Apple II

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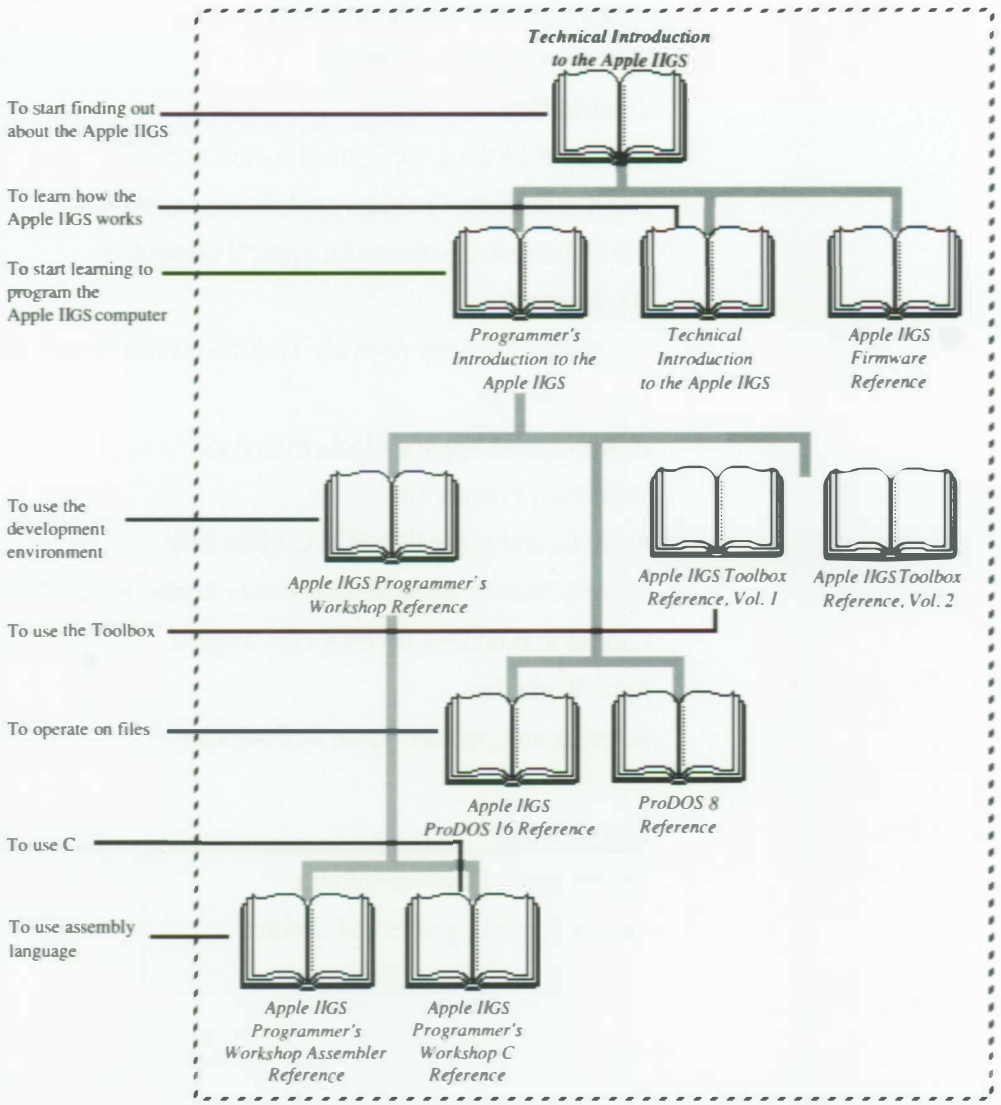
Road Map to Apple Technical Manuals

Finding the technical information you need about Apple® computers can be a perplexing process. A variety of manuals and guides have been published, and it is sometimes difficult to know which book contains the information you are looking for. The information in this article is taken from the *Apple II Technical Introduction Guide for Apple IIGS*. Reviewing the road map can help you determine which publication is right for you. Published by Addison-Wesley, Apple Technical Manuals are available at many computer stores and bookstores.

The Apple IIGS® personal computer has many advanced features, making it more complex than earlier models of the Apple II computer. To



describe it fully, Apple has produced a suite of technical manuals. Depending on the way you plan to use your Apple IIGS computer, you may need to refer to a select few of the manuals, or you may need to refer to most of them. This article offers you a description of the manuals.

Introductory Manuals

The following two books are introductory manuals for developers, computer enthusiasts, and other Apple IIGS owners who need technical information. Their purpose is to help the technical reader understand the features of the Apple IIGS, particularly the features that differentiate it from other Apple computers. Having read the introductory manuals, you can refer to specific reference manuals for details about a particular aspect of the Apple IIGS.

The Technical Introduction

The *Technical Introduction to the Apple IIGS* describes all aspects of the Apple IIGS, including its features and general design, the program environments, the Toolbox, and the development environment.

While the *Apple IIGS Owner's Guide* is a user's introduction, the *Technical Introduction* describes what the programmer has to consider in designing a program, such as the operating features the program uses and the environment in which it runs.

The Programmer's Introduction

The *Programmer's Introduction to the Apple IIGS* provides the concepts and guidelines you need when you start writing programs that use the Apple IIGS user interface, including windows, menus, and the mouse. Although the *Programmer's Introduction* isn't a complete course in programming, it provides a starting point—introducing the Apple IIGS Toolbox routines and the program environment under which they run. It includes a sample event-driven program that demonstrates how a program uses the Toolbox and the operating system.

Hardware and Firmware References

There are two reference manuals for the machine itself: the *Apple IIGS Hardware Reference* and the *Apple IIGS Firmware Reference*. Both books contain detailed specifications for people who want to know exactly what's inside the machine.

The Hardware Reference Manual

The *Apple IIGS Hardware Reference* is required reading for hardware developers, and it will also interest anyone who wants to know how the machine works. Information for developers includes the mechanical and electrical specifications of all connectors, both internal and external. Information of general interest includes descriptions of the internal hardware, which provide a better understanding of the machine's features.

The Firmware Reference Manual

The *Apple IIGS Firmware Reference* describes the programs and subroutines stored in the machine's read-only memory (ROM), with two significant exceptions: Applesoft BASIC and the Apple IIGS Toolbox, which have their own manuals. The *Firmware Reference* includes information about interrupt routines and low-level I/O subroutines for the serial ports, the disk port, and the Apple Desktop Bus™ interface, which controls the keyboard and the mouse. The *Firmware Reference* also describes the Monitor, a low-level programming and debugging aid for assembly-language programs.

The Toolbox Manuals

Like the Macintosh® computer, the Apple IIGS has a built-in Toolbox. The *Apple IIGS Toolbox Reference*, Volume 1, introduces concepts and terminology and explains how to use some of the tools. It also tells how to write and install your own tool set. Volume 2 contains information about the rest of the tools.

If you want to write only simple programs that don't use the mouse, windows, menus, or other parts of the desktop user interface, you can get along without the Toolbox. However, if you are developing an application that uses the desktop interface, or if you want to use the Super Hi-Res graphics display, you'll find the Toolbox to be indispensable.

The Programmer's Workshop Manual

The development environment for the Apple IIGS is called the Apple IIGS Programmer's Workshop (APW™). APW is a set of programs that enable developers to create and debug IIGS application programs. The *Apple IIGS Programmer's Workshop Reference* includes information about the parts of APW that all developers will need, no matter which programming language they use: the shell, the editor, the linker, the debugger, and the utilities. The manual also describes how to write other programs, such as custom utilities and compilers, that run under the APW shell.

Programming Language Manuals

Apple currently provides a 65C816 assembler and a C compiler. Other compilers can be used with APW if they follow the standards defined in the *Apple IIGS Programmer's Workshop Reference*.

Separate reference manuals address each Apple IIGS programming language. Each one includes the specifications of the language—and of the Apple IIGS libraries for the language—and describes how to write a program. The manuals for the Apple-provided languages are the *Apple IIGS Programmer's Workshop Assembler Reference* and the *Apple IIGS Programmer's Workshop C Reference*.

Operating System Manuals

Two operating systems run on the Apple IIGS: ProDOS® 16 and ProDOS 8 operating system software. Each system is described in a separate manual: *Apple IIGS ProDOS 16 Reference* and *ProDOS 8 Reference*. ProDOS 16 uses the full power of the Apple IIGS and is not compatible with earlier Apple II systems. The ProDOS 16 manual includes information about the System Loader, which works closely with ProDOS 16. If you write programs for the Apple IIGS, whether as an application programmer or a system programmer, you are almost certain to need the *ProDOS 16 Reference*.

ProDOS 8, previously just called ProDOS, is compatible with the models of Apple II that use 8-bit CPUs. As a developer of Apple IIGS programs, you need to use ProDOS 8 only if you are developing programs that run on 8-bit Apple II computers as well as on the Apple IIGS.

General Apple Manuals

In addition to the Apple IIGS manuals mentioned above, there are two manuals that apply to all Apple computers: *Human Interface Guidelines* and *Apple Numerics Manual*.

Human Interface Guidelines describes Apple's standards for the desktop interface of programs that run on Apple computers. If you are writing an application for the Apple IIGS, you should be familiar with the contents of this manual.

The *Apple Numerics Manual* is the reference for the Standard Apple Numeric Environment (SANE®), a full implementation of the IEEE standard floating-point arithmetic. The functions of the Apple IIGS SANE tool set match those of the Macintosh SANE package and the 6502 assembly-language SANE software. The *Apple IIGS Toolbox Reference* tells how to use the SANE routines in your programs; the *Apple Numerics Manual* is the comprehensive reference for the SANE numerics routines.

For more information, contact:

Addison-Wesley Publishing Company
Jacob Way
Reading, MA 01867
(617) 944-3700

Apple IIGS Firmware Overview

The following information is taken from the Apple IIGS Firmware Reference, *published by Addison-Wesley.*

Firmware is the set of low-level routines that provides programmers with an interface to the system hardware. The firmware controls the display, the mouse, serial input/output (I/O), and disk drives. Firmware programs, such as the Monitor and the Control Panel, work directly with the system memory. For most of the functions that the firmware entry points perform, there are equivalent functions provided in the Toolbox.

Traditionally, programmers have controlled hardware directly through their application programs, bypassing any system firmware. The disadvantage of this approach is that the programmer has to do a lot more work. More important, bypassing the firmware increases the likelihood that the resulting program will be incompatible either with other programs or with future versions of the computer. By using the firmware interface, a programmer can maintain compatibility with current and future releases of the system.

Levels of Program Operation

You can think of the different levels of program operation on the Apple IIGS as a hierarchy, with a hardware layer at the bottom, firmware layers in the middle, and the application at the top. Figure 1 shows a hierarchy of command levels; in general, higher-level components call on lower-level ones. (In the figure, the levels are separated by lines; the hardware components have heavy outlines.)

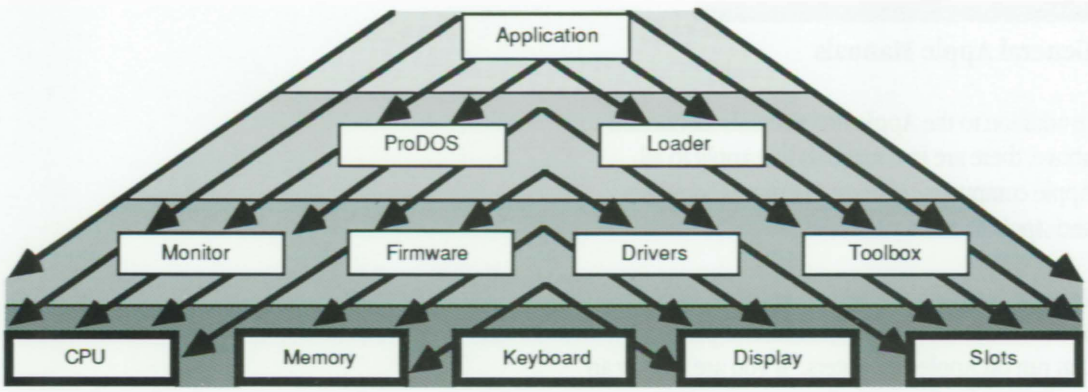


Figure 1: Levels of Program Operation

System Monitor Firmware

The system Monitor firmware is a set of routines that you can use to operate the computer at the machine-language level. You can examine and change memory locations, examine and change registers, call system routines, and assemble and disassemble machine-language programs.

Video Firmware

Video firmware allows you to manipulate the screen in low-resolution mode and text mode through your application programs and from the keyboard. Communication between the keyboard and the video screen is controlled by firmware subroutines, escape codes, and control characters. The video firmware provides on-screen editing, keyboard input, output to the screen, and cursor-control facilities.

Serial Port Firmware

The Apple IIGS serial port firmware allows serial communication with external devices, such as printers and modems. The serial port firmware provides support for such options as hardware and software handshaking and background printing. There are two serial ports, either of which can be configured as a printer port or a modem port.

Disk II Support

The Apple IIGS Disk II®firmware is a disk-support subsystem. It uses a built-in Integrated Woz Machine (IWM) chip and accommodates Disk II, DuoDisk®, or UniDisk™ drives. Slot 6 is the standard Disk II support slot. The firmware that communicates with the IWM at boot time provides support for booting DOS 3.3 software. Other handling of Disk II devices is a function of the particular disk operating system that is booted.

SmartPort Firmware

Disk II devices are directly manipulated by Slot 6 control hardware. Intelligent devices, by contrast, are not directly manipulated by hardware, but rather are controlled by software-driven command streams. Devices such as the UniDisk 3.5 are labeled *intelligent devices* because they have their own controllers, which can interpret command streams. The SmartPort firmware is a set of assembly-language routines that permit you to attach one or more intelligent devices to the external disk port of the Apple IIGS system. Using the SmartPort firmware, you can control such devices through SmartPort calls, such as Open, Close, Format, ReadBlock, and WriteBlock.

Interrupt Handler Firmware

System interrupts halt the execution of a program or the performance of a function or feature. The system contains built-in interrupt handler firmware, a user's interrupt handler entry point, and a means to notify the user when an interrupt occurs.

Apple Desktop Bus Microcontroller

The Apple Desktop Bus (ADB) microcontroller is used to receive information from peripheral units attached to the Apple Desktop Bus. The ADB microcontroller polls the internal keyboard, sensing key-up and key-down events as well as control keys, and optionally buffers keystrokes for later access by the 65C816. In addition, it acts as host for ADB peripheral devices, such as the detachable keyboard and mouse. The ADB microcontroller has its own built-in set of instructions, including Talk, Listen, SendReset, and Flush.

Mouse Firmware

The Apple IIGS mouse firmware supplies the communication protocol for sensing the current status of the mouse. The mouse firmware tracks mouse-device position data and button status and provides entry points for assembly-language control.

Apple IIGS Graphics Modes

The Apple IIGS computer executes graphics under the following types of graphics displays:

- Lo-Res and Hi-Res modes, found on all Apple II systems
- Double Hi-Res mode, available on the Apple IIe and IIc
- Super Hi-Res modes, available only on the Apple IIGS

Apple IIGS performance in Lo-Res and Hi-Res modes is the same as Apple II performance; the manual *Applesoft on the IIGS* outlines the appropriate commands. Because the IIGS ROM doesn't have routines for the use of Double Hi-Res graphics, programmers must add assembler routines that properly draw lines and locate points in Double Hi-Res mode. Commercially available packages include such routines.

The Apple IIGS performs in Super Hi-Res graphics modes with a resolution of either 320 x 200 or 640 x 200. Using 320 x 200 mode permits a full 16 colors per line. 640 x 200 mode can also use 16 colors per line, but each pixel is limited to a choice of four of the 16 colors. Both modes are supported by the Apple IIGS QuickDraw™ II tools. To make Super Hi-Res mode programming easier, screen memory is mapped contiguously.

320 x 200 Super Hi-Res Mode

Each line of pixels in 320 mode is associated with a table of 16 entries that correspond to the 16 colors to be shown on that line. Each entry represents one of the possible 4,096 colors available on the Apple IIGS. There may be as many as 16 color tables defined, permitting 256 colors on the screen at a time.

Within each line, a byte determines two pixels' colors. The high four bits of a byte contain a number from 0 to 15, which is used as an offset into the color table for that line. The pixel mapped to that memory location will have the color found at the appropriate table location. Similarly, the low four bits of the byte will determine the color of the adjacent pixel.

Pixels in 320 mode are almost square. The aspect ratio is 5:6 on an Apple Monochrome Composite Monitor, an AppleColor™ Composite Monitor, or an AppleColor RGB Monitor.

640 x 200 Super Hi-Res Mode

Sometimes called Limited 16 Colors, 640 mode also allows 16 colors per line, but each pixel is limited to one of four colors. As in 320 mode, each line addresses one of up to 16 color tables. However, each pixel in the line is represented by only two bits, so that each byte contains information about four pixels.

To represent four adjacent pixels, bits 7 and 6 choose from among colors 0 through 3 in the appropriate color palette; bits 5 and 4 choose from colors 4 through 7; bits 3 and 2, from colors 8 through 11; and the last two bits choose from colors 12 through 15. Therefore, each pixel can be one of four colors, but there may be a total of 16 colors on each line.

The pixel aspect ratio in 640 mode is 5:12 on an Apple monitor, so that each pixel's height is approximately twice its width.

Color Fill Mode

The Apple IIGS can also use 320 x 200 mode with color fill. The color zero (0) takes on a special meaning. A pixel with color 0 will have the same color as the preceding pixel, so that a series of bytes with values 80 00 00 would all be shown in the color represented by the eighth entry in the color palette. Using 0 to represent no color change limits the selection to only 15 colors per line, but saves time for the programmer.

Setting Up a Network: A Case Study

Tom Spadafore, Apple K–12 Account Executive, was until recently the Computer Resource Director for the Lincoln Unified School District in Stockton, California. For three and a half years, it was his responsibility to design, oversee construction of, and manage computer networks. He determined which hardware and software were appropriate, and he supported users with instruction and service. Having set up 17 networks that use both Apple II and Macintosh computers, Tom was the networking "guru" for his district.

Tom started out teaching at the elementary level, and later became a special education teacher. Recognizing the potential that computers held for the education community, he made a commitment to bring twentieth-century technology to the school district. That commitment was the force that eventually brought him to the position of Computer Resource Director—and made the Lincoln Unified School District a pioneering role model for educational computer networking.

A look at the Lincoln experience may give you an idea of what to consider when setting up a network.

Assessing and Addressing Needs

Putting together an appropriate school network takes a lot of time and careful analysis. Tom Spadafore studied the school district for a year and a half before making his first network proposal to the board of trustees. His argument included the efficiency of distributive processing, the economics of managing and sharing software, the availability of multilaunch programs, and the desirability of making high-quality hardware, such as Apple LaserWriter® printers, accessible to a large number of users.

Eventually, Stockton students, teachers, and administrators all benefited from Tom's efforts. Networked computers have appeared on every administrator's desk. Each classroom has at least one workstation, and computer labs have as many as 30. The libraries are hooked up, too. All the users have easy access to the resources resident on the network. The 17 networks are connected to the district office so that the Computer Resource Director can monitor and troubleshoot their operation. Each school can communicate and share resources with the other schools, and users who have computers at home can dial into the district network.

Equipment

Computer hardware used in the networks includes Macintosh II file servers for administrative offices, Macintosh SE/30 file servers for computer labs, Apple IIGS and Macintosh computers in the labs and classrooms, at least one LaserWriter IINT printer per school, and Apple ImageWriter® printers placed strategically throughout each school.

Tom designed the networks for 22-gauge twisted-pair Farallon PhoneNET wire and phone connectors. Farallon PhoneNET StarControllers amplify the signal so that the network can run longer distances without signal degradation. The system uses RJ11 connector boxes, so that any computer can easily be disconnected from the system without interrupting the network. Such networks are flexible and easy to install, take advantage of existing wire, and make it possible for a student to disconnect a computer, reconnect in another location, and access his or her file folder or any resources on the network.

Applications

Network applications include administrative tasks, such as registration, grading, mailings, and record keeping; research using CD-ROM–based information; report writing and general schoolwork; desktop publishing of the school paper; checking out books from the library; connection to on-line services (GEnie, CompuServe, Dialog, SchoolNet, SpecialNet, and the AppleLink® network); and electronic mail.

Although Tom reports that problems in setting up and using the networks have been minimal, it did take a long time to sort through the software issues. Because most companies had not dealt with networking customers, it was sometimes difficult to secure a site license for the school district. In other cases, it was hard to find software that worked correctly on the network, even when it was billed as "networkable." Months of trial and error finally weeded out the software that didn't work satisfactorily and yielded a set of programs that filled the bill. The connectivity programs used most often are these:

- Let's Share: menu management (Russ Systems)
- AppleWorks® Network: network version of AppleWorks (Claris Corporation)
- MacSchool: school administration (Chancery Software)
- Bank Street Writer III: word processing and electronic mail (Scholastic, Inc.)
- Timbuktu/Remote: real-time troubleshooting (Farallon Computing)
- Various "AppleShare® aware" programs from MECC (Minnesota Educational Computing Corporation)

Expansion Plans

Although Tom works for Apple now, he's left a thriving computer resource group in Stockton. Over the summer they're installing five new AppleShare networks with existing Apple IIe computers and new Apple IIGS computers. By the fall, every school will have a server, an administrative network, and an educational network bridged to the district network. In fact, there will be six servers on the high school campus alone—with three networks for education and three for administration.

Lab Setup Tips

Tom favors a computer lab configuration that enables students to see everything that's going on, while allowing teachers enough room to easily oversee and help any student. U-shaped arrangements, for example, can work well. Inbound and outbound cables are fed overhead in the ceiling or under the floor to avoid students' tripping or damaging the interclassroom trunk cables. It's also helpful for the teacher to have a computer hooked up to a wall projector; students can then simply swivel their chairs to watch the teacher's presentations.

Networking Benefits

The biggest benefit of the school networks, according to Tom, is that "everyone gets the information they want." Students, teachers, and administrators appreciate the independence and the varied resources that are instantly available to them. If anything, they want more—more software, more hardware, more technology. They're no longer tied to the school print center or limited to the contents of the library. They have nearly unlimited potential for creative expansion, including flexible work and study practices.

The board of trustees is happy, too. The school district has been brought up to current technological standards, providing students with real-life experience using the technology that they will find in the workplace. Administration is free from the sluggish backlog caused by duplication of information and labor. And it all makes good economic sense. Networking has allowed the Lincoln Unified School District to get far more for its money than any stand-alone computer education program could provide.

Editor's Notes

- AppleWorks Network: The network version of AppleWorks, available to education customers only. For further information on the product, contact your Apple Education dealer or the Claris Corporation:

  Claris Corporation
  440 Clyde Avenue
  Mountain View, CA 94043
  (408) 727-8227

- Bank Street Writer III: AppleTalk® network system e-mail version of the word processor.

  Scholastic, Inc.
  730 Broadway
  New York, NY 10003
  (212) 505-3000

- Farallon Computing: Hardware manufacturer and software publisher of primarily AppleTalk products. The PhoneNET cabling system, PhoneNET StarController junctions, and Timbuktu/Remote software (for remote observation by a Macintosh computer of the operation of another Macintosh computer) are Farallon products.

  Farallon Computing
  2201 Dwight Way
  Berkeley, CA 94704
  (415) 849-2331

- Let's Share: Menu management software for Apple II networks; runs on a Macintosh computer.

  Russ Systems, Inc.
  1344 Pacific Avenue, Suite 103
  Santa Cruz, CA 95060
  (408) 458-5080

- MacSchool: School administration software for the Macintosh computer.

  Chancery Software Ltd.
  500 – 1168 Hamilton Street
  Vancouver, BC V6B 2S2
  Canada
  1-800-663-1050

- MECC: The Minnesota Educational Computing Corporation, a software publisher and education service organization.

  Minnesota Educational Computing Corporation
  3490 Lexington Avenue North
  St. Paul, MN 55112
  (612) 481-3500

Printing on Apple II Networks

Printing on an Apple II network requires that users consider the following three preparation issues:

- Printer assignment, via the Chooser (for startup from a local disk) or assignment by the network administrator (for startup from a server)
- Printing slot assignment and corresponding software slot assignment
- ImageWriter emulation for LaserWriter use

Printer Assignment: Startup from a Local Disk

Workstations that start up from local disks must be configured for printing through the Chooser application. Follow these steps:

1. Install the system software and utilities—including the Chooser—in the Startup ProDOS System Folder or subdirectory.
2. Open the Chooser and select the printer to which the workstation will print.
3. When using a ProDOS 8 application, open the program and set the printing default. Select the slot in which the workstation card is installed on an Apple IIe, or Slot 7 on an Apple IIGS.

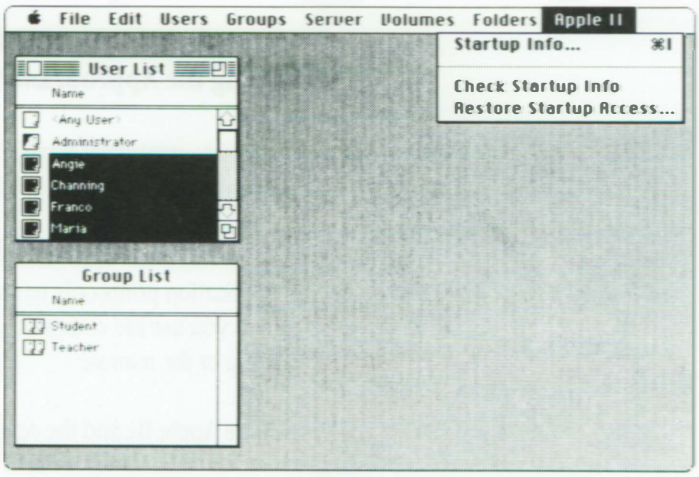


Figure 1

Printer Assignment: Startup from an AppleShare Server

The network administrator sets the network parameters according to guidelines in the *AppleShare File Server Administrator's Supplement for Apple II Workstations*. After installing the AppleShare server software and the Apple II resources (which come with the workstation software), the administrator assigns a printer using the AppleShare administrator program. Here are the steps for assigning a printer for workstations booting from the server:

1. Pull down the Apple II Menu (Figure 1) and choose Startup Info. You'll see a dialog box for specifying startup information about the selected users or groups.
2. Click Set Printer (Figure 2).
3. Choose the printer for the selected users.
4. Back in the startup information window, click Set Startup Application.
5. Choose the startup application, whether menu management software—such as Artistotle™ or Let's Share—or another application.

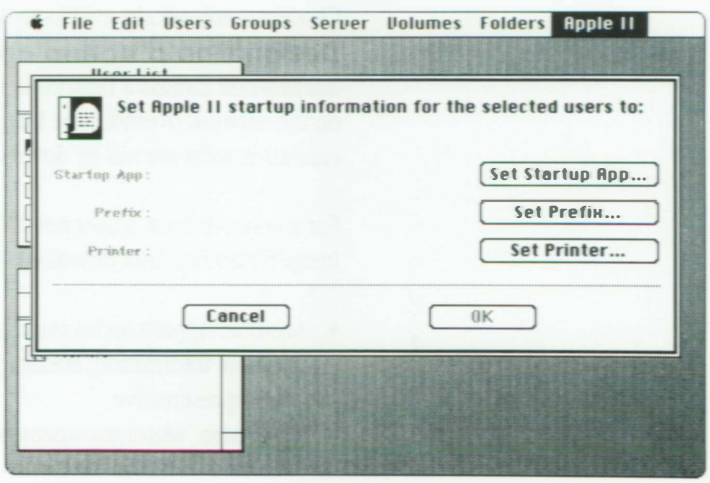


Figure 2

Notes:

- When a user starts up from a local disk, server settings don't affect the local workstation.
- Adding a menu display and management software program allows users to easily view and access applications or files on the server. Although all Apple IIGS systems running the Apple IIGS System Software Version 5.0 can "see" a file server on the network, in some cases it may be desirable to use menu management software along with Version 5.0, because such programs feature an interface specifically designed for classroom or workgroup use.

Assigning the Appropriate Printing Slot

Applications—especially ProDOS 8 applications—may be hard-coded to print to a specific slot number. Check the application's manual; it will indicate which slot must be used, or whether you can select a slot.

The Apple IIGS is hard-wired to Slot 7, and you will not need a workstation card to print. However, if your application prints only to a slot other than Slot 7, you cannot use it on the IIGS. Verify that the programs you use are compatible with the Apple IIGS—and can print to Slot 7—by checking the software packaging or the manual.

Note: The Apple IIc and the Apple IIc Plus computers cannot be used on a network.

The LaserWriter and ImageWriter Emulation

When starting up from a local disk, you can assign a LaserWriter or ImageWriter printer to your workstation by using the Chooser to select the appropriate printer. If you select a LaserWriter, the Chooser automatically checks to see whether the ImageWriter Emulator has been downloaded to the LaserWriter. If it hasn't, the Chooser downloads the emulation software—unless you cancel. The ImageWriter Emulator remains in memory until the LaserWriter is turned off or, in some cases, until a user on the network overrides the ImageWriter Emulator by printing from a PostScript®application. The emulation software will be downloaded again only when a user runs the Chooser.

For a network boot, a user needs to run the Chooser and choose the desired LaserWriter for the ImageWriter Emulator download.

- Aristotle: Apple's menu management server software for the Apple II; runs on a Macintosh computer. For more information, contact your authorized Apple Desktop Communications dealer or your Apple sales representative.
- Let's Share: Menu management software from Russ Systems, Inc.

Russ Systems, Inc.
1344 Pacific Avenue, Suite 103
Santa Cruz, CA 95060
(408) 458-5080

Desktop Publishing Applications for the Apple II

Desktop publishing applications for the Apple II now cover a range of options. Some of the available programs are outlined here.

geoPublish, from Berkeley Softworks, is an extension of the GEOS (Graphic Environment Operating System) software, which is included in the package. Hardware requirements include an Apple IIe, IIc, IIc Plus, or IIGS computer; a 5.25- or 3.5-inch disk drive; and a mouse or joystick. Along with pull-down menus and an icon-based environment, the program features three modes:

- Master Page: for establishing horizontal and vertical rules and creating a basic template for all elements that repeat on every page
- Page Layout: for importing text or clip art and for defining regions for graphics, text, or headlines
- Overlay Graphics: for creating oversize text and graphics, adding headlines or pull quotes, and creating special borders and large posters.

The three modes are designed to function as three pieces of transparent paper laid on top of one another; when you print, all three appear as a single page.

The program provides the choice of printing finished documents on a dot-matrix printer or using the geoPubLaser utility to print on the LaserWriter. Other features include the following:

- Stretching and scaling artwork to fit boxes
- Smoothing
- Importing graphics from a variety of graphics programs
- Built-in text editor (also imports AppleWorks, MultiScribe, or WordPerfect files)
- WYSIWYG display—what you see (on the screen) is what you get (from the printer)

Berkeley Softworks
2150 Shattuck Avenue
Berkeley, CA 94704
(415) 644-0883

GraphicWriter III, from Seven Hills Software, is written specifically for the Apple IIGS. It requires 512K of memory and at least one 3.5-inch disk drive, although two drives are recommended. GraphicWriter III supports super-high-resolution pictures along with color text and graphics. Word processing, graphics, and page layout are integrated instead of being separated into three modules. In addition to providing fast text entry and program execution and a pull-down-menu interface, the program allows you to insert a GraphicWriter III disk into a Macintosh system so that you can print from a LaserWriter. You can also initialize a storage disk from within the program using a New Desk Accessory provided free with the program. Other features include the following:

- Text and graphics importation
- Built-in spelling checker
- Sample page layouts
- Clip art
- 30 fonts in a variety of sizes

Seven Hills Software purchased GraphicWriter 2.0 from DataPak Software, and GraphicWriter III is a completely redesigned and rewritten program. Upgrades are available to owners of earlier GraphicWriter versions.

Seven Hills Software
2310 Oxford Road
Tallahassee, FL 32304
1-800-627-3836

Springboard Publisher 2.0 is targeted to users who have Apple II computers with at least 1 megabyte of available memory. Available for the Apple IIe, IIc, or IIGS, the program is optimized for use with a RAM disk and a mouse. Navigation is facilitated through integrated page design, word processing, and graphics creation: Double-clicking on the appropriate area changes modes automatically. Intuitive Text monitors and reformats documents automatically as needed. With a large amount of memory installed, the program works from RAM, which lets it run faster. On the Apple IIGS, Springboard Publisher 2.0 runs as much as three times faster than previous Publisher versions. The program has built-in PostScript printer support, as well as AppleTalk network printer support for both ImageWriter and LaserWriter printers. Although color is not supported, the Springboard Publisher provides the following other features:

- Keyboard shortcuts for pull-down menus
- Text and graphics importation
- WYSIWYG display
- Clip art
- Sample page layouts

Springboard Publisher requires a 128K Apple IIc, IIc Plus, IIe, or IIGS computer and a 1-megabyte RAM disk. Springboard also recommends a mouse and a 3.5-inch floppy disk drive or hard disk. An upgrade is available for owners of Springboard Publisher 1.0 or 1.1.

Springboard Software, Inc.
7808 Creekridge Circle
Minneapolis, MN 55435
1-800-445-4780

AppleWorks GS, from Claris Corporation, combines word processing, page layout, graphics, database management, spreadsheet analysis, and communications into a single integrated program for Apple IIGS computers with 1.25 megabytes of memory. AppleWorks GS allows you to open, view, and modify up to 14 windows at the same time. The interface provides WYSIWYG document display and printing to the LaserWriter, or in full color to the ImageWriter II printer.

Compatible with all major IIGS graphics programs, the AppleWorks GS Page Layout allows text and graphics from other AppleWorks GS applications to be copied and pasted into Page Layout documents. It supports full text editing and formatting, as well as object-oriented graphics tools.

Other AppleWorks GS features include the following:

Word processing
- Built-in spelling checker and thesaurus
- Automatic mail merge
- Optional keyboard command shortcuts
- Headers and footers

Spreadsheet
- Absolute and relative referencing
- Automatic color chart generation
- Manual and automatic recalculation
- Sorting and searching capabilities

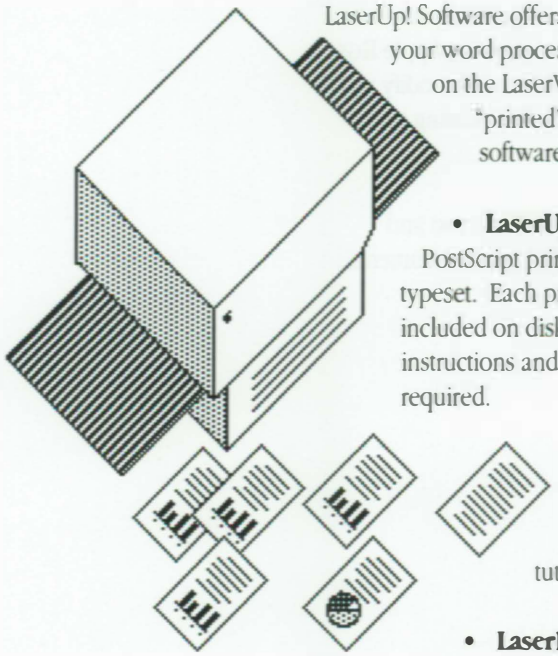
Database
- Graphic display interface
- Built-in report generator
- Numeric, string, date, and boolean functions with searching and sorting capabilities

Communications
- Supports Apple, Hayes, and Hayes-compatible modems—both internal and external
- Review buffer saves text as it scrolls off the screen
- Runs in background
- Supports XModem, YModem, Binary II, and ASCII file transfer protocols
- Built-in phone book and speed dial commands

Recommended hardware includes an Apple IIGS computer with 1.25 megabytes of memory, a hard disk or a second 3.5-inch floppy disk drive, and an RGB color monitor. Claris provides upgrade programs for owners of AppleWorks and MultiScribe GS.

Claris Corporation
440 Clyde Avenue
Mountain View, CA 94043
(408) 727-8227

LaserUp! Software Connects Apple II and LaserWriter



LaserUp! Software offers products that allow you to use an Apple II, II Plus, IIc, IIe, or IIGS computer and your word processing software to create high-quality formatted text or graphic images for printing on the LaserWriter. (Because PostScript programs consist of ordinary ASCII text that is "printed" through the serial port to the LaserWriter, you can use any word processing software that can save or print unformatted ASCII text.)

- **LaserUp! Utilities:** A collection of PostScript procedures for formatting text on a PostScript printer. The procedures are contained in files sent as "headers" to the text to be typeset. Each procedure can be edited or expanded for custom applications. The manual is included on disk, PostScript-formatted and ready to be typeset from your computer. Startup instructions and a command help sheet are already printed, and no other page-layout software is required.

- **LaserUp! Fonts:** Three downloadable analytic (not bit-mapped) fonts for PostScript printers. The display fonts are scalable from very small sizes (2 points) to very large sizes (at least 64,000 points). LaserUp! Fonts includes a tutorial that helps you use downloadable fonts with LaserUp! Utilities.

- **LaserDumps:** Two sets of programs that allow you to print any high-resolution Apple II screen on any PostScript printer. Each set offers three modes—high resolution (280 x 192), double high resolution (560 x 192), and quadruple high resolution (560 x 192 with two bit planes)—and provides control over scale and translation. The first set is controlled by menu and joystick and offers a WYSIWYG (what you see is what you get) interface. The second group is designed for computers without joysticks. The package includes a startup guide, cable diagram, screen reversal routine (for negative images), and hints on using PostScript printers.

LaserUp! Software
S. Anthony Studios
889 DeHaro Street
San Francisco, CA 94107
(415) 826-6193

GEOS: Integrated Software for Apple II Computers

GEOS (Graphic Environment Operating System), from Berkeley Softworks, is a set of programs for the Apple II, II Plus, IIe, IIc, and IIGS computers. It includes its own operating system, along with the following fully integrated interfaces: deskTop, geoWrite, geoSpell, Text Grabber, geoMerge, geoPaint, and geoLaser.

- The **deskTop** is the graphical interface from which the GEOS system operates. Supporting ProDOS files and hierarchical file structure, it automatically sorts files alphabetically or by size, type, or date of last modification, and allows you to view files in either icon or text mode.
- **geoWrite** combines multiple font images and variable styles with a WYSIWYG interface. It allows integration of geoPaint graphics and features variable vertical spacing, search and replace functions, headers and footers, superscript, subscript, and decimal tabs.
- Using a dictionary of more than 28,000 words, **geoSpell** finds and corrects misspelled words in any geoWrite document. The user can create personal dictionaries for special vocabularies, and the program features global search and replace options.
- **Text Grabber** converts documents from other word processors to the GEOS environment with formatting commands intact.
- **geoMerge** is a mail merge program that creates personalized form letters from geoWrite documents.
- **geoPaint** is a graphics workshop that enables the user to create charts, diagrams, or full-page images up to 8 by 11 inches. You can cut, copy, and paste images into other GEOS applications and documents, zoom in for detailed work, and preview entire pages.
- **geoLaser** supports LaserWriter output; the overlay print option allows creation of multicolumn and windowed pages.

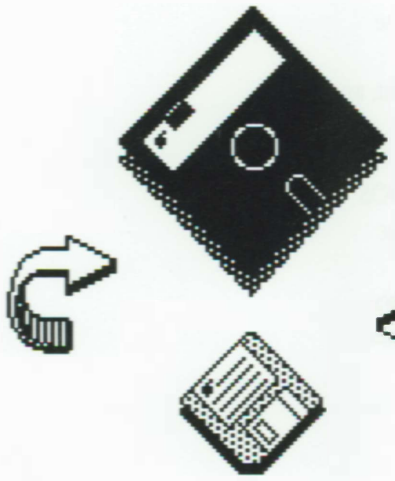
Requiring an Apple II computer with at least 128K of memory and an 80-column text card, GEOS supports multiple combinations of disk drives and RAM disks.

You can purchase three additional graphics-based programs to use separately or along with the base GEOS package; the operating system, fonts, drivers, and deskTop interface are included with each program.

- **geoFile** is a database management program that allows up to 115 fields per record. Both text and graphics may appear in data fields, and you can save up to 63 alternative record layouts. The program imports AppleWorks databases directly. A 256K RAM expansion board and a mouse are recommended.
- **geoCalc** is a spreadsheet that supports 45 mathematical functions and up to 64 user-defined functions for special calculations. Capable of importing and exporting AppleWorks files, the program also includes the geoChart graphing application for creating bar charts, line graphs, pie charts, and scatter plots.
- **geoPublish** is the GEOS desktop publishing program (see "Desktop Publishing Applications for the Apple II," page 17).

Berkeley Softworks
2150 Shattuck Avenue
Berkeley, CA 94704
(415) 644-0883

Apple IIGS Disk Copy Anomaly: GS/OS Versions 4.0 and Earlier



Under the GS/OS™ operating system, Versions 4.0 and earlier, when you try to copy a 3.5-inch disk to a 5.25-inch disk (or vice versa), you may have this problem: You are unable to write to the destination disk because the system perceives it as locked. The problem lies in the 5.25-inch driver. If the 5.25-inch disk is locked, the 3.5-inch disk registers as locked, whether or not it is actually locked. The same holds true for the reverse case: If the 3.5-inch disk is locked, all 5.25-inch drives will register as locked.

Until the 5.25-inch driver anomaly is corrected, don't write-protect or "lock" your 3.5- or 5.25-inch disks when you make copies.

How to Access Apple II Clocks from BASIC

To access the Apple IIGS clock from Applesoft, you need ProDOS 8 Version 1.2 or later. There are two methods, both of which require you to enter machine-language programs for the BASIC program to call.

The preferred method is the ProDOS Get_Time call ($82), which works on any Apple II running under ProDOS and with most Apple II–compatible clocks (since they all come with ProDOS patch routines). This call has no parameter list, and it cannot generate an error. It calls a clock/calendar routine, if there is one, that returns the current date and time to the system date and time locations ($BF90–BF93). If there is no clock/calendar routine, the system date and time locations are left unchanged.

The other method is to call the routine in the Miscellaneous Tool Set. While this routine doesn't require ProDOS, it works only on the Apple IIGS. Here is a short program that illustrates how it is done:

```
5  REM  Applesoft BASIC program that reads the Apple II GS clock and prints the
       time
6  REM
9  REM  First poke in the short machine-language routine
10 FOR X=768 TO 768+21
20 READ A
30 POKE X,A
40 NEXT X
99 REM  Main program starts here
100 GT=768 : REM   Address of our machine-language routine
110 TB=768+128 : REM   Address of time buffer used by the machine-language routine
120 PRINT CHR$(4);"pr#3"
140 CALL GT
150 TM$=""
160 FOR X=0 TO 19:TM$=TM$+CHR$(PEEK(TB+X)):NEXT X
170 HTAB 30:VTAB 12
180 PRINT TM$
190 GOTO 140
1000 DATA 24,251,194,48,244,0,0,244,128,3,162,3,15,34,0,0,225,56,251,96,0,0,0
```

The machine-language routine source code is as follows:

```
300:18              CLC             ; TURN ON 16-BIT MODE
301:FB              XCE
302:C2 30           REP #30         ; WITH 16-BIT REGS
304:F4 00 00        PEA 0000        ; PUSH OUR BUFFER ADDRESS ON STACK
307:F4 80 03        PEA 0380        ; THIS IS THE LONG ADDRESS FORMAT
30A:A2 03 0F        LDX #0F03       ; _GETTIMEASCII
30D:22 00 00 E1     JSL E10000      ; JSL TO TOOL LOCATOR
311:38              SEC             ; TURN BACK ON 8-BIT MODE
312:FB              XCE
313:60              RTS             ; AND RETURN
```

Note: You can use this same framework to make calls to ReadTimeHex if you want to store the date and time numerically instead of as ASCII characters.

Third-Party Product Tips

- **RGB Video Adapter for the Apple IIc**

  Users often ask about RGB video adapters for the Apple IIc. Telemax Inc. makes such a device: the Peacock RGB Module for the IIc (Model CM2C).

  Telemax Inc.
  P.O. Box 339
  Warrington, PA 18976
  (215) 343-3000

- **Recovery Software for DOS 3.3 and ProDOS Files**

  Copy II Plus, from Central Point Software, restores deleted files under both DOS 3.3 and ProDOS, provided you have not written to the disk since the file was deleted.

  Central Point Software
  15220 Northwest Greenbrier Parkway, Suite 200
  Beaverton, OR 97006
  (503) 690-8090

- **RF Modulator for Apple II Computers**

  Sources for an internal RF modulator for the Apple II, II Plus, and IIe computers are limited, but we can suggest the following vendor:

  Memory Plus Distributors
  505 South 48th Street, Suite 104
  Tempe, AZ 85281
  (602) 820-8819

Apple IIe and Apple IIGS: SCSI Card Location

Use the chart below to determine the best slot for an SCSI card in the Apple IIe or IIGS computer.

IIGS Slot Number	Comments
7	OK, if no AppleTalk devices are used
6	OK, if no Apple 5.25-inch drives are attached
5	OK, if no Apple 3.5-inch drives are attached
4	Not recommended
3	Not recommended
2	OK, if no modem or other serial device is used
1	Not recommended

IIe Slot Number	Comments
7	OK, unless other card is installed
6	OK, unless other card is installed
5	OK, unless other card is installed
4	OK, unless other card is installed
3	Not recommended
2	OK, if no modem or other serial device is used
1	Not recommended

Apple II Enhancement: Microprocessor Replacement Products

The following two products are microprocessor replacements for the Apple II Plus, IIe, and IIc computers.

Zip Chip, from Zip Technology, runs up to four times faster than the standard 1-megahertz 6502/65C02 CPU. It can be set to run at 18 different speeds, up to a maximum of 4 megahertz. With a 16K memory cache, the Zip Chip improves speed for systems with as much as 2 megabytes of RAM.

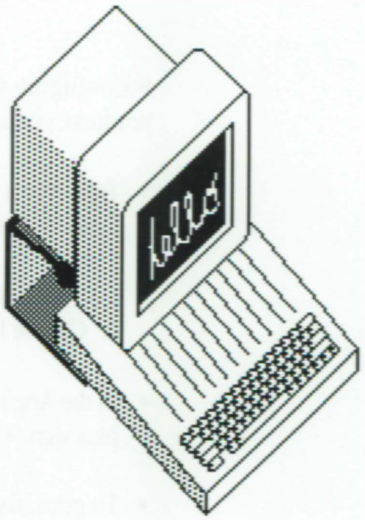
Zip Technology
5601 West Slauson Avenue, Suite 190
Culver City, CA 90230
(213) 337-1313

RocketChip, from Bits & Pieces Technology, speeds up the first 1.6 megabytes of RAM. The original product runs at speeds of up to a maximum of 5 megahertz, and the newest release, at speeds of up to 10 megahertz.

Bits & Pieces Technology, Inc.
31332 Via Colinas, Suite 110
Westlake Village, CA 91362
(818) 706-2978

Note: Because the Apple IIc doesn't have slots, microprocessor replacements may particularly interest Apple IIc users, who are not able to take advantage of accelerator cards, such as TransWarp from Applied Engineering (see *Technical Bulletin*, Issue 4, June–July 1989, page 28).

Choices in Hard Disk Drives for the Apple II



In addition to the Apple SCSI drives available for the Apple II, the following hard disk drives are available from third-party vendors.

- Applied Ingenuity Inner Drive 40: Replaces the power supply, fitting inside the Apple IIe or IIGS case. Designed specifically for the Apple II computer, the drive is available in versions for the Apple IIe and the IIGS, and in 20MB and 40MB sizes.

  Applied Ingenuity
  14922M Ramona Blvd.
  Baldwin Park, CA 91706
  1-800-346-0811
  (818) 960-1485

- Chinook CT-20c: The only currently available hard disk drive that works with the Apple IIc and IIc Plus. Providing 20MB of storage, it operates through the DB-19 external disk drive connector on the back of your computer. You can daisy-chain the drive to a UniDisk 3.5 or Apple 3.5 Drive, and you can chain additional 3.5-inch and 5.25-inch drives to the DB-10 connector on the back of the drive.

  Chinook Technology
  601 Main Street, #635
  Longmont, CO 80501
  1-800-727-5544
  (303) 678-5544

- Sider C96: With the largest storage capacity of all available Apple II hard disk drives, it includes a built-in tape backup unit. Providing a 90MB hard disk and a 60MB tape backup, the Sider C96 requires use of the supplied interface card.

  First Class Peripherals
  2875 Northwestern Parkway
  Santa Clara, CA 95051
  1-800-982-3232
  (408) 980-0200

- Western Digital Preference 40 Hard Disk AP: A 40MB SCSI unit for the Apple II Plus, IIe, or IIGS computer (requires an Apple II SCSI Card, which is not supplied).

  Western Digital Corporation
  2445 McCabe Way
  Irvine, CA 92714
  (714) 863-0102

AppleWorks Tips

Following are suggestions for using AppleWorks and AppleWorks GS. For further information about the products, contact Claris Corporation.

- To import a word processing file into an existing box in the Page Layout module in AppleWorks GS, do the following:

  1. Select the text tool and position the insertion point in the box where you want the text to appear.
  2. Choose Import File from the File menu.

- In the AppleWorks GS spreadsheet module, begin all formulas with an equals sign (=), instead of a plus sign (+), as in AppleWorks.

- To print labels from AppleWorks, set "Accepts top-of-page commands" to "No" by following these steps:

  1. Choose "Other Activities." Press Return.
  2. Choose "Specify information about your printer(s)." Press Return.
  3. Under "Change printer specifications," highlight your ImageWriter printer name. Press Return.
  4. Select "Accepts top-of-page commands" and press Return.
  5. You'll see "Change the value?" Select "Yes."
     "Accepts top-of-page commands" will now be set to "No" and you can proceed with the remaining preparation for labels (that is, set up a label-styles report, position the fields, and set page length to the length of the label).

- To change the order of the categories in the AppleWorks database module, make sure you are in single-record layout. If not, press Open Apple-Z. Then follow these steps:

  1. Press Open Apple-L.
  2. Place the cursor on the first letter of the name of the category you want to change. Hold down the Open Apple key while you use the arrow keys to move the category to a different location. You'll have to move *around* other categories; you can't move *through* them.
  3. When the categories are positioned to your satisfaction, press Escape.
  4. Choose the data entry order. The two choices AppleWorks offers you are these:
     — Order in which you defined categories
     — Left to right, top to bottom

- When you convert AppleWorks database files to AppleWorks GS, hidden fields in the layout will not be converted automatically. You must first change your layout to show all fields. Then AppleWorks can convert the information without complication.

- Take advantage of the windowing capabilities of AppleWorks GS. To "hot paste" material, press Control while dragging the highlighted material from one module to another—you don't need to cut and paste.

Claris Corporation
440 Clyde Avenue
Mountain View, CA 94043
(408) 727-8227

Resetting an Upgraded Apple IIc Computer

An upgraded Apple IIc may appear to be unable to perform an Open-Apple-Control-Reset, because with this system the timing of the keystrokes is critical. Here's how to make this key sequence work correctly: While simultaneously holding down the Open-Apple and Control keys, press and release the Reset key. Release the Open-Apple and Control keys only after you have released the Reset key.

Current Apple II System Software

Application	Current Version	Date Released
Applesoft BASIC		
ProDOS Applesoft Sampler	1.2	3/5/85
ProDOS BASIC Programmer's Examples	1.1	10/26/84
ProDOS Applesoft Command Interpreter (BASIC.SYSTEM)	1.1	6/18/84
Getting Down to BASIC IIe	1.1	6/12/86
ProDOS Applesoft Programmer's Asst. (APA)	1.4	6/28/84
Apple IIGS BASIC	1.0B4	9/15/87
System Disk (Apple IIe)	3.1	4/14/86
System Disk (Apple IIe, Apple IIc)	3.0	7/17/87
System Disk (Apple IIGS)	5.0	7/15/89
System Utilities (IIc, IIe), 3.5-inch	2.1.2	3/3/86
System Utilities (IIc, IIe), 5.25-inch	2.1.2	3/3/86
System Tools Disk (Apple IIGS)	5.0	7/15/89
Workstation Disk	1.0	4/20/88

Current Apple Upgrades and Updates

An **upgrade** enhances features of existing hardware or software. Generally, an upgrade involves a fee, and any additional Apple hardware must be installed by an authorized Apple service provider.

A software **update** consists of enhancements, fixes, or patches to software. An update to Apple software is handled through an authorized Apple dealer or your Apple sales representative.

Following is a summary of the Apple upgrades and updates currently available for Apple II products.

Enhanced Apple II SCSI Card

An enhanced version of the Apple II SCSI Card, Revision C, was developed to provide better performance with new and more sophisticated Apple II software. The card also increases the system's ability to handle different classes of SCSI peripheral devices.

If you have an Apple II SCSI Card and the ROM part number is not 341-0437, you may want to update the ROM.

Apple IIGS VGC Controller and ROM

Two free upgrades are available to Apple IIGS owners. The Video Graphics Controller (VGC) corrects video display problems that may occur in double high-resolution and standard text mode. The new ROM corrects minor bugs and provides enhancements for future software releases.

Apple IIe to Apple IIGS Upgrade

Your authorized Apple service provider can install a new logic board to upgrade the Apple IIe to an Apple IIGS.

Apple IIe to Enhanced IIe Upgrade (Apple IIe Enhancement Kit)

Your authorized Apple service provider can install the chips required to enhance the Apple IIe.

Apple Access II Version 1.3.1

This version of Apple Access II supports the Apple IIGS and is also compatible with the Apple IIe and Apple IIc. ($25 coupon required for upgrade; available 1/1/89 through 9/30/89.)

ProDOS Version 1.7

ProDOS Version 1.7 solves the problem that occurred with recognition of 1988 dates when third-party RAM cards were installed.

AppleWriter Version 2.1

AppleWriter™ Version 2.1 solves problems that occurred when non-Apple printers were used with earlier versions. AppleWriter has been discontinued; Version 2.1 is the last update that will be available.

AppleWorks

For information about upgrades for AppleWorks, please contact:

Claris Corporation
440 Clyde Avenue
Mountain View, CA 94043
1-800-544-8554

Apple IIGS System Software Version 5.0

Apple IIGS System Software Version 5.0 is available to owners who purchased an Apple IIGS computer or Apple IIGS System Software Update Version 4.0 between July 15 and October 31, 1989. Obtain a coupon from your authorized Apple dealer or from an Apple sales representative. An electronic version of the coupon resides on AppleLink under the Apple Programs icon, in the Updates and Upgrades folder. Owners who purchased the Apple IIGS prior to July 15, 1989, must pay a fee for the new software. Customers who subscribe to the Apple Software Update Program will receive the new software automatically.

Information for the *Choices in Hard Disk Drives for the Apple II* and *AppleWorks Tips* articles was taken from *A+* and *InCider* magazines.

The *Apple II Technical Bulletin* provides users with current technical information about Apple products. Featured topics may be under consideration, and new product versions may be under development. Therefore, it's appropriate to consider this publication as a bulletin that is correct at the date of publication, rather than as a long-term reference source.

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Apple Technical Bulletins are bimonthly publications designed to provide timely and useful technical information to Apple II and Macintosh users, particularly those who provide technical support to other users. Articles about new products, compatibility and connectivity issues, "power user" features, and product updates and upgrades help you use your Apple hardware and software more effectively and efficiently. Two editions are available for an annual subscription price of $129 each: the *Apple II Technical Bulletin* (order number B0134LL/A) and the *Macintosh Technical Bulletin* (order number B0133LL/A). Each edition is published six times a year, and each issue is approximately 36 pages long. Subscribers also receive the full text of each issue on disk. A storage binder is included.

Apple Technical Bulletins are available as a separate product or as part of the Apple Software Update Program. For more information, contact your authorized Apple reseller or Apple sales representative.

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