systems, Inc.
 201 N. Grand
 Enid, OK 73701
 (405) 233-1125
 Mike O'Brien
R S T 3

Connecting Point
 10944 N. May
 Oklahoma City, OK 73120
 (405) 751-2781
R S T 3

Dowling's Computer Center, Inc.
 304 S. Air Depot Blvd.
 Midwest City, OK 73110
 (405) 737-8844
 Tony Lowe
R S T 3

Connecting Point of Stillwater
 121 S. Main St.
 Stillwater, OK 74074
 (405) 743-3790 or (800) 284-5828
 National
 Sam Hamilton
R S T 3

Computers/Associates
 2301 W. Main
 Norman, OK 73069
 (405) 360-6818 or
 (800) 522-0760 in Oklahoma
 Annette Schwiebert/Connie Rowe
R S T 3

ComputerOne
 7114 S. Mingo
 Tulsa, OK 74133
 (918) 250-1140
 Larry Payne/Willie Rauchwerger
R S T 3

Oregon

The Computer Store - Corvallis
 2305 N.W. Kings Blvd.
 Corvallis, OR 97330
 (503) 754-0811
R S T 3

Microworks/Connecting Point
 259 Barnett Rd., Ste. 3
 Medford, OR 97501
 (503) 7739861
R S T 3

ComputerLand of Eugene
 844 Olive St.
 Eugene, OR 97401
 (503) 485-5591
R S 3

ComputerLand of Portland
 206 S.W. Morrison
 Portland, OR 97204
 (503) 295-1298
R S 3

The Computer Store of Eugene
 61 W. 8th Ave.
 Eugene, OR 97401
 (503) 343-1434
R S 3

The Computer Store - Portland
 700 N.E. Multnomah St., Ste. 190
 Portland, OR 97232
 (503) 238-1200
R S T 3

ComputerLand of Hood River
 1936 12th St.
 Hood River, OR 97031
 (503) 386-9311
 Colleen Wells
R S T 3

- R** Repair/Service
- S** Software
- T** Training
- 3** Third-Party Hardware

Pennsylvania

McCartney's Connecting Point
819 Howard Ave.
Altoona, PA 16601
(814) 949-6111

R S 3

The Computer Store
832 W. Lancaster Ave.
Bryn Mawr, PA 19010
(215) 527-5041

R 3

General Computer Centers, Inc.
3552 Old Gettysburg Rd.
Camp Hill, PA 17011
(717) 763-4191

R S T 3

Sunrise Computers/Connecting Point
1048 Lincoln Way E.
Chambersburg, PA 17201
(717) 267-1341

Todd Orner

R S T 3

Solutions Computer Center
33 N. Main St.
Doylestown, PA 18901
(215) 345-4411

R S

Bundy Typewriter & Computer
Pilgrim Gardens Ctr.
Drexel Hill, PA 19026

R S T 3

T.J. Business Systems
Rt. 40E. of Brownsville, Box 699
Grindstone, PA 15442
(412) 785-5311

R S T 3

Computerware Inc./CPA
Old York & Wyncote Rds.
Jenkintown, PA 19046
(215) 886-6000
FAX: (215) 572-7789

R S 3

Computer Campus
400 Goddard Blvd.,
King of Prussia Mall
King of Prussia, PA 19406
(215) 265-6311

Nancy Reither

R S T 3

Computerware Inc./ CPA
125 North Gulph Rd.
King of Prussia, PA 19406
(215) 962-5500
FAX: (215) 962-5508

R S 3

General Computer Centers, Inc.
Foxshire Plaza, Fruitville Pk.
Lancaster, PA 17601
(717) 569-1895

R S T 3

Computerware Inc./CPA
512 N. Oxford Valley Rd.
Langhorne, PA 19047
(215) 741-4900
FAX: (215) 741-6190

R S 3

T.J. Business Systems
Waterdam Plaza/
Donaldson Crossroads
McMurray, PA 15317
(412) 942-3380

R S T 3

MicroMax Business Systems
518 Fifth Ave.
New Brighton, PA 15066
(412) 846-3000
Scott Zell

R S 3

Bundy Typewriter & Computer
10th & Chestnut Sts.
Philadelphia, PA 19107
(215) 922-0500

R S T 3

Bundy Typewriter & Computer
Roosevelt Mall
Philadelphia, PA 19149
(215) 332-5600

R S T 3

ComputerLand Northeast
9475-V Roosevelt Blvd.
Philadelphia, PA 19114
(215) 698-5808
Charles Dipatrae/Sharon Sibley

R S 3

Morgan's Computer &
Education Center
Clairton Blvd.
Pittsburgh, PA 15236
(412) 653-4115

Rod Darby

R S T 3

Pittsburgh Computer Store
612 Smithfield St.
Pittsburgh, PA 15222
(412) 391-8050

R S T 3

Pittsburgh Computer Store -
Pleasant Hills
47 Clairton Blvd.
Pittsburgh, PA 15236
(412) 655-8220
Chet Backowski

R S T 3

General Computer Centers, Inc.
3607 Pottsville Pk.
Reading, PA 19605
(215) 921-9800

R S T 3

General Computer Centers, Inc.
535 Wyoming Ave.
Scranton, PA 18509
(717) 969-1177

R S T 3

General Computer Centers, Inc.
R.R. #4, Box 127F, Rts. 11 & 15
Selinsgrove, PA 17870
(717) 374-5080

R S T 3

General Computer Centers, Inc.
Dale Summitt Sq.,
2603 E. College Ave.
State College, PA 16801
(814) 237-3444

R S T 3

General Computer Centers, Inc.
R.R. #7, Box 7495B, Rt. 611
Stroudsburg, PA 18360
(717) 424-8587

R S T 3

General Computer Centers, Inc.
R.R. #3, Box 7, Valley Square Mall
Tamaqua, PA 18252
(717) 668-6080

R S T 3

General Computer Centers, Inc.
R.R. #3, Box 7, Rt. 309
Tamaqua, PA 18252
(717) 386-3900
(800) 332-4222 in Pennsylvania

R S T 3

University Business Machines
45 Long Ln.
Upper Darby, PA 19082
(215) 352-1444

R S 3

Computer Bay
546 Penn Ave.
West Reading, PA 19611
(215) 375-4231

R S T 3

General Computer Centers, Inc.
2420 MacArthur Rd.
Whitehall, PA 18052
(215) 821-5977

R S T 3

General Computer Centers, Inc.
325 Market St.
Williamsport, PA 17701
(717) 323-5095

R S T 3

- R** Repair/Service
- S** Software
- T** Training
- 3** Third-Party Hardware

General Computer Centers, Inc.
342 Wilkes Barre Twp. Blvd.,
Rt. 309 & Coal St.
Wilkes Barre, PA 18702
(717) 825-9548

R S T 3

General Computer Center, Inc.
West Gate Plaza, 1550A Kenneth Rd.
York, PA 17404
(717) 764-4069

R S T 3

Rhode Island

UNICOM/ MicroAge
297 Elmwood Ave.
Providence, RI 02907
(401) 467-5600 or (800) 566-2828
Raymond Gamache

R S T 3

South Carolina

Computer Source/Connecting Point
Village Sq. Shopping Ctr.-W. Ashley,
1660 Sam Rittenberg Blvd.
Charleston, SC 29407
(803) 571-1452
FAX: (803) 571-1459
Wendy Sosebee/Evans Jenkins

R S T 3

Byte Shop
7372A Two Notch Rd.
Columbia, SC 29223
(803) 788-2524
Jerry Gossett/Reynolds Tokunaga

R S T 3

Computer Source/Connecting Point
Arcadia Lakes Shopping Ctr., 6432A
Two Notch Rd.
Columbia, SC 29223
(803) 786-6100
FAX: (803) 754-5792
Beverly Coffey

R S T 3

The Computer Store, Inc.
810 Dutch Square Blvd.
Columbia, SC 29210
(803) 798-3300

R S T 3

Creative Computer Systems, Inc.
2151-G W. Evans St.
Florence, SC 29501
(803) 665-8655 or
(800) 922-9573 in South Carolina
Archie Buchan

R S T 3

Computer Source/Connecting Point
North Hills Shopping Ctr.,
2485 E. North St.
Greenville, SC 29615
(803) 268-0461
FAX: (803) 268-0170
Cheryl White

R S T 3

MicroAge Computer Stores
526 E. Durst Ave.
Greenwood, SC 29649
(803) 229-7575
Sue Smith/Perry Smith

R S 3

Inacomp Computer Centers
945 3rd Ave. S.E.
Hickory, SC 28602
(704) 327-2330

R S T 3

Automated Business Systems, Inc.
115 Amelia N.E.
Orangeburg, SC 29115
(803) 531-4666

R S T 3

Valcom/ ADS Computer Center
 946 Oakland Ave.
 Rock Hill, SC 29730
 (803) 329-3240
 Leigh Baker/Stephanie Blackman
R S 3

Computer Source/ Connecting Point
 North Town Mall Shpg. Ctr., 100 N.
 TownDr., #3
 Spartanburg, SC 29303
 (803) 583-7766
 FAX: (803) 591-0072
 Lawrence Cook/Deanna Phillips,
 AESC
R S T 3

Byte Shop
 102 Mulberry Hill
 Summerville, SC 29485
 (803) 821-3435
 Jim Moore
R S T 3

South Dakota

Computer Solutions, A MicroAge
 Affiliate
 1500 W. 41st St.
 Sioux Falls, SD 57105
 (605) 334-3000
 Paul Werner
R S T 3

Ultra, Inc.
 3300 W. 49th
 Sioux Falls, SD 57106
 (605) 361-8881
R S T 3

Ultra, Inc.
 1018 14th S.E.
 Watertown, SD 57201
 (605) 882-1555
R S T 3

Inacomp Computer Centers
 330 Franklin Rd.
 Brentwood, TN 37027
 (615) 373-5667
 Ginny Smith/Mark Gregory
R S T 3

Tennessee

Connecting Point,
 MicroComputer Center
 408 S. James Campbell
 Columbia, TN 38401
 (615) 381-7695 or (615) 381-7523
 Scott Kozicki
R S T 3

Computerlab/ Connecting Point
 133 Old Hickory
 Jackson, TN 38305
 (901) 668-9282
R S T 3

Eastern Computer, Inc.
 5100 Kingston Pk.
 Knoxville, TN 37919
 (615) 588-6491
 John Tuggle
R S 3

Computerlab/ Connecting Point
 4760 Poplar Ave.
 Memphis, TN 38117
 (901) 761-4743
R S T 3

Opus 2
 747 E. Brookhaven Cir.
 Memphis, TN 38117
 (901) 683-0117
R S T 3

- R** Repair/Service
- S** Software
- T** Training
- 3** Third-Party Hardware

Texas

Amarillo Computers/
Connecting Point
201-J Westgate Pkwy.
Amarillo, TX 79121
(806) 358-0404

Doyle Hoover, Shawn Walsh/Sarah
Dworzack

R S T 3

ComputerCraft - Ft. Worth/Lincoln
252 Lincoln Square
Arlington, TX 76011
(817) 274-6001
Bob Brown

ComputerCraft - Austin/Research Str.
2438 W. Anderson Ln.
Austin, TX 78757
(512) 458-4236
Barbara Kluge

ComputerCraft - Austin/South Lamar
4211 S. Lamar
Austin, TX 78704
(512) 443-4183
Fred Bond/Susan Beasley

U.S. Tech
1236 San Jacinto Mall
Baytown, TX 77521
(713) 421-2723
Wen-Lee Huang

R S T 3

Computer Dimensions, Inc.
6465 Calder Ave.
Beaumont, TX 77707
(409) 866-8378

R S T 3

ComputerLand
Brazos Valley/Huntsville
1140 E. Harvey Rd.
College Station, TX 77840
(409) 693-2020
Judy Wright

R S T 3

ComputerCraft - Dallas
12330 Inwood Rd.
Dallas, TX 75244
(214) 960-0800
Al Bessin/Leslie Gayden

ComputerCraft - Dallas/Garland
5111 Geenville Ave., #145
Dallas, TX 75206
(214) 369-6464
Polly Durham/Brent Whitsell

ComputerCraft - Quorum
4900 Beldine Rd., Ste. 150
Dallas, TX 75240
(214) 991-2971
Audley Logan

Mr. Micro
17174 Preston Rd.
Dallas, TX 75248
(214) 733-4274

R S T 3

Mr. Micro
6067 Forest Ln.
Dallas, TX 75230
(214) 386-9712

R S 3

Mr. Micro
Plaza Level, One Main Pl.
Dallas, TX 75201
(214) 747-8899

R S 3

ComputerCraft - Ft. Worth/Ridgmar
6020 Camp Bowie
Ft. Worth, TX 76116
(817) 732-1771
Jay Merreu/John Mitchell

Southwest Computer Centre, Inc.
605 N. 77 Sunshine
Harlingen, TX 78550
(512) 421-2414

R S 3

ComputerCraft -
Houston Town and Country
10516 Old Katy Rd.
Houston, TX 77043
(713) 827-1744
Mark Killingsworth/Kathy Parker/
Al Bessin

ComputerCraft -
Houston/Chimney Rock
2709 Chimney Rd.
Houston, TX 77056
(713) 840-9762
Mark Crain/Janice Maixner

ComputerCraft - Houston/Downtown
916 Travis
Houston, TX 77002
(713) 650-3841
Les Polvado/John Lucas

ComputerCraft - Houston/Greenbriar
2621 S. Shepard
Houston, TX 77098
(713) 527-8088
Dorene Herzog/Pete Mikiten

ComputerCraft - Houston/Huntwick
4608 FM 1960 W. Northwood Ctr.
Houston, TX 77069
(713) 583-2032
Carl Nyberg/James Johnson

ComputerCraft - Southport
12885 Gulf Freeway Shopping Ctr.
Houston, TX 77034
(713) 481-5600
Rich Garcia/Lori Bonin

Supertec - IMS
218 Higgins
Humble, TX 77338
(713) 446-9770
R S T 3

Southwest Computer Centre, Inc.
5603 IH 35, Ste. #4
Laredo, TX 78041
(512) 724-1133
R S 3

C.A.S.A. Computer
7412 S. University, #1
Lubbock, TX 79423
(806) 745-6991
Stacey Burrell/Elias Bengoa
R S T 3

ComputerLand of Lubbock
6223 Slide Rd.
Lubbock, TX 79414
(806) 792-3835
R S 3

Connecting Point's Education Center
2103 34th St.
Lubbock, TX 79411
(806) 741-0475
Stephen Thrash
R S T 3

Southwest Computer Centre, Inc.
1800 S. Main, #210
McAllen, TX 78504
(512) 687-9468
R S 3

ComputerCraft - San Antonio/
Broadway/CCraft Corp. Sales
8503 Broadway, #100
San Antonio, TX 78217
(512) 826-6046
Reesa Bowen/Helen Knox

ComputerCraft - San Antonio/Ingram
5819 N.W. Loop 410
San Antonio, TX 78238
(512) 680-1980
Joe Pack/John Meyer

Williams Computer Center, Inc.
25770 I-45 N.
Spring, TX 77386
(713) 367-1600
Mike Mitchell
R S T 3

- R** Repair/Service
- S** Software
- T** Training
- 3** Third-Party Hardware

ComputerLand of Texarkana
 2700 Richmond Rd.
 Texarkana, TX 75503
 (214) 832-7577
 Janet C. Sisson
R S T 3

ComputerLand of Tyler
 225 E. Amherst
 Tyler, TX 75701
 (214) 581-7000
 Randy McDonald
R S 3

CCST - Computers
 1930 E.S.E. Loop 323
 Tyler, TX 75701
 (214) 592-8800
 Jackie Gregory
R S T

Utah

Southeast Utah Computers, Inc.
 1 E. Main St.
 Price, UT 84501
 (801) 637-9292
 Lance Greenwood
R S T 3

Alpine Computing
 291 N. Bluff
 St. George, UT 84770
 (801) 628-4423
R S T 3

Alpine Computing
 25 S. Main
 Richfield, UT 84701
 (801) 896-9292 or (800) 824-1373
R S T 3

Vermont

Ormsby's Connecting Point
 Computer Center
 12 Keith Ave.
 Barre, VT 05641
 (802) 476-1414 or (800) 649-8977
R S T 3

Applied Graphics Co., Inc.
 1960 Shelburne Rd.
 Shelburne, VT 05482
 (802) 985-3341 or (800) 639-3154
 (in Vermont and New Hampshire)
 Steffen Parker
R S T 3

Connecting Point - Datatronic, Inc.
 Putney Rd.
 Brattleboro, VT 05301
 (802) 257-0555
 Bill Vermouth
R S T 3

Virginia

OmniComp/ Connecting Point
 2125 Ivy Rd.
 Charlottesville, VA 22903
 (804) 971-6771
R S T 3

ComputerLand Mid-Atlantic
 4040 E. Cox Rd.
 Glen Allen, VA 23060
 (804) 346-8827
R

Computer Works, Inc.,
 Connecting Point Computer Ctrs.
 P. O. Box 1111, 785 E. Market St.
 Harrisonburg, VA 22801
 (703) 434-1111 or (800) 729-5368

R S T 3

Computer Workshop
 10 E. Church St.
 Martinsville, VA 24112
 (703) 632-3050
 FAX: (703) 666-8978
 Margaret Fey/Claude Young

R S T 3

ComputerLand
 3521 Franklin Rd.
 Roanoke, VA 24014
 (703) 342-1333

R S T 3

Jack Hartman/ MicroAge
 2840 Peters Creek Rd.
 Roanoke, VA 24019
 (703) 992-1057
 Wayne Slusher

R S T 3

ComputerLand Mid-Atlantic
 8032 Leesburgh Pk.
 Vienna, VA 22182
 (703) 442-3800

R S

Memory Bank Computer Center
 4772 Euclid Rd.
 Virginia Beach, VA 23462
 (804) 473-2265

Scott Willett

R S T 3

Washington

Sun Computers
 881 Bellevue Way N.E.
 Bellevue, WA 98004
 (206) 451-2828
 Beverly Wardlow

R S T 3

Alpha Tech Computers
 2300 James St.
 Bellingham, WA 98225
 (206) 671-2332
 Scott Ocheltree

R S T 3

MICRO Computer Systems
 2615 184th St., #105
 Lynnwood, WA 98037
 (206) 778-7337

R S 3

Empire Computer Center
 616 S.W. 152nd
 Seattle, WA 98166
 (206) 244-5200

Jeff Hardwick

R S 3

Sun Computers
 2521 Third Ave.
 Seattle, WA 98121
 (206) 728-2828
 Beverly Wardlow

R S T 3

The Computer Store-Seattle
 6406 Roosevelt Way N.E.
 Seattle, WA 98115
 (206) 522-0220

R S T 3

Connecting Point Computer Center
 E. 200 Second Ave.
 Spokane, WA 99202
 (509) 455-5255

R S T 3

Quantum Computers, Inc.
 5003 Tacoma Mall Blvd.
 Tacoma, WA 98409
 (206) 475-7000

R S T 3

Cliff Miller's Computers
 22 N. 2nd St.
 Yakima, WA 98901
 (509) 248-1585

R S 3

- R** Repair/Service
- S** Software
- T** Training
- 3** Third-Party Hardware

West Virginia

The Computer Store, Inc.
of West Virginia
Ste. 5 - Municipal Parking Bldg.
Charleston, WV 25301
(304) 345-1360
Samuel L. Miles

R S T 3

The Computer Store, Inc.
of West Virginia
833 Sixth Ave.
Huntington, WV 25701
(304) 529-6426
Dwight Dille

R S T 3

T.J. Business Systems
1756D Mileground Plaza
Morgantown, WV 26505
(304) 291-5044

R S T 3

Wisconsin

Connecting Point/Amery
216 N. Keller Ave.
Amery, WI 54001
(715) 268-8159
FAX: (715) 268-2064
Linette Brown

R S T 3

Computer World
3015 W. Wisconsin Ave.
Appleton, WI 54914
(414) 733-9547
Dave Hietpas

R S T 3

Compco Computers, Inc.
13660 W. Capitol Dr.
Brookfield, WI 53005
(414) 781-6700

R S T 3

ComputerLand of Eau Claire
3408 Oakwood Mall Dr.
Eau Claire, WI 54701
(715) 835-8082
Michele Overgard

R S T

Connecting Point - Green Bay
529 N. Monroe
Green Bay, WI 54301
(414) 435-2335

R S T 3

Byte Shop of Milwaukee, Inc./
Connecting Point
4840 S. 76th St.
Greenfield, WI 53220
(414) 281-7004

R S T 3

Team Electronics/
Connecting Point of Janesville
2619 Milton Ave.
Janesville, WI 53545
(608) 756-3159
Don Woody

R S T 3

ThreeRivers Computer Center
1627 Losey Blvd.
La Crosse, WI 54601
(608) 788-1234
Kevin Capwell

R S T 3

Connecting Point/Community Camera
506 Main St.
LaCrosse, WI 54601
(608) 782-1565
Eric Anderson/John Pongratz

R S T 3

ComputerLand of Madison
6688 Odana Rd.
Madison, WI 53719
(608) 833-0777

R S T 3

North Shore Computers
5237 N. Ironwood Ln.
Milwaukee, WI 53217
(414) 963-9700

R S 3

Office Technology, Inc.
1315 Gillingham Rd.
Neenah, WI 54957
(414) 725-5551
Sandra Weiss

R S T 3

CBM Computer Center
124 Dellwood Ln.
Nekoosa, WI 54494
(715) 424-2131

R S T 3

Midwest Visual Equipment Co.
16908 W. Victor Rd.
New Berlin, WI 53151
(414) 784-5880

R S T 3

Colortron Computers
2101 West Blvd.
Racine, WI 53405
(414) 637-2003

Sue Londre

R S T 3

Ross, Inc.
1406 N. 25th St.
Sheboygan, WI 53082
(414) 452-2771

R S T 3

Information Age Computer Center
2600 Stewart Ctr.
Wausau, WI 54401
(715) 845-3311

David Barwick

R S T 3

Wyoming

Team Electronics a MicroAge Affiliate
207 S. Montana Ave.
Casper, WY 82609
(307) 235-6691

R S T 3

ComputerLand/Gillette
801 E. 4th, Ste. #16
Gillette, WY 82716
(307) 682-6609

Bill Nelson/Jeno Rohde/Jim Butler

R S T 3

U.S. TECH/ Connecting Point
1885 Dewar Dr.
Rock Springs, WY 82901
(307) 382-8225

Harlan Schreiner

R S T 3

- R** Repair/Service
- S** Software
- T** Training
- 3** Third-Party Hardware

Resources for People With Disabilities

Empowering people with disabilities through a network of resource and support centers

There are a variety of ways that Apple II computers can help people with disabilities realize their goals. Because of its open architecture, the Apple IIe computer is one of the most accessible personal computers. The newest Apple IIGS computer has built-in easy access features for people with disabilities and more access features are coming soon.

There are many organizations that can help people with disabilities find just the right technology tools to make their Apple II read for them, help them communicate with a friend, turn on the lights or TV and even say good night. Some of these organizations are listed below.

Office of Special Education and Rehabilitation

At Apple, our energies are directed toward ensuring that the power and the promise of microcomputers are as available to individual with disabilities as to everyone else. Toward that end, the Office of Special Education and Rehabilitation focuses on several broad goals: increasing awareness of the array of computer solutions available to children and adults with disabilities; providing access to information on how to implement computer solutions at home, at school and in the workplace; creating a national network of partnerships with agencies and organizations to assist individuals with disabilities in the use of personal computers; and developing accessible personal computers for people with disabilities. Please contact the Office Special Education and Rehabilitation for more information about our activities.

Office of Special Education and Rehabilitation

Apple Computer, Inc.
20525 Mariani Ave., MS 36-SE
Cupertino, CA 95014
(408) 974-7910
AppleLink: Special.Ed

Trace Research and Development Center

The Trace Center is widely recognized as the force behind ensuring that computer technology is designed to be accessible to all individuals with disabilities. The Trace Center has many areas of specialization, but it is particularly responsive to individuals seeking ways to tailor computers to meet the needs of children and adults with disabilities.

Trace Research and Development Center
S-151 Waisman Center, 1500 Highland Ave.
Madison, WI 53705
(608) 262-6966

Closing The Gap

This well-known organization publishes a comprehensive newsletter in the field of disability and technology — a must read for individuals concerned with new developments. Closing The Gap also conducts an annual conference and many workshops around the country to help people with disabilities and their friends find and use the technology that makes a difference.

Closing The Gap
P.O. Box 68
Henderson, MN 56044
(612) 248-3294

Alliance for Technology Access Resource Centers

The Alliance for Technology Access is a growing movement of people across the country who are redefining human potential through the powerful and imaginative application of computer technology.

The Alliance for Technology Access (ATA), formerly the National Special Education Alliance, was founded in 1987 with 11 resource centers in 10 states. The ATA now boasts 43 resource centers in 32 states. All ATA centers seek to provide people of every age with any disability easy access to important technological tools.

Apple Computer's Office of Special Education and Rehabilitation supports the ATA by providing computer equipment, technical expertise, and organizational resources to help the ATA grow. The ATA's ultimate goal is to empower individuals with disabilities with the means to control and direct their lives through technology.

National Headquarters Alliance for Technology Access National Headquarters
1307 Solano Avenue
Albany, CA 94706-1888
(415) 528-0747

Alabama Independent Living Center
3421 5th Ave. South
Birmingham, AL 35222
(205) 251-2223
Judy Roy
AppleLink: BILC

Technology Assistance for Special Consumers
2939 Johnson Rd., S.W.
Huntsville, AL 35805
(205) 880-0671
Pamela Harnden
AppleLink: TASC

Alaska Alaska Center for Adaptive Technology
Sheffield Hotel
104 Katlian
P.O. Box 6069
Sitka, AK 99835
(907) 747-6960
Bruce Anderson
AppleLink: ACAT

Arkansas Technology Resource Center
c/o Arkansas Easter Seal Society
2801 Lee Ave.
Little Rock, AR 72205
(501) 663-8331
Ginny Heiple
AppleLink: TRC

California Team of Advocates for Special Kids
100 W. Cerritos
Anaheim, CA 92805
(714) 533-TASK
Lane Cole
AppleLink: TASK

Disabled Children's Computer Group
2095 Rose Street, 1st Fl.
Berkeley, CA 94709
(415) 841-3224
Lisa Wahl
AppleLink: DCCG

Special Technology Center
590 Castro St.
Mountain View, CA 94041
(415) 961-6789
Lisa Cohn
AppleLink: STC

Computer Access Center
2425 16th St., Rm. 23
Santa Monica, CA 90405
(213) 450-8827
Donna Dutton
AppleLink: CAC.SM

Special Awareness Computer Center
Rehabilitation Center
2975 N. Sycamore Dr.
Simi Valley, CA 93065
(805) 582-1881
Suzanne Feit
AppleLink: SACC

Colorado AssessAbility Resource Center
1056 E. 19th Ave., B-410
Denver, CO 80218-1088
(303) 861-6250
Ann Grady
AppleLink: AARC

Florida Computer CITE
215 E. New Hampshire St.
Orlando, FL 32804
(407) 299-5000 x3291 or (407) 896-3177
Carol Adams
AppleLink: CITE

Georgia TechAble
1040 Irwin Bridge Rd.
Conyers, GA 30207
(404) 922-6768
Lynn S. Chiu
AppleLink: TechAble

Hawaii Aloha Special Technology Access Center
1750 Kalakaua Ave., #1008
P.O. Box 27605
Honolulu, HI 96827
(808) 955-4464
Ruth Akiona
AppleLink: ALOHASTAC

Illinois Technical Aids & Assistance for the Disabled Center
1950 W. Roosevelt
Chicago, IL 60608
(312) 421-3373
Margaret Pfrommer
AppleLink: TAAD

Northern Illinois Center for Adaptive Technology
3615 Louisiana Rd.
Rockford, IL 61108
(815) 229-2163
David Grass
AppleLink: ILCAT

Iowa READI
1655 17th Ave.
P.O. Box 523
Marion, IA 52302
(319) 377-1771
Doug Patterson
AppleLink: READI

Kansas Technology Resources for Special People
3023 Canterbury
Salina, KS 67401
(913) 827-0301
Marjorie Hargis-Delker
AppleLink: TRSP

Kentucky Specialink
36 W. 5th St.
Covington, KY 41011
(606) 491-2464
Walter and Elaine Hackett
AppleLink: SPECIALINK

Blue Grass Technology Center for People with Disabilities
894 Georgetown St.
Lexington, KY 40511
(606) 255-9951
Jean Isaacs
AppleLink: BLUEGRASS

Disabled Citizens Computer Center
Louisville Free Public Library
4th and York St.
Louisville, KY 40203
(502) 561-8637
Mary Ellen Harned
AppleLink: DCCC

Louisiana CATER-Center for Adaptive Technology and Educational Resources
1636 Toledano St., Ste. 311
New Orleans, LA 70115-4598
(504) 899-8375
Kay Hickey
AppleLink: CATER

Massachusetts Massachusetts Special Technology Access Center
1/6 Mudge Way
Town Center
Bedford, MA 01730
(617) 275-2446
Paul Giguere
AppleLink: MASTAC

Michigan Living & Learning Resource Centre
Physically Impaired Association of Michigan
601 W. Maple St.
Lansing, MI 48906
(517) 487-0883
In Michigan(800) 833-1996
AppleLink: LLRCPIAM

Minnesota PACER Center, Inc.
4826 Chicago Ave. S.
Minneapolis, MN 55417-1055
(612) 827-2966 (voice or TDD)
Judy Simon
AppleLink: PACER.CTR

Missouri Computer Resource Center
St. Louis Easter Seal Society
5025 Northrup
St. Louis, MO 63110
(314) 776-1996
Nancy Lacey
AppleLink: UKNES

Montana Parents, Let's Unite for Kids
1500 N. 30th St.
Billings, MT 59101-0298
(406) 657-2055
Katharin Kelker
AppleLink: PLUK

Nevada Nevada Technology Center
2880 E. Flamingo Rd., Ste. A
Las Vegas, NV 89121
(702) 735-2922
Bruce McAnnany
AppleLink: NTC

New Jersey Computer Center for People With disAbilities
c/o Family Resource Associates, Inc.
35 Haddon Avenue
Shrewsbury, NJ 07702
(201) 747-5310
Joanne Castellano
AppleLink: CCDA

New York Techspress
Resource Center for Independent Living
401 Columbia St.
Utica, NY 13502
(315) 797-4642 (voice or TDD)
Russ Holland
AppleLink: TECHSPRESS

North Carolina Carolina Computer Access Center
Metro School
700 E. Second St.
Charlotte, NC 28202
(704) 342-3004
Judy Timms
AppleLink: CCAC

North Dakota Pathfinder Parent Training and Information Center
ATA Computer Resource Center
1600 2nd Ave. S.W.
Minot, ND 58701
(701) 852-9426; (701) 852-9436
Kathryn Erickson
AppleLink: Pathfinder

Ohio Communication Assistance Resource Service
2140 Arbor Blvd.
Dayton, OH 45439
(513) 294-8086
Pat Cashdollar/Terry Trzaska
AppleLink: CARS

Oklahoma Developmental Disabilities Resources, Inc.
4641 S. Braden, Ste. 113
Tulsa, OK 74135
(918) 664-5257
Dennis Ilarms
AppleLink: DDR

Oregon Oregon Outback Technology Access Center
P.O. Box 2916
La Grande, OR 97850
(503) 963-2129
Julie Farnam
AppleLink: OUTBACK

Computer and Technology Services
3241 N.E. 21st Ave.
Portland, OR 97212
(503) 281-6121
Dave Soyster
AppleLink: CATS.OR

Pennsylvania Technology Resources for People with Disabilities
One Plymouth Meeting Mall, Rm. 600
Plymouth Meeting, PA 19462
(215) 825-9298
David Landsman
AppleLink: TRPD

Tennessee West Tenn. Special Tech. Resource Center
Lambuth College, Carney Johnson Hall
401 Maple St., P.O. Box 3683
Jackson, TN 38303
(901) 424-9089 or (901) 424-9090
Margaret Doumitt
AppleLink: WESTTN

East Tennessee Special Technology Access Center, Inc.
UT, Rm. 106-A, CA
Knoxville, TN 37996-3400
(615) 584-4465
Lois Symmington
AppleLink: EASTTN

Technology Access Center
Fountain Square, Ste. 110
2222 Metro Center Blvd.
UCP of Middle Tennessee
Nashville, TN 37228
(615) 248-6733
Bob Kibler
AppleLink: TAC

Texas SHIP
University United Methodist Church
5084 DeZavala Rd.
San Antonio, TX 78249
(512) 696-1033
Dee Dee Sedgewick
AppleLink: SHIP

Utah Computer Center for Citizens with Disabilities
410 Twelfth Ave., Ste. 114
Salt Lake City, UT 84103
(801) 521-1624
Craig Boogaard
AppleLink: CCCD

Washington Seattle Technology Alliance for Resources and Training
257 100th Ave. N.E.
Bellevue, WA 98004
(206) 637-9848
Grant Lord
AppleLink: START

West Virginia Project G.L.U.E.
c/o Children's Therapy Clinic
2345 Chesterfield Ave.
Charleston, WV 25304
(304) 340-3546
Margaret McGarrity

Third-Party Products

A sampling of Apple II third-party products that offer solutions to users

Third-party products include all software applications, hardware devices, and peripherals — such as accelerator cards and joysticks— designed, produced, and marketed by U.S. and international manufacturers dedicated to producing products that are compatible with and support the Apple II family of computers.

Software categories range from animators to word processors, from education to music and include many other productivity applications. Hardware includes memory expansion boards, disk drives, modems, speech synthesizers, and much more.

While it is not possible to list all of the third-party products available for the Apple II, *inCider/A+* magazine and Redgate Communications Corp., Vero Beach, Fla., have compiled a sampling of the many fine software applications and hardware products available for the Apple II from third-party vendors. This list also includes third-party products that are listed in the “AppleWorks” article and the Apple II Success Stories. Mention of products in this listing is for information purposes only and constitutes neither an endorsement nor recommendation. Apple assumes no responsibility with regard to the selection, performance or use of the products listed.

Software is organized alphabetically by application type: AppleWorks, Business Productivity, Creative, Desk Accessories, Desktop Communications, Education, Music, Personal Productivity, Programming and Utilities, Word Processing. Hardware and Peripherals are listed after software products. Products are listed alphabetically within each application type.

Software **AppleWorks and Related Software**

AppleWorks GS is an integrated software package that provides word processing, database, spreadsheet, page layout, graphics, and communications applications. This software requires an Apple IIGS with 1.125 MB or more; not copy protected. For AppleWorks GS upgrade information, call (800) 544-8554.

Claris Corp., 5201 Patrick Henry Dr., P.O. Box 58168, Santa Clara, CA 95052, (408) 987-7000.

AppleWorks; AppleWorks/Network provides word processing, database management, mail merge, and spreadsheet analysis. This software requires an Apple II with 128K or more, ProDOS 8; not copy protected. For AppleWorks 3.0 upgrade information, call (800) 544-8554.

Claris Corp., 5201 Patrick Henry Dr., P.O. Box 58168, Santa Clara, CA 95052, (408) 987-7000.

The TimeOut Series includes the following separately available AppleWorks enhancements: GS Font Editor, Program Writer, TimeOut DeskTools, TimeOut DeskTools II, TimeOut FileMaster, TimeOut Graph, TimeOut MacroTools, TimeOut MacroTools II, TimeOut PowerPack, TimeOut QuickSpell, TimeOut SideSpread, TimeOut SpreadTools, TimeOut SuperFonts, TimeOut Thesaurus, TimeOut UltraMacros, TimeOut ReportWriter, TimeOut TeleComm. This software requires an Apple II with 128K or more, ProDOS 8; not copy protected.

Beagle Bros, Inc., 6215 Ferris Sq., Ste. 100, San Diego, CA 92121, (619) 452-5500, (800) 345-1750, or (800) 992-4022 (in California).

Business Productivity

DB Master Version 5; DB Master Professional are versatile database management systems. DB Master Professional brings multifile, relational capability to the Apple II user. This software requires an Apple II with 128K or more, ProDOS 8; not copy protected.

Stone Edge Technologies, Inc., P.O. Box 3200, Maple Glen, PA 19002, (215) 641-1825.

GeoCalc is a spreadsheet analysis and charting program. This software requires an Apple II with 128K or more (256K RAM expansion recommended), GEOS; not copy protected.
GeoWorks, 2150 Shattuck Ave., Berkeley, CA 94704,
(415) 644-0883.

GeoFile is a database and forms manager. This software requires an Apple II with 128K or more (256K RAM expansion recommended), GEOS; not copy protected.
GeoWorks, 2150 Shattuck Ave., Berkeley, CA 94704,
(415) 644-0883.

Notes 'N Files is a database filing system with a word processor-like editor and powerful mail merge capabilities. This software requires an Apple IIGS with 512K or more, ProDOS 16; not copy protected.
DataPak Software, Inc., 9317 N.E. Hwy. 99, Ste. G, Vancouver, WA 98665, (206) 573-9155.

VIP Professional is a Lotus 1-2-3-compatible spreadsheet with database and graphics features. This software requires an Apple IIGS with 512K or more, ProDOS 8; not copy protected.
ISD Marketing, Inc., 2651 John St., Unit 3, Markham, Ontario, Canada L3R 2W5, (416) 479-1880.

Creative

816/Paint is a color graphics program that supports all Apple color graphics modes. This software requires an Apple II with 128K or more; ProDOS 8, ProDOS 16; not copy protected.
Baudville, Inc., 5380 52nd St. SE, Grand Rapids, MI 49512,
(616) 698-0888.

Beagle Bros Clip Art/Volume I contains usable samples of clip art. This software requires an Apple IIGS.
Beagle Bros, Inc., 6215 Ferris Sq., Ste. 100, San Diego, CA 92121,
(619) 452-5500, (800) 345-1750, or (800) 992-4022
(in California).

BeagleDraw is an object-oriented drawing program. This software requires an Apple IIGS with 512K or more, color monitor, ProDOS 16; not copy protected.

Beagle Bros, Inc., 6215 Ferris Sq., Ste. 100, San Diego, CA 92121, (619) 452-5500, (800) 345-1750, or (800) 992-4022 (in California).

DeluxePaint II is paint software containing more than 90 painting tools and effects. This software requires an Apple IIGS with 768K or more, color monitor, ProDOS 16; not copy protected.

Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404, (415) 571-7171.

Paintworks Gold is a sophisticated paint program. This software requires an Apple IIGS with 1.25 MB or more, RGB monitor, GS/OS; not copy protected.

Mediagenic, 3885 Bohannon Dr., Menlo Park, CA 94025, (415) 329-0500.

Paintworks Plus is a paint program containing a clip art gallery of more than 650 images. This software requires an Apple IIGS with 512K or more, GS/OS; not copy protected.

Mediagenic, 3885 Bohannon Dr., Menlo Park, CA 94025, (415) 329-0500.

Desk Accessories

Beagle Bros GS Desk Accessories includes a telephone dialer, keyboard macros, screen preserver, programmable scientific calculator, note pad, alarm clock, and more. This software requires an Apple IIGS.

Beagle Bros, Inc., 6215 Ferris Sq., Ste. 100, San Diego, CA 92121, (619) 452-5500, (800) 345-1750, or (800) 992-4022 (in California).

DeskPak Desk Accessories includes file tools, a calculator, system security lock, file printer, appointment calendar, scrapbook, and more. This software requires an Apple IIGS, 10K per accessory, ProDOS 16; not copy protected.

SSSI, Inc., 4612 N. Landing Dr., Marietta, GA 30066, (404) 928-4388.

The Desktop Manager includes a note pad, calculator, printer manager, envelope labeler, ASCII chart, screen print, cut and paste, appointment calendar, disk manager, and communications manager. This software requires an Apple IIGS with 512K or more, GS/OS; not copy protected.

On Three, Inc., 1050 West Columbia, Ste. 3E, Chicago, IL 60626, (312) 338-2202.

Disk Initializer lets users initialize 3.5- and 5.25-inch data disks from within other programs and works with any program that is GS/OS compatible. This software requires an Apple IIGS, GS/OS; not copy protected.

Seven Hills Software Corp., 2310 Oxford Rd., Tallahassee, FL 32304, (800) 627-3836.

Softswitch is a desk accessory that allows users to switch among several applications loaded into RAM. This software requires an Apple IIGS with 768K or more, ProDOS 16; not copy protected.

Roger Wagner Publishing, Inc., 1050 Pioneer Way, Ste. P, El Cajon, CA 92020, (619) 442-0522.

Desktop Communications

MouseTalk is a telecommunications product with a Macintosh-like user interface and pull-down menus that accommodates data transfer speeds up to 19,200 bits per second. This software requires an Apple II with 128K or more, ProDOS 8, mouse optional; not copy protected.

United Software Industries, 22231 Mulholland Hwy., Ste. 212A, Woodland Hills, CA 91364, (818) 887-5800.

Point-To-Point is a versatile telecommunications program. This software requires an Apple II with 128K or more, ProDOS 8; not copy protected.

Beagle Bros, Inc., 6215 Ferris Sq., Ste. 100, San Diego, CA 92121, (619) 452-5500, (800) 345-1750, or (800) 992-4022 (in California).

ProTERM 2.2 is a telecommunications program featuring a scroll-back buffer for capturing text on screen. This software requires an Apple II with 128K or more, ProDOS 8; not copy protected.
InSync Software, 3035 E. Topaz, Phoenix, AZ 85028,
 (602) 992-5515.

ReadyLink is communications software. This software requires an Apple IIGS with 128K or more, modem, and ProDOS 8.
Applied Engineering, P.O. Box 5100, Carrollton, TX 75011,
 (214) 241-6060.

Teleworks Plus is a IIGS-specific telecommunications program. This software requires an Apple IIGS with 768K or more, GS/OS; not copy protected.
Mediagenic, 3885 Bohannon Dr., Menlo Park, CA 94025,
 (415) 329-0500.

Desktop Publishing

GraphicWriter is an Apple IIGS-specific desktop publishing program that features page-layout, graphics and word processing capabilities. This software requires an Apple IIGS with 768K or more, GS/OS; not copy protected.
Seven Hills Software Corp., 2310 Oxford Rd., Tallahassee, FL 32304, (800) 627-3836.

Graph It! is a high-impact presentation graphics program. This software requires an Apple II with 128K or more, ProDOS 8; printer; not copy protected.
Timeworks, Inc., 444 Lake Cook Rd., Deerfield, IL 60015, (708) 948-9200.

Medley 2.0 is a IIGS-specific integrated desktop publishing program combining word processing, artwork, and page layout capabilities. This software requires an Apple IIGS with 1.25 MB or more, color monitor recommended, , ProDOS 16; not copy protected.

Milliken Publishing Co., 1100 Research Blvd., P.O. Box 21579, St. Louis, MO 63132, (314) 991-4220.

The Print Shop IIGS is a personal publishing program with a multicolor graphics editor that allows users to create, design, and print out multicolor custom cards, signs, banners, and letterheads. This software requires an Apple IIGS with 512K or more, printer, ProDOS 8; copy protected.

Brøderbund Software, Inc., 17 Paul Dr., San Rafael, CA 94903, (800) 521-6263.

Publish-It! 3 is a desktop publishing program that allows users to edit, design, lay out, and print documents. This software requires an Apple II with 128K or more, ProDOS 8; not copy protected.

Timeworks, Inc., 444 Lake Cook Rd., Deerfield, IL 60015, (708) 948-9200.

Springboard Publisher is a desktop publishing program with full-featured page layout, word processor, and graphics tools. This software requires an Apple II with 128K or more and a 1 MB RAM disk, ProDOS 8; not copy protected.

Spinnaker Software Corp., 201 Broadway, Cambridge, MA 02139, (617) 494-1200.

Education

The Children's Writing And Publishing Center is a word processing and desktop publishing program for ages 7 to 14. This software requires an Apple II with 128K or more, ProDOS 8; copy protected.

The Learning Co., 6493 Kaiser Dr., Fremont, CA 94555, (415) 792-2101.

Explore-A-Science Series offers elementary and middle school students exciting and realistic reading/writing-based scientific investigations. This software requires an Apple II with 128K or more, ProDOS 8; program disk copy protected, student disk not copy protected.

William K. Bradford Publishing Co., 310 School St., Acton, MA 01720, (508) 263-6996 or (800) 421-2009.

First Letters And Words is an alphabet learning program with a talking narrator for ages 3 to 8. This software requires an Apple IIGS with 512K or more, ProDOS 16; not copy protected.

First Byte, Clauset Centre, 3100 S. Harbor Blvd., Ste. 150, Santa Ana, CA 92704, 714-432-1740, 800-523-8070 or distributed by Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404, (415) 571-7171.

Homeworker — The Student Organizer is a secondary education program providing Word Processor, Outliner, Flash Card Maker, Grade Keeper, Calendar, and Calculator modules. This software requires an Apple II with 128K or more, ProDOS 8; copy protected.
Davidson & Associates, Inc., 3135 Kashiwa St., Torrance, CA 90505, (213) 534-2250 or (800) 556-6141.

Math And Me builds early math skills for children ages 3 to 6. This software requires an Apple II with 128K or more, ProDOS 8; copy protected.

Davidson & Associates, Inc., 3135 Kashiwa St., Torrance, CA 90505, (213) 534-2250 or (800) 556-6141.

The New Talking Stickybear Alphabet teaches upper and lowercase letter recognition to children ages 3 to 6 and includes three activities to complement and encourage alphabet learning. This software requires an Apple IIGS with 512K or more, ProDOS 16; copy protected.

Weekly Reader Software From Optimum Resource, Inc., 10 Station Pl., Norfolk, CT 06058, (203) 542-5553 or (800) 327-1473.

The New Talking Stickybear Opposites teaches opposites and helps build reasoning skills for children ages 3 to 6. This software requires an Apple IIGS with 512K or more, ProDOS 16; copy protected.

Weekly Reader Software From Optimum Resource, Inc., 10 Station Pl., Norfolk, CT 06058, (203) 542-5553 or (800) 327-1473.

The New Talking Stickybear Shapes helps children ages 3 to 6 identify shapes and includes a poster and Stickybear stickers. This software requires an Apple IIGS with 512K or more, ProDOS 16; copy protected.

Weekly Reader Software From Optimum Resource, Inc., 10 Station Pl., Norfolk, CT 06058, (203) 542-5553 or (800) 327-1473.

Reader Rabbit is a talking early education program that reinforces reading, spelling, and vocabulary skills for children ages 3 to 7. This software requires an Apple IIGS with 256K or more, color monitor recommended, ProDOS 16; copy protected.

The Learning Co., 6493 Kaiser Dr., Fremont, CA 94555, (415) 792-2101.

Revolution '76 is a historical simulation. This software requires an Apple IIGS with 1.2 MB or 768K or more, and GS/OS.

Britannica Software, Inc., 345 4th St., San Francisco, CA 94107, (415) 597-5555 or (800) 572-2272.

SmoothTalker is a software-only speech synthesizer that converts text into speech. This software requires an Apple IIGS with 512K or more, ProDOS 16; not copy protected.

First Byte, Clauset Centre, 3100 S. Harbor Blvd., Ste. 150, Santa Ana, CA 92704, 714-432-1740, 800-523-8070 or distributed by Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404, (415) 571-7171.

Studymate: The Grade Booster is a study tool for teens and adults. This software requires an Apple IIGS or Apple IIc Plus with 128K or more, ProDOS 16; not copy protected.

Compu-Teach Corp., 78 Olive St., New Haven, CT 06511-6909, (203) 777-7738 or (800) 448-3224.

Talking Schoolhouse Series includes 16 separate software programs that use real human speech to teach basic skills. This software requires an Apple IIGS with 512K or more.

Orange Cherry-Talking Schoolhouse Software, P.O. Box 390, Westchester Ave., Scotts Corners, Pound Ridge, NY 10576, (914) 764-4104 or (800) 672-6002.

USA GeoGraph teaches U.S. geography for grades 5 to adult. This software requires an Apple IIGS with 768K or more, GS/OS; copy protected.

MECC, 3490 Lexington Ave. N, St. Paul, MN 55126, (612) 481-3500 or (800) 228-3504.

Where In The World Is Carmen Sandiego? teaches geography and history by allowing players to track Carmen and her gang of thieves around the world to recover stolen treasures. This software requires an Apple IIGS with 512K or more, ProDOS 16.

Broderbund Software, Inc., 17 Paul Dr., San Rafael, CA 94903, (800) 521-6263.

Writer Rabbit builds reading comprehension and writing skills for ages 7 to 10. This software requires an Apple II with 64K or more, ProDOS 8; copy protected.

The Learning Co., 6493 Kaiser Dr., Fremont, CA 94555, (415) 792-2101.

Music

Diversi-Tune turns the Apple IIGS into a MIDI synthesizer and recorder and plays up to 32 channels simultaneously. This software requires an Apple IIGS with 512K or more, MIDI interface optional, ProDOS 8; not copy protected.

Diversified Software Research, Inc., 34880 Bunker Hill, Farmington, MI 48331, (313) 553-9460

Jam Session is a music performance program. This software requires an Apple IIGS with 768K or more.

Broderbund Software, Inc., 17 Paul Dr., San Rafael, CA 94903, (800) 521-6263.

Master Tracks Pro is a professional MIDI recording and graphic editing sequencing program. This software requires an Apple IIGS with 1.25 MB or more, Passport serial port MIDI interface or compatible, MIDI instrument(s), GS/OS; not copy protected.
Passport Designs, Inc., 625 Miramontes St., Ste. 103, Half Moon Bay, CA 94109, (415) 726-0280.

Music Construction Set is a music composition program with 33 digitized instruments, a MIDI output, and stereo music capability. This software requires an Apple IIGS with 256K or more, stereo card and speakers recommended, ProDOS 8; not copy protected.
Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404, (415) 571-7171.

The Music Studio 2.0 is a music creation program with pull-down menus, a music paint box, and more. This software requires an Apple IIGS with 768K or more, GS/OS; not copy protected.
Mediagenic, 3885 Bohannon Dr., Menlo Park, CA 94025, (415) 329-0500.

Pyware Instrument Designer is a sound-wave designer that enables users to create an infinite variety of synthesized sounds. This software requires an Apple IIGS with 512K or more, synthesizer and printer optional, ProDOS 16; not copy protected.
Pygraphics Corp., P.O. Box 639, Grapevine, TX 76051, (817) 481-7536 or (800) 222-7536.

Personal Productivity

Managing Your Money 4.0 is a financial planning, budgeting, checkbook, and small-business package combining nine integrated programs that export to AppleWorks GS. This software requires an Apple IIGS with 256K or more, two disk drives, ProDOS 8; not copy protected.
MECA Ventures, Inc., 327D Riverside Ave., Westport, CT 06881, (203) 226-2400.

Quicken is single-entry bookkeeping software for small businesses and personal use. This software requires an Apple II with 128K or more, ProDOS 8; not copy protected.
Intuit, Inc., P.O. Box 3014, Menlo Park, CA 94026, (415) 322-0573.

Programming and Utilities

Copy II Plus backs up copy protected disks. This software requires an Apple II with 128K or more (all Laser 128 series machines must have an 80-column card), ProDOS 8; not copy protected.

Central Point Software, Inc., 15220 NW Greenbrier Pkwy., Ste. 200, Beaverton, OR 97006, (503) 690-8090.

The Diversi Series is a family of utility software designed to enhance the performance of the Apple IIGS and its disk drives. This software requires an Apple IIGS with 512K or more, ProDOS 8; not copy protected.

Diversified Software Research, Inc., 34880 Bunker Hill, Farmington Hills, MI 48331, (313) 553-9460.

The Graphic Exchange is a universal graphics conversion utility program. This software requires an Apple IIGS with 768K or more, ProDOS 8; not copy protected.

Roger Wagner Publishing, Inc., 1050 Pioneer Way, Ste. P, El Cajon, CA 92020, (619) 442-0522.

HyperScreen is a multimedia presentation tool which allows creation of interactive presentations, reports, and lessons. This software requires an Apple II with 128K or more and supports the Video Overlay Card.

Scholastic Software, 730 Broadway, New York, NY 10003, (800) 325-6149.

HyperStudio is a hypermedia authoring system. This software requires an Apple IIGS with 1.25 MB or more, GS/OS.

Roger Wagner Publishing, Inc., 1050 Pioneer Way, Ste. P, El Cajon, CA 92020, (619) 442-0522.

MacroMate is a universal macro program. This software requires an Apple IIGS with 768K or more, ProDOS 16, or GS/OS.

Roger Wagner Publishing, Inc., 1050 Pioneer Way, Ste. P, El Cajon, CA 92020, (619) 442-0522.

Merlin 8/16 includes two versions of Merlin 8 for assembling 8-bit ProDOS and DOS 3.3 programs and Merlin 16 for assembling 8- and 16-bit ProDOS programs. This software requires an Apple II with 128K or more; and ProDOS 8, ProDOS 16, or DOS 3.3; not copy protected.

Roger Wagner Publishing, Inc., 1050 Pioneer Way, Ste. P, El Cajon, CA 92020, (619) 442-0522.

Micol Basic provides 8 bit and 16 bit basic compilers.

Micol System, 9 Lynch Rd., Toronto, Ontario, Canada M2J2V6, (416) 495-6864.

Word Processing

Bank Street Writer III is a word processing program for grades 2-12 featuring an integrated 60,000-word spelling checker and a 50,000-synonym thesaurus. This software requires an Apple II with 128K or more, ProDOS 8, printer recommended; not copy protected.

Scholastic, Inc., P.O. Box 7502, 2931 E. McCarty St., Jefferson City, MO 65102, (800) 541-5513 or (800) 392-2179 (in Missouri).

BeagleWrite GS is a basic word processor. This software requires an Apple IIGS.

Beagle Bros, Inc., 6215 Ferris Sq., Ste. 100, San Diego, CA 92121, (619) 452-5500, (800) 345-1750, or (800) 992-4022 (in California).

DeluxeWrite is a word processor that combines text and graphics to create documents for letters, school reports, business reports, and more. This software requires an Apple IIGS with 768K or more, ProDOS 16; not copy protected.

Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404, (415) 571-7171.

Sensible Grammar is a proofreading program that checks word processing files for common grammatical errors. This software requires an Apple IIGS with 128K or more, word processing program, ProDOS 8; copy protected.

Sensible Software, Inc., 335 E. Big Beaver, Ste. 207, Troy, MI 48083, (313) 528-1950.

Sensible Speller For ProDOS is an electronic dictionary containing the 80,000-word Concise Edition of the Random House Dictionary on disk. This software requires an Apple IIGS with 64K or more, word processing program, ProDOS 8; copy protected.
Sensible Software, Inc., 335 E. Big Beaver, Ste. 207, Troy, MI 48083, (313) 528-1950.

WordPerfect For The Apple IIGS is a full-featured word processor with more than 110 features. This software requires an Apple IIGS with 512K or more, two disk drives or a hard disk drive recommended, additional memory card recommended, ProDOS 16, GS/OS (Version 5.0) compatible; not copy protected.
WordPerfect Corp., 1555 N. Technology Way, Orem, UT 84057, (801) 225-5000.

Hardware and Peripherals

A2S Series are 20 MB to 60 MB external SCSI (Small Computer System Interface) hard disk drives. This hardware requires an Apple IIGS.
CMS Enhancements, Inc., 1372 Valencia Ave., Tustin, CA 92680, (714) 259-9555.

Adaptive Firmware Card is a keyboard emulator that enables a handicapped user — or any user — to run off-the-shelf software without using a keyboard. This hardware requires an Apple IIe or Apple IIGS with 64K or more.
Don Johnston Developmental Equipment, P.O. Box 639, Wauconda, IL 60084, (708) 526-2682 or (800) 999-4660.

Bose RoomMate Speakers are digital sound speakers with full-range drivers, a dual-channel amplifier, an equalization network, and distortion-limiting circuitry. This hardware requires an Apple IIGS.
Bose Corp., The Mountain, Framingham, MA 01701-9168, (508) 879-7330.

DataLink 1200 and DataLink 2400 are internal 1,200 bps and 2,400 bps modem boards, respectively, that come with the necessary communications software to permit operation. This hardware requires an Apple II.
Applied Engineering, P.O. Box 5100, Carrollton, TX 75011, (214) 241-6060.

Echo II Speech Synthesizer provides speech capability for more than 100 educational software products. This hardware requires an Apple IIGS with 256K or more, ProDOS 8, and DOS 3.3.
Street Electronics Corp., 6420 Via Real, Carpinteria, CA 93013, (805) 684-4593.

FingerPrint GSi Version III is a screen-dump graphic utility card. This hardware requires an Apple IIGS and a printer.
Thirdware Computer Products, 4747 NW 72nd Ave., Miami, FL 33166, (305) 592-7522.

Quickie is a hand-held scanner that requires an Apple II.
Vitesse, Inc., 13909 Amar Rd., Ste. 2, La Puente, CA 91746-1669, (818) 813-1270 or (800) 777-7344.

Sonic Blaster is a stereo digitizer that records, amplifies, allows editing, and plays back music in full stereo. The required software is included. This hardware requires an Apple IIGS with 512K or more, and GS/OS.
Applied Engineering, P.O. Box 5100, Carrollton, TX 75011, (214) 241-6060.

ThunderScan replaces an Apple ImageWriter's ribbon cartridge with a digitizing scanning cartridge. This hardware requires an Apple II with 512K or more, an ImageWriter, and ProDOS 16.
Thunderware, Inc., 21 Orinda Way, Orinda, CA 94563, (415) 254-6581.

TransWarp GS is an accelerator card that increases the Apple IIGS processing speed 2.5 times and is compatible with all standard software and hardware.
Applied Engineering, P.O. Box 5100, Carrollton, TX 75011, (214) 241-6060.

Unicorn Membrane Keyboard is an adaptive keyboard for a handicapped — or any user — that replaces the traditional Apple II keyboard and facilitates use of the computer. This hardware requires an Apple II (or IBM) computer and an interface card, such as the Adaptive Firmware Card from Don Johnston Developmental Equipment (see listing this section).
Unicorn Engineering, Inc., 5221 Central Ave., Ste. 205, Richmond, CA 94804, (415) 528-0670.

Articles, Books, and Publications

Printed materials can keep you up to date on a variety of Apple II topics

Articles and publications are a great source of up-to-date information about your Apple II. They review new products and show you how you can use your Apple II for a wide variety of applications at home, at school, or at work. Books give you in-depth understanding of and practical guidance in how to use your Apple II computer.

An ever-growing number of printed materials are available in bookstores, libraries, computer stores, and by mail that provide additional information about the inner workings of the Apple II family of computers, how-to instructions, and special-interest coverage about software applications and hardware devices. Topics covered include Apple II diagnostic and maintenance tips, programming-language tutorials, AppleWorks and other mainstream software applications, software tutorials, system overviews, junior high and high school text books, college-level text books, technical resource books, teaching manuals, directories and indexes, and a lot more.

This list was compiled by the Apple Library Users Group, *inCider/A+* magazine, and Redgate Communications Corporation, Vero Beach, Fla. Mention of articles, books, and publications in this listing is for information purposes only and constitutes neither an endorsement or recommendation. Apple assumes no responsibility with regard to the selection or use of the articles, books, and periodicals listed.

Articles Apple II articles are listed within the following subject areas: educational tools and uses, file transfer and telecommunications; general maintenance and programming, graphics and multimedia, and historical information about Apple.

Educational Tools and Uses

“Classes benefit from network, software (at Marine Academy of Science and Technology)”

The Marine Academy of Science and Technology, a 9- to 12-grade school in Sandy Hook, N.J., has an AppleTalk network that runs Bank Street Writer III, which allows students to share their work and improve their writing. Mathematics programs are also available on the network.

THE Journal (Technological Horizons In Education), April 1990, vol. 17 no. 8, p45.

“Helping at-risk children through distance tutoring: Memphis ACOT. (Apple Classroom of Tomorrow)”

Apple Computer, Inc., Memphis City Schools, and Memphis State University created the Apple Classroom of Tomorrow (ACOT), featuring a distance-tutoring project to assist at-risk students in the fifth and sixth grades. Tutors are volunteer Memphis State Masters of Arts in Teaching candidates.

Ross, Steven M.; Smith, Lana J.; Morrison, Gary R.; Erickson, Ann. *THE Journal*, Feb., 1989, vol. 16 no. 6, p68.

“How do you spell that?”

Descriptions of three Apple II spelling instruction programs are given. A sidebar describes various games, included in the software, that teach spelling. A second sidebar lists additional spelling programs and includes purchasing criteria.

Eiser, Leslie. *InCider*, Sept. 1989, vol. 7 no. 9, p60-62.

“Learning social studies in a one-computer classroom (in Canadian, Texas)”

A teacher at Canadian High School in Canadian, TX, uses an Apple IIe with commercial and self-created software to teach social studies. The computer has helped slower learners who need to move ahead at their own pace.

Solomon, Gwen. *Electronic Learning*, April 1990, vol. 9 no. 7, p18.

“Mission control; Space Shuttle simulator relies on three Apple II computers. (Future Astronaut Training Program)”

Seventh- through ninth-grade students participate in the Future Astronaut Training Program at the Kansas Cosmosphere and Space Center. Space-shuttle simulator systems are controlled by an Apple II microcomputer, the hydraulic system is operated by an Apple II Plus, and the video system and on-board computer are run by an Apple IIe.

Clarkson, M.A. *A+*, Jan. 1989, vol. 7 no. 1, p53.

“Teachers create Apple II stackware for hearing-impaired”

Teachers in Florida discovered there is little instructional software for the hearing impaired. Most of these students do not perform well with software that has considerable text. Tutor-Tech from Techware Corp. has minimal text and provides quick feedback to the students. Dryer, Kymberly G. *THE Journal* (Technological Horizons In Education), Feb. 1990, vol. 17 no. 6, p36.

“The ultimate field trip; space-station simulation at the new Challenger Center”

Apple IIgs microcomputers create the space environment, monitor progress, deploy probes, and transmit information from them, and gather physiological data from crew members in simulated missions at the Challenger Center at the Houston Museum of Natural Science.

Brawer, Jennifer. *A+*, Jan. 1989, vol. 7 no. 1, p52.

“Using a microcomputer and speech synthesizer with learning disabled adolescents (Apple II)”

Learning-disabled adolescents who learned by using a voice synthesizer on a microcomputer were tested along with another group who learned with a human tutor. The results revealed that the speech synthesizer was as effective as a human tutor.

Hannaford, Alonzo E.; Icabone, Dona G.; Barbus, Stephen. *Educational Technology*, Jan. 1990, vol. 30 no. 1, p45.

“What’s happened to math literacy? Can computers help resolve the crisis?”

A description of eight software packages for the Apple II designed to teach mathematics and problem-solving skills. Includes criteria for choosing a math package.

Summers, Tan. *inCider*, Sept. 1, 1989, vol. 7 no. 9, p56-59.

File Transfer and Telecommunications

“Back to basics. Talk to your Apple in a language it understands”

This article presents a few BASIC techniques that will help you customize your programs and create practical solutions for home and business needs. Includes three program descriptions and supporting program listings.

Kennedy, William, P. *inCider*, April 1, 1989, vol. 7 no. 4, p40-46.

“Bit by bit”

A description of two-way technology transfer between the Apple II family and the Macintosh, including information on the current state of connectivity.

Linzmayer, Owen W., *inCider*, Jan. 1, 1990, vol. 8 no.1, p64-67.

“Compute! Specific: Apple II”

A review of two programs for transferring Apple II files to a Macintosh or IBM PC. Describes how to use Apple File Exchange to transfer text files to the Mac. Says Cross-Works can be used to convert AppleWorks word processor, spreadsheet, and database files to a PC.

Keizer, Gregg. *COMPUTE!*, May 1, 1990, vol.12 no. 5, p14-15.

“Coping with diversity”

A discussion of the easy and convenient transfer of information between incompatible computers. Includes the sidebar “Out of One, Many” and two charts.

Ryan, Bob. *BYTE*, March 1, 1990, vol.15 no.3, p257-260.

“Link up with telecommunications software. From commercial database services to user-group bulletin boards to electronic mail sent across town or around the globe, the world...”

A buyer's guide to telecommunications software for the Apple II series, featuring a table that rates and compares 17 features of seven packages from six manufacturers. A glossary of telecommunications terms is included.

Itzkahn, Seth. *inCider*, May 1, 1990, vol. 8 no. 5, p50-56.

“Macintosh users expand on-line forums”

Apple Users Group, Inc. has expanded its user forums on CompuServe from four to 11 to serve additional users.

Feuche, Mike. *MIS Week*, Dec. 4, 1989, vol. 10 no. 48, p22.

General Maintenance and Programming

“How to use a hard disk”

Gives tips on how to use a hard disk drive with Apple II computers. Covers configuring, organizing, and partitioning the disk; loading software from floppies; launching programs; backups; and cleanups.

Mossberg, Walter S. *A+*, May 1, 1989, vol. 7 no. 5, p17-20.

“Lock it up! What could be worse than losing your data? Losing your Apple II!”

Examines inexpensive ways to secure your Apple II system. Includes a buyer's guide listing products, manufacturer information, and price.

Field, Cynthia E. *inCider*, July 1989, vol. 7 no. 7, p56-61.

“Software's greatest hits, 1989”

Descriptions of 25 software programs for the Apple, recommended by Booklist as the best software of 1989.

Booklist; including *Reference Books Bulletin*, Jan. 1, 1990, vol. 86 no. 9, p934-937.

“Viruses”

Offers an AppleSoft program for the Apple II that checks for Cyberaids or Festering Hate viruses, which attempt to erase the root directory of all volumes on-line. Includes an AppleSoft program that installs fake viruses for testing the antivirus program.

Schack, Robert. *Call A.P.P.L.E.*, May 1, 1989, vol. 12 no. 5, p56-59.

“What to do when all else fails: Where to find answers to your Apple II problems”

Offers suggestions for avoiding and/or resolving problems with Apple II productivity software.

Linzmayer, Owen W. *A+*, May 1, 1989, vol. 7 no. 5, p77-78.

Graphics and Multimedia

“Making movies with your Apple II: Part I”

Part I of a two-part series that shows how to use Apple II-based desktop video equipment. Presents video basics and explains the tools needed to create video productions with the Apple II.

Kennedy, William P; Wright, Guy. *inCider*, April 1990, vol. 8 no. 4, p44-49.

“Making movies with your Apple II: Part II”

The second installment of a two-part series. Details some basic guidelines for creating professional-looking video productions.

Outlines the process step by step.

Kennedy, William P; Wright, Guy. *inCider*, May 1990, vol. 8 no. 5, p45-49.

“Montage Dabble! Experiment! Discover your artistic talents — and your Apple II’s — with a variety of graphics tools”

Describes several graphics programs for educational use. Because most educational software operates in the standard (single) hi-res mode, designing professional-quality graphics is a challenge. Includes a buyer’s guide listing.

Schwartz, Roberta; Callery, Michael. *inCider*, July 1, 1989, vol. 7 no. 7, p76-79.

“Move over Roger Rabbit — your competition has arrived”

A review of the Apple II Video Overlay Card, which offers an easy method of producing customized educational videotapes. Says the card is easy to install, easy to use, and well documented.

Solomon, Gwen. *Electronic Learning*, Sept. 1, 1989, vol. 9 no. 1, p56-57.

“Reel-world images. Digitizers, scanners, and genlock technology are the stars of this show”

Discusses four hardware products that let the Apple II acquire and manipulate video images from a variety of sources.

Wallace, Lou. in *Cider*, July 1989, vol. 7 no. 7, p40-45.

“Take II desktop video brings big-screen creativity to the small screen of your Apple”

Discusses the steps in making desktop videos on an Apple II, including setup, digitizing images, and adding sound tracks.

Software and hardware are also discussed.

Wilson, Leslie. *A+*, March 1, 1989, vol. 7 no. 3, p18-28.

“Yabba Dabba II. Animation on your Apple computer is easier than you probably think it is”

Offers information on how to create animation on an Apple II.

Includes topics such as cel-type animation, vector animation, begin at the beginning, camera shots, and transitions. Includes a sidebar on animators' techniques and a list of products discussed.

Schwartz, Roberta; Callery, Michael. *A+*, March 1, 1989, vol. 7 no. 3, p36-45.

Historical Information about Apple

“The Apple story part I: early history”

Williams, G.; Moore, R. *BYTE*, Dec. 1984, vol. 9 no. 13, p67-71.

“The Apple story part II: more history and the Apple III”

Williams, G.; Moore, R. *BYTE*, Jan. 1985, vol. 10 no. 1, p167-168.

“Apple: the first ten years (Part 1)”

Hogan, Thom. *A+*, Jan. 1987, vol. 5 no. 1, p43.

“Apple: the first ten years (Part 2)”

Hogan, Thom. *A+*, Feb. 1987, vol. 5 no. 2, p45.

“The Challenge: to unearth some computer relics in search of early Apples”

Schnatmeier, V. *A+*, Aug. 1985, vol. 3 no. 8, p66-68.

“The first decade of personal computing”

Ahl, D.H. *Creative Computing*, Nov. 1984, vol. 10 no. 11, p30-32.

“My first personal computer”

Cooper, A. *Popular Computing*, Jan. 1985, vol. 4 no. 3, p84.

“My first personal computer”

Hearst, W. *Popular Computing*, Jan. 1985, vol. 4 no. 3, p90.

“Ten years before the past: how the times have changed at Apple Computer, Inc”

Rosenthal, Steve. *A+*, Jan. 1987, vol. 5 no. 1, p131.

Books The Apple II books in this listing are organized alphabetically by book title.

1001 Things To Do With Your Apple

This revised best-seller offers practical ideas and programs for owners of the Apple II, II+, IIe, and IIc computers.

TAB Books, Inc., Blue Ridge Summit, PA 17294-0850,
(800) 822-8183.

1001 Things To Do With Your Apple IIgs

Useful activities for an Apple IIgs user.

TAB Books, Inc., Blue Ridge Summit, PA 17294-0850,
(800) 822-8183.

Advanced AppleWorks — 2nd Edition

Offers users an insight into AppleWorks.

TAB Books, Inc., Blue Ridge Summit, PA 17294-0850,
(800) 822-8183.

Apple 16, A Comprehensive Guide To IIGS Computing

A non-technical book that discusses the Apple IIGS' use of color, paint and draw programs, desktop publishing, laser printing, telecommunications, music, and more.

The Archives Press, 140 University Ave., Ste. 38, Palo Alto, CA 94301.

Apple Care Manual: Diagnosing and Maintaining Your Apple II+, IIe, and IIc Computers

Tells how to take better care of Apple II computers, to diagnose problems, and to make simple repairs.

Windcrest Books, a division of **TAB Books, Inc.**, Blue Ridge Summit, PA 17294-0850, (800) 822-8183.

The Apple IIc: Your First Computer

A primer about the Apple IIc for first-time users.

COMPUTE! Books, P.O. Box 5058, Greensboro, NC 27403,
(800) 334-0868.

Apple IIc User's Handbook

A comprehensive guide to the operation, programming, and practical uses of the Apple IIc.

Ballantine Books, 201 East 50th St., New York, NY 10022, (800) 726-0600.

Apple IIGS Assembler Toolbox Quick Reference; C Toolbox Quick Reference

Provides summaries of the programming toolbox calls.

APDA — Apple Computer, Inc., 20525 Mariani Ave., MS 33G, Cupertino, CA 95014, (800) 282-2732.

Apple IIGS Assembly Language Programming

A tutorial about the assembly programming language.

Bantam Books, Inc., 666 Fifth Ave., New York, NY 10103, (212) 765-6500.

The Apple IIGS Book

Chronicles the Apple IIGS computer from conception to development.

Bantam Books, Inc., 666 Fifth Ave., New York, NY 10103, (212) 765-6500.

Apple IIGS Firmware Reference

A technical guide for programmers and hardware designers.

Addison-Wesley Publishing Co., Inc., 1 Jacob Way, Reading, MA 01867, (617) 944-3700.

Apple IIGS Hardware Reference, Second Edition

Provides an extensive description of the mechanisms and internal operations of an Apple IIGS.

Addison-Wesley Publishing Co., Inc., 1 Jacob Way, Reading, MA 01867, (617) 944-3700.

Apple IIGS Machine Language For Beginners

An assembly language tutorial for use with the Merlin 8/16 assembler.

Roger Wagner Publishing, Inc., 1050 Pioneer Way, Ste. P, El Cajon, CA 92020, (619) 442-0522.

Apple IIGS Technical Reference

Explains every detail of the Apple IIGS architecture. Describes how to write software that runs in IIGS 8-, 16-, and 32-bit operating modes. Covers specifics on programming with color graphics, sound, desk accessories, and AppleTalk.

McGraw-Hill, 2600 Tenth St., Berkeley, CA 94710, (800) 227-0900 or (800) 772-2531 (in California).

Apple IIGS Toolbox Reference, Vols. I And II

A programmers' toolbox description reference, two volumes.

Addison-Wesley Publishing Co., Inc., 1 Jacob Way, Reading, MA 01867, (617) 944-3700.

Apple IIGS Toolbox Reference, Vol. III

Introduces new tools for Apple IIGS programmers.

Addison-Wesley Publishing Co., Inc., 1 Jacob Way, Reading, MA 01867, (617) 944-3700.

The Apple IIGS Toolbox Revealed

Introduces a programmer or would-be programmer to the toolbox and to the IIGS' circuits.

Bantam Books, Inc., 666 Fifth Ave., New York, NY 10103, (212) 765-6500.

Apple Programmer's Handbook

An extensive programming reference for advanced users.

Howard W. Sams & Co., Inc., 4300 W. 62nd St., Indianapolis, IN 46268, (800) 428-7267.

The AppleWorks Handbook: Vol. II

New ideas to help users get more productivity from AppleWorks.

National AppleWorks Users Group, P.O. Box 87453, Canton, MI 48187, (313) 454-1115.

AppleWorks Made Easy, Third Edition

A tutorial that covers AppleWorks Version 3.

Osborne/McGraw-Hill, 2600 Tenth St., Berkeley, CA 94710, (800) 227-0900.

Discovering Science On Your Apple II, II+, IIc and IIGS

A guidebook designed for individual student use or as a supplemental text for use in middle or junior high school science classes.

TAB Books, Inc., Blue Ridge Summit, PA 17294-0850, (800) 822-8183.

Exploring Apple GS/OS and ProDOS 8

Provides programming techniques for the GS/OS and ProDOS 8 operating systems.

Addison-Wesley Publishing Co., Inc., 1 Jacob Way, Reading, MA 01867, (617) 944-3700.

Exploring the Apple IIGS

The architecture and capabilities of the 65816 microprocessor, Apple IIGS Programmer's Workshop, file management with ProDOS 16, and using Super Hi-Res graphics are among the topics covered.

Addison-Wesley Publishing Co., Inc., 1 Jacob Way, Reading, MA 01867, (617) 944-3700.

GS/OS Reference

Programmer's guide to the Apple IIGS operating system.
Addison-Wesley Publishing Co., Inc., 1 Jacob Way, Reading, MA
01867, (617) 944-3700.

GS/OS Driver Reference

Information about GS/OS drivers.
ADPA — Apple Computer, Inc., 20525 Mariani Ave., MS 33G,
Cupertino, CA 95014, (800) 282-2732

Human Interface Guidelines

Defines the desktop interface used in Apple IIGS-specific programs.
Addison-Wesley Publishing Co., Inc., 1 Jacob Way, Reading, MA
01867, (617) 944-3700.

ImageWriter LQ Reference

A technical reference for the ImageWriter LQ printer.
Addison-Wesley Publishing Co., Inc., 1 Jacob Way, Reading, MA
01867, (617) 944-3700.

Inside the Apple IIc

A comprehensive guide to the internal workings of the Apple IIc.
Includes a brief overview of Apple Computer, Inc.
Brady Communications Co., Inc., Dept. TS, Bowie, MD 20715.

Inside the Apple IIe

A comprehensive volume for developing programs for the Apple IIe.
Includes technical information about the IIe and a history of Apple
Computer, Inc. Knowledge of AppleSoft and a familiarity with the
6502 assembly language is recommended.
Brady Communications Co., Inc., Dept. TS, Bowie, MD 20715.

Inside ProDOS 16

A close-up look at ProDOS 16.
TAB Books, Inc., Blue Ridge Summit, PA 17294-0850,
(800) 822-8183.

LaserWriter Reference

A technical resource for laser printers.
Addison-Wesley Publishing Co., Inc., 1 Jacob Way, Reading, MA
01867, (617) 944-3700.

Programmer's Introduction To The Apple IIGS

Essential concepts for programming the Apple IIGS.

Addison-Wesley Publishing Co., Inc., 1 Jacob Way, Reading, MA 01867, (617) 944-3700.

Programming The 65816

A teaching manual and reference guide for the 65816.

Brady Books/Simon & Schuster, 1 Gulf & Western Plaza, 14th Fl., New York, NY 10023, (212) 373-8500.

Programming The Apple IIGS In Assembly Language

Tells how to program the Apple IIGS in a step-by-step manner.

Brady Books/Simon & Schuster, 1 Gulf & Western Plaza, 14th Fl., New York, NY 10023, (212) 373-8500. Also available from the author: Ron Lichty, P.O. Box 27262, San Francisco, CA 94127, (415) 564-2697.

Smart Apples: 31 Artificial Intelligence Experiments with the Apple II, II+, IIe, IIC, and IIGS

Instructions are presented that enable a user to perform hands-on artificial intelligence experiments. Includes hardware information, software recommendations, reviews of telecommunications programs, and a description of software designed for the mouse.

TAB Books, Inc., Blue Ridge Summit, PA 17294-0850, (800) 822-8183.

Technical Introduction To The Apple IIGS

An overview of the Apple IIGS written for programmers.

Addison-Wesley Publishing Co., Inc., 1 Jacob Way, Reading, MA 01867, (617) 944-3700.

The UltraMacros Primer

Tells how to use TimeOut UltraMacros, from the TimeOut Series of AppleWorks enhancements.

National AppleWorks Users Group, PO Box 87453, Canton, MI 48187, (313) 454-1115.

Using AppleWorks GS

A comprehensive guide to using the six integrated applications of AppleWorks GS.

Addison-Wesley Publishing Co., Inc., 1 Jacob Way, Reading, MA 01867, (617) 944-3700.

X-Ref (Cross-Reference) For Apple II Books And Notes

Contains indexes to all of the programming books for the Apple II family of computers.

APDA — Apple Computer, Inc., 20525 Mariani Ave., MS 33G, Cupertino, CA 95014, (800) 282-2732.

Periodicals The Apple II periodicals in this listing are organized alphabetically by publication title.

8/16

A monthly Apple II magazine featuring tips and techniques for programmers.

Ariel Publishing, P.O. Box 398, Pateros, WA 98846, (509) 923-2249.

A-2 Central (formerly Open Apple)

A monthly newsletter covering the Apple II computing environment. The heart of the newsletter is letters from readers.

A-2 Central, P.O. Box 11250, Overland Park, KS 66207, (913) 469-6502.

The AppleWorks Educator

A newsletter covering AppleWorks, written for educators and anyone interested in education.

AACE, P.O. Box 60730, Phoenix, AZ 85082.

AppleWorks Forum

A 36-page monthly newsletter for NAUG members and AppleWorks users.

National AppleWorks Users Group, P.O. Box 87453, Canton, MI 48187, (313) 454-1115.

Call A.P.P.L.E.

This periodical has ceased publication with the Winter 1990 issue. However, past issues offer a lot of information for Apple II users. This title was widely distributed and indexed.

TechAlliance, 290 SW 43rd St., Renton, WA 98055, (206) 251-5222.

GS+

A bimonthly magazine (also available on disk) for Apple IIGS users.
EGO Systems, P.O. Box 15366, Chattanooga, TN 37415-0366,
(615) 870-4960.

inCider/A+

A monthly magazine covering the entire family of Apple II computers, written for educators and home consumers.
IDG Communications/Peterborough, 80 Elm St., Peterborough, NH 03458, (603) 924-9471 or (800) 289-0619.

The Road Apple

A bimonthly newsletter for users of all Apple II computers.
RA Enterprises, 1121 N.E. 177, Ste. B, Portland, OR 97230, (503) 254-3874.

Nibble

A monthly magazine for Apple II users, enthusiasts, and hobbyists.
Mindcraft Publishing Co., 52 Domino Dr., Concord, MA 01742,
(508) 371-1660.

Software Information! For Apple II Computers

A biannual directory that lists more than 12,000 software titles for Apple II computers. Includes publisher's name, system requirements, price, and a brief product description of the software. The directory has listings by subject or category, by publisher, by product title, and publisher information.

MENU Publishing, P.O. Box MENU, Pittsburgh, PA 15241,
(800) 843-6368.

On-Line Services

Access a world of information and software without ever leaving your Apple II

Nationwide on-line services, such as those listed in this section, provide a variety of information about your Apple II computer, business and personal services, and interpersonal communications capabilities.

Traditionally, a user's Apple II communicates with an on-line service via communications software, a modem, and a telephone hookup over which files can be uploaded and downloaded. Many services offer substantial discounts for calling during off-peak hours.

Basic services provided include up-to-the-minute news, weather, sports, and stock-market information; bulletin-board listings; entertainment news and features; travel and shopping services; airline reservations; classified ads; and remote printing services. Many of the on-line services offer Apple II forums where focus topics such as AppleWorks, databases, games, communications, and other items of interest are covered.

On-line services are listed in alphabetical order.

America Online features consumer-oriented services such as electronic mail, bulletin boards, multiplayer games, travel news, stock quotes, world and national news, sports news, and more. System requirements include an Apple II, Hayes-compatible modem, 512K, and ProDOS 16 (disk also contains ProDOS 8 version that will be launched if 256K). America Online is not copy protected. **Quantum Computer Services, Inc.;** 8619 Westwood Center Dr.; Vienna, VA 22182; (800) 227-6364.

CompuServe Information Service provides standard on-line features such as news, weather, stock quotes, sports, and electronic mail, plus special Apple II entertainment, productivity, and vendor forums. System requirements include an Apple II, modem, and communications software. Special Vidtex communications software is available.

CompuServe Information Service; PO Box 20212; Columbus, OH 43220; (614) 457-0802 outside U.S. or (800) 848-8199.

Delphi services include electronic mail; on-line shopping; computer, personal, and hobby special-interest groups; downloadable public-domain and shareware programs; real-time conferencing; multiplayer games; news, weather, and sports reports; and more. System requirements include an Apple II, a modem, and a communications program.

General Videotex Corp.; Three Blackstone St.; Cambridge, MA 02139; (617) 491-3342.

Dow Jones News/Retrieval has 55 separate on-line databases that offer a wide variety of general news and financial information to users of a number of personal computer systems, including the Apple II, workstations, and mainframe terminals. Several major magazines and newspapers can be accessed on-line, including The Wall Street Journal, L.A. Times, Money, Forbes, etc. System requirements include a modem and communications software.

Dow Jones & Company, Inc.; PO Box 300; Princeton, NJ 08543; (609) 520-4641.

GEnie offers electronic mail, updated news and weather reports, travel news, stock-exchange reports, and other information, as well as one of the most active Apple II special-interest groups in the country. System requirements include an Apple II, modem, and communications software.

General Electric Information Services Co.; 401 N. Washington St.; Rockville, MD 20850; (800) 638-9636.

SeniorNet offers general news, weather, sports, electronic mail, conferencing, and news of interest to seniors. It is available to senior Apple II users through Delphi. System requirements include an Apple II, a modem, and a communications program.

General Videotex Corp.; Three Blackstone St.; Cambridge, MA 02139; (617) 491-3342.

SpecialNet is a telecommunications service devoted to serving the information and special-interest needs of professionals in the special-education and rehabilitation fields. System requirements include an Apple II, modem, and communications software.

GTE Education Services; SpecialNet, Ste. 315; 2021 K St. N.W.; Washington, DC 20006; (202) 835-7300.



\$19.95 U.S.

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