The Apple II Guide

A complete resource for users of
Apple II computers

1992

Current Apple logo

Apple Computer

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 at the time.

April

- In a videotaped message to educators in the United States, Apple reaffirms its commitment to Apple II users, and to bridging the gap between Apple II and Macintosh lines. John Sculley promises that a future, entry-level, color Macintosh will have an option to run Apple II software.

October

- Apple releases three low-cost Macintosh computers: Macintosh Classic®, Macintosh LC, and Macintosh IIsi. The LC is Apple's most affordable color Macintosh. It includes the ability to run Apple II software by using an Apple IIe coprocessor card.

December

- HyperCard IIGS, the Apple IIGS version of Apple's personal information management software for different media types, including video, graphics, and sound, is introduced. While retaining compatibility with version 1.2.5 for the Macintosh, HyperCard IIGS supports the color capability of the Apple IIGS and sells for $99.

- System software 5.0.4 for the Apple IIGS is released. It includes much faster printer drivers for the ImageWriter. For Apple IIe and Apple IIc owners, ProDOS 1.9 makes switching between programs much easier than previous versions.

1991 Bridging the gap between Apple II and Macintosh

March

- The Apple IIe Card ships for Macintosh LC. This card allows Macintosh LC owners to run Apple IIe software while taking advantage of the RAM, keyboard, mouse, and monitor of the Macintosh LC. It retails for $199.

June

- The AppleCD SC Plus ships. It's approximately 20% faster than the AppleCD SC. It costs $799.

- Apple makes HyperMover available to user groups and on-line services for distribution. HyperMover is a two disk set — one for the Apple IIGS and one for the Macintosh — that allows HyperCard stacks to be converted from the Macintosh to the Apple IIGS. The stack set can also convert HyperCard IIGS stacks to Macintosh format.

September

- Apple announces plans for new Apple II enhancement products: Apple IIGS system software 6 and HyperCard IIGS 1.1. Apple IIGS system software 6 includes three new File System Translators, two that support read-only access to Pascal and DOS 3.3-formatted disks, and one that supports reading and writing to Macintosh-formatted disks. Apple plans to ship Apple IIGS system software 6 and HyperCard 1.1 in early 1992.

- UG TV — User Group TV — is Apple's first ever user group broadcast. The satellite broadcast features on-air demonstrations by Apple product managers and product engineers, and an interactive question and answer session for both Apple II and Macintosh enthusiasts.

November

- Apple releases the Apple II 3.5 Controller Card. Users now have the power to use 1.4 MB 3.5-inch floppy disk drives with an Apple IIe or Apple IIGS computer. The Apple II 3.5 Controller Card also supports the Apple II UniDisk™ and Apple 3.5 Drives.
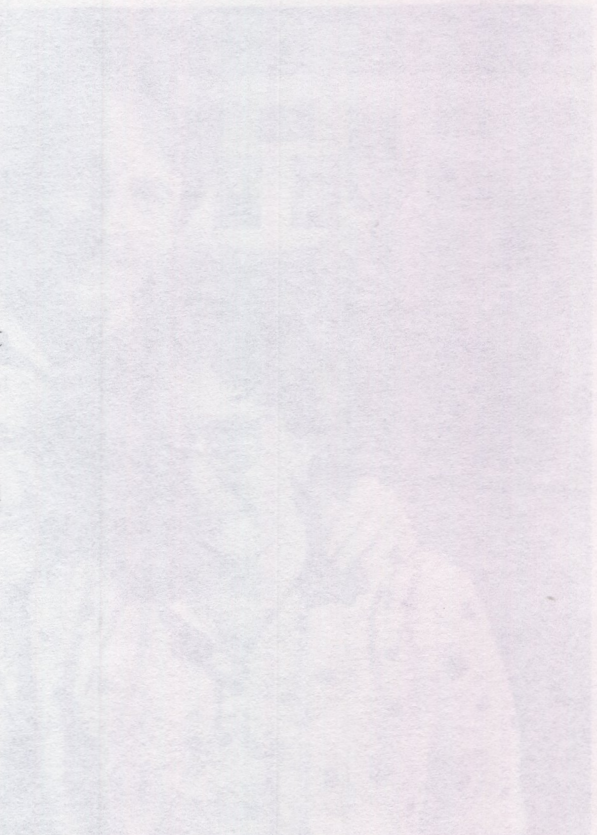
Connecting Your Apple II to a LaserWriter

How to improve the quality of your printed word

By now you've probably mastered Apple-Works and found software to create a variety of spreadsheets, graphics, and text files. But if you want to see the results of your work on paper, you need to connect your Apple II to a printer. You may be using a dot matrix printer like the ImageWriter to produce good copies for home use, but you might want to improve the clarity and professional quality of your output. Laser printers produce the highest-quality hardcopy for your Apple II.

The Personal LaserWriter NT, or any other Laser-Writer that can be networked on a LocalTalk network, is a good choice for Apple II users. You can use an Apple IIGS and LocalTalk or an Apple IIe, a LocalTalk card, and LocalTalk to create a network and enjoy the benefits of the LaserWriter NT, such as sharper edges. Still, your output is text-generated, which means the shape of the letters will not differ whether you use a dot matrix printer or a laser printer. Character generation resides in your computer, specifically, in ROM.

Connecting an Apple II computer to a Personal LaserWriter NT involves the following steps, which are described in detail in this article. For more detailed instructions, see the manuals that came with your computer, system software, and Apple II Workstation Card (for Apple IIe users).

If you are connecting the LaserWriter to an Apple IIe, you must first install the Apple II Workstation Card. See the *Apple II Workstation Card User's Guide* for instructions.

1. Connecting the cables;

2. Setting the Control Panel (Apple IIGS users only);

3. Installing the LaserWriter update (Apple IIGS users only);

4. Naming the LaserWriter;

5. Installing fonts (Apple IIGS users only); and

6. Choosing the printer.

Connecting the cables

To connect the LaserWriter to an Apple II computer:

1. Make sure both the printer and the computer are switched off.

2. Plug a LocalTalk connector box into the LocalTalk port on the LaserWriter. (The LocalTalk port is on the right side of the connector panel.)

3. Plug a second connector box into the Apple-Talk port on the workstation card installed in your Apple IIe or into the printer port on your Apple IIGS. If the printer port on your Apple IIGS is already in use, you can connect the connector box to the modem port instead. Connect the two connector boxes with a LocalTalk cable.

Setting the Control Panel (Apple IIGS users only)

If you are connecting the LaserWriter to an Apple IIe, you can skip these steps. Go to "Naming the LaserWriter" later in this article.

If you are connecting the LaserWriter to an Apple IIGS computer, the next step is to set the Control Panel to use AppleTalk software. There are two models of the Apple IIGS (ROM 01 and ROM 03), and each has a slightly different setup procedure.

If you are not sure which version of the Apple IIGS you have, watch the bottom of the screen as you start up or restart the computer.

For the Apple IIGS (ROM 01):

1. Open the Control Panel.

2. Choose slots from the Control Panel menu.

3. Set Slot 1 to "Your Card." Or if you connected the LocalTalk connector box to the modem port instead, set Slot 2 to "Your Card," and set Slot 1 to Printer Port.

   It is important to note that if you want to use the modem port for AppleTalk, you must set Slot 1 to "Printer Port" and Slot 2 to "Your Card." If Slot 1 is set to "Your Card," you must use the printer port for AppleTalk. See the documentation that came with your computer for more information.

4. Set Slot 7 to "Built-in AppleTalk."

   Although the LaserWriter is physically connected to Slot 1 (the printer port) or Slot 2 (the modem port), the Apple IIGS now acts as though the printer were connected to Slot 7.

5. Choose "Printer Port" from the Control Panel menu. Or if you connected the LocalTalk connector box to the modem port instead, choose "Modem Port" from the Control Panel menu.

6. Set Devices Connected to "Printer."

7. Set Add LF after CR to "YES."

8. Close the Control Panel and restart your computer.

Apple IIGS (ROM 3)

1. Open the Control Panel

2. Choose Slots from the Control Panel menu.

3. Set Slot 1 to AppleTalk. Or if you connected the LocalTalk connector box to the modem port instead, set Slot 2 to AppleTalk.

4. Set Add LF after CR to "Yes."

5. Close the Control Panel and restart your computer.

Installing the LaserWriter update (Apple IIGS users only)

If you are using a version of Apple IIGS system software older than version 4 or if you are connecting the LaserWriter to an Apple IIe, you can skip this step. Go to the next section, "Naming the LaserWriter."

If you are an Apple IIGS user, the next step is to use the Installer to install the LaserWriter update on your startup disks. See the documentation that came with your computer and system software for details on using the Installer.

Naming the LaserWriter

If your AppleTalk network system includes more than one LaserWriter printer, you'll want to give each one a distinguishing name. These names

appear in different places, depending on which computer and system software you are using:

■ On the Apple IIGS with system software 5, you'll find printer names in the Control Panel. Just click the LaserWriter icon.

■ On an Apple IIGS with versions of system software earlier than 5, the names are in the dialog box that appears when you choose "Choose Printer" from the File menu of an application.

■ On an Apple IIe, printer names appear in the Chooser II application.

Opening the Namer
The first step in naming your printer is to open the Namer application. How you do that depends on what kind of computer you have.

Apple IIe users
If you are using an Apple IIe, follow these steps:

1. Start up the Apple IIe with the Apple II Workstation Card disk.

2. Select "Printer Namer" from the menu. This starts the Namer.II application.

3. Go to the section in this article called "Using the Namer."

Apple IIGS users
If you are using an Apple IIGS, follow these steps.

■ Start the Apple IIGS with a startup disk. If you haven't installed the Namer on your startup disk, use the System Tools disk. Or if you are using a version of system software older than version 5, open the AppleTalk folder.

■ Open the Namer.II application. Or if you are using a version of system software older than version 4, open the Namer application.

■ Apple IIGS system software 6 users can use the "Namer" control panel.

Using the Namer
Once the Namer is open, follow these steps to rename the printer:

1. Select the LaserWriter as the device type. You'll see a list of printers of this type on the right side of the dialog box.

2. Select the name "LaserWriter" from the list on the right.

   The printer name automatically moves to the New Name box.

3. Type the new name, and select "Accept."

   You can use this procedure to name (or rename) all LaserWriter printers on the network. If you change the name of any printer, be sure to tell everyone else who uses the network.

4. Quit the Namer.II or Namer application.

Installing fonts (Apple IIGS users only)
If you are connecting the LaserWriter to an Apple IIe, this section does not apply to you. Continue reading the next section, "Choosing the Printer."

If you are using an Apple IIGS, you can install additional fonts on your startup disks with the Installer application, or you can copy additional fonts into the Fonts folder, which is inside the System folder on the startup disk.

If you are using a version of Apple IIGS system software older than 4, you must copy the fonts you want to install into the Fonts folder.

See the documentation that came with your computer and system software for details on adding fonts and using the Installer.
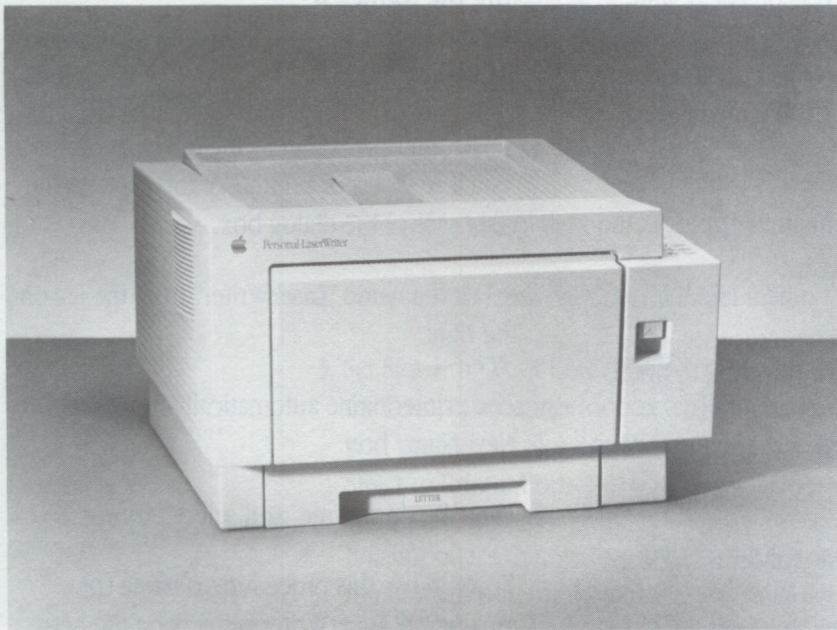
The Personal Laserwriter NT

Choosing the printer

The next step is to tell your computer which printer to use.

Apple IIGS users

If you are using a version of system software older than 5, you need to use the Chooser.II application or the "Chooser Printer" command in the File menu of your application to choose the printer. See the manuals that came with your computer, system software, and application software for instructions.

If you are using an Apple IIGS with system software 5 or newer, follow these steps:

1. Start the Apple IIGS with a startup disk that includes the LaserWriter update.

2. Choose "Control Panel" from the Apple menu.

3. Click the LaserWriter icon to select it. You may have to scroll through the list of icons to see the LaserWriter icon.

4. If necessary, select the correct AppleTalk zone. If your network is divided into several Apple-Talk zones, choose the zone your printer belongs to by clicking its name.

5. Select the printer you want to use.

   All LaserWriter printers on the network will be listed on the right side of the dialog box. Click the name of the printer you want.

6. If necessary, click the ImageWriter Emulator button.

   If your applications print to the LaserWriter as if it were an ImageWriter printer, you'll need to download the ImageWriter emulator software before you print. Most applications written for the Apple IIGS do not need the ImageWriter emulator to print on a LaserWriter. Check the documentation for your applications to see if the emulator is required.

   You'll see the message "Checking for presence of the ImageWriter emulator." If no one has printed with that LaserWriter since it was last turned on, you'll also see the message "Downloading the emulator," and the printer will print a page informing you that the emulator is installed.

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, versions 5.0.4 and 6. 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 many people, your interests include 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.

Most applications also need to talk to storage devices so that you can get to information easily. The most popular storage device is the disk drive. Application programs like to issue commands 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 eas-

ier management, and then group all of that information into files. Such a program is called a disk operating system, or DOS for short.

DOS is a specialized control program known more generically as an operating system, or OS. An operating system usually works in your computer's memory in coordination with 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 turn 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 a disk. This second program then uses the miniature programs on the interface card (known as firmware because they are software programs stored permanently on a hardware card) to load the rest of the operating 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 only with this disk organization.

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. In 1979 UCSD Pascal for the Apple II, or Apple II Pascal, was released 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 DOS 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 of memory 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.

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

> 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
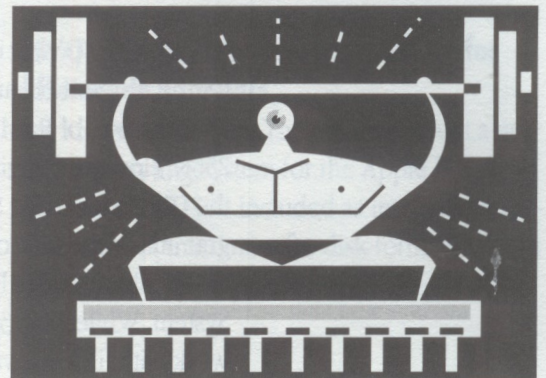
ProDOS: Power, sophistication à la SOS

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 Wendell Saunders' daughter. (SOS 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 Pro-DOS:

UniDisk™ 3.5	Apple's first 3.5-inch disk drive for the Apple II
Apple II High Speed SCSI Card	Connects any SCSI device to the enhanced Apple IIe and the Apple IIGS
Apple II ProFile	Allows ProDOS to work with the 5 MB or 10 MB ProFile hard disks
Apple 3.5 Controller Card	Connects any of Apple's 3.5-inch disk drives (UniDisk 3.5, Apple 3.5 Drive, SuperDrive) to any enhanced Apple IIe or Apple IIGS computer

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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 compli-

cated 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.

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 II computers 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.

The engineers for the Apple IIGS had a bolder move in mind, however. The successes of SOS, ProDOS, and 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 only knew 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, DOS 3.3 disks, or any kind of disk for which a translator existed.

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

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

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 generally 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 MB.

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.

How can ProDOS 8 v2.0 (included with Apple IIGS system software 6) recognize more than two devices in some slots? That has to do with a firmware protocol known as SmartPort, which allows up to 127 devices to be connected to an interface card. SmartPort is a more powerful way of talking to storage devices than the bare-bones level needed by ProDOS, and GS/OS takes advantage of it to talk to devices faster. ProDOS 8 versions 1.2 and later have recognized up to four SmartPort devices in Slot 5 by pretending the third and fourth devices were really in Slot 2 — but this required the SmartPort interface on the card or in the computer to know the details. In other words, the interface had to know that a request to Slot 2 was really a request to the third and fourth devices in Slot 5. The built-in firmware in the Apple IIGS disk port, as well as both the Apple II SCSI Card and the Apple II High-Speed SCSI Card know how to do this.

In ProDOS 8 v2.0, ProDOS does all the translation instead of putting the burden on the peripheral card. If you have a SmartPort interface, ProDOS 8 v2.0 will automatically remap the devices beyond the second device in each slot to lower slots, and when someone tries to use those "phony" slot and drive numbers, ProDOS 8 translates them back into SmartPort calls. This makes a lot more devices available to you in any slot, but it still doesn't change the fact that ProDOS 8 uses one bit in each of seven slots to indicate drives, so you still can't have more than 14 (7 times 2) devices, total.

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

GS/OS also made it possible for 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 IIGS 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 GS/OS driver for use with 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 with existing applications, the Pro-DOS file system translator has to stay within the limits of ProDOS.)

Apple IIGS System Software Version 5.0: More changes for GS/OS

ProDOS 8 is now a mature system that hasn't changed much in the past several years. But GS/OS was expanded with the release of Apple IIGS system software, version 5, which shipped in 1989. Among its new features were an AppleShare FST that allows the operating system to use AppleShare file servers as disks. In system software version 5, GS/OS was also made restartable from memory, so you don't have to wait for all the parts of GS/OS to reload from disk after running a ProDOS 8 application. This dropped the time it took to quit from ProDOS 8 to GS/OS from an average of 30 seconds to an average of 2 seconds.

The Apple 3.5 Drive device driver got a new feature called scatter read. Scatter read allows the drive to read an entire track of the disk in one revolution of the disk and "detangle" the information later, making reading large amounts of data two or four times faster than before.

A new "ExpressLoad" feature made loading into memory of specially-processed program files up to eight times faster — one large application's loading time went from four minutes under 4 to 15 seconds under 5!

The operating system and system software are the backbone of the work you do with your computer

The system software consists of more than just the operating system, GS/OS. It also includes the utilities and programs that implement the desktop interface. Because the ability to do pull-down menus, buttons, windows, and icons is built into the system, every program can do the same things the same way. This helps Apple IIGS programs be more consistent. Together, the mostly non-disk related programs and routines in the ROM of the Apple IIGS computer that are updated and enhanced by system software are called the *Toolbox*.

The Apple IIGS toolbox was made faster in version 5, resulting in a truly remarkable speed increase for almost every desktop application. A new Control Panel desk accessory added graphical control of built-in features, and also let third-party developers expand it by creating their own Control Panel extensions. For more information about the changes and features of version 5.0 of the system software, see the *Apple IIGS System Software User's Guide, Version 5*.

After 5: How to raise the bar once again

The first order of business after the release of Apple IIGS system software 5, was to deliver on the capabilities of GS/OS by providing the file system translators for disk formats that Apple IIGS owners wanted to use. A read-only FST was created for Apple's DOS 3.3 and Apple II Pascal disks, so you can read files from those disks in any GS/OS application (although you have to save them to disks of other formats). However, the biggest new FST was also the most difficult to create — a program that can read *and write* the powerful, complicated file system used on the Macintosh, known as the "Hierarchical Filing System" (HFS). Since HFS disks include more

information for each file than ProDOS disks do, the engineers also changed the ProDOS FST to hold more information about each file in certain cases, so more files can be transferred back and forth between HFS and ProDOS disks without losing any information. The engineers also realized that since HFS and DOS 3.3 disks can have much longer names (with more characters from the keyboard in them, like spaces and symbols like "#" or "&"), people might be confused when a name they saw on one disk didn't work on another disk. To help remedy this potential source of confusion, they gave each FST that allows you to write files a routine that tells you which names are legal and which names aren't. The rest of the system software uses this capability to let you know when the name you want to use won't work on a given disk.

This set of translators represented a tremendous change to GS/OS — not only was creating the translators a formidable task, but the inner workings of GS/OS had to be significantly changed and enhanced to allow for unexpected variations needed for the different file systems and the new capabilities. Implementation from initial ideas through final released product took over two and half calendar years, requiring the effort of well over a dozen software and quality assurance engineers for the entire period.

The engineering and marketing teams realized that it would take much longer to complete these features with the necessary quality. HyperCard IIGS was also being created and needed new, powerful capabilities in the system software and users required fixes to some bugs that had been discovered in version 5.0.2. So, the engineering team switched gears in mid-1990 and split some projects down the middle — work

continued on most of the new features, now destined for a software release called version 6, and existing software bugs were fixed and some small new features added for a new release in late 1990 known as version 5.0.3.

Version 5.0.3 included several new features and enhancements, with one of the most notable enhancements being a new version of the tool which allows you to pick files to open and close within applications. The new version of this tool (known as "Standard File Operations," because it lets applications do file operations in a standard way) works more intuitively, more reliably, and adds new features and shortcuts for experienced users. Version 5.0.3 also included a brand-new ImageWriter LQ printer driver, allowing owners of that printer to use its full 27-pin, 300 dpi quality for the first time from desktop applications. The same technology was used in a new ImageWriter II printer driver, making the interface easier to deal with and printing up to twice as fast and more reliable. Twenty pages of "release notes" explaining the differences between 5.0.2 and 5.0.4 (released six weeks after 5.0.3 to fix some final bugs) are available from APDA and most of the on-line services.

Meanwhile, the other half of the engineering team continued work on new enhancements for Apple IIGS system software 6, and then the whole team went full-tilt on it after the release of 5.0.4 in late 1990. ExpressLoad was merged into the System Loader, so both functions would take less memory. The Finder was extensively revised to work more easily with multiple file systems. The toolbox was extended by the addition of the Media Control tool set, which controls media devices like compact disc players and laserdisc players. The existing tools were significantly

enhanced and updated. For example, the toolbox gained a way to let all programs deal with inserting disks into disk drives in the same way. Another of the dozens of new features allowed desk accessories to have more than one window, which led to the creation of version 2.0 of the Control Panel, where each Control Panel device opens in a separate, independent window.

New device drivers in system software 6 include those for the Apple Scanner, the Apple Tape Backup unit, the Apple II Memory Expansion card (which doesn't increase the amount of system memory available in an Apple IIGS computer but does work as an independent RAM disk), and an Apple 5.25-inch driver that's up to three times faster than before. The SCSI drivers include new capabilities for dealing with Macintosh hard drives and now include the capability to write-protect SCSI disks from software. Just click a check box in the Finder; no switches to flip or plugs to plug. A new printer driver for the Style-Writer™printer gives great output from the inexpensive, high-quality printer (under desktop applications only). Large versions of most of the Apple IIGS standard fonts are included with system software 6 to make printing work that much better. System software 6 even includes a backup program, a new, easier-to-use Installer, as well as a simple text processing program for things like "Read me first" files.

And somewhere in all this, Apple engineers found time to create a new version of ProDOS 8, version 2.0, which lets you access more than two devices in a slot if the interface card uses the SmartPort firmware protocol. Version 2.0 only runs on Apple IIc, Apple IIc+, enhanced Apple IIe, or Apple IIGS computers. (See the sidebar on page 110 for more information.)

All of these enhancements in system software 6 are designed with one goal in mind: to make it possible for you to do more things more easily with your Apple II computer. The system software is the backbone of the work you do with your computer, and version 6 of the Apple IIGS system software strengthens that backbone so it can carry the weight of more work — to empower *you* to do things you never imagined. After all, that's what Apple's vision of personal computing is all about.

Matt Deatherage works in Apple's Developer Technical Support group, where he was the technical leader for Apple IIGS System Software 4.0 through 5.0.2, 5.0.4, and 6 and was the co-lead on versions 3.2 and 5.0.3 . He has written dozens of technical notes as well as articles for APDAlog , develop, GS +, and Call -A.P.P.L.E magazines. He also presided over the 1990 Apple II Developer Achievement Awards in a tuxedo!

If you are interested in more information or finding an Apple II User Group near you, 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 48AA
Cupertino, CA 95014

Thanks to the User Group Connection, user groups are able to distribute Apple software to members. This software is also available on major on-line services such as GEnie and America Online. Here's the list:

Software	Description
System 6	The latest version of Apple's system software for the Apple IIGS. The software comes on a set of five 3.5-inch disks.
System 5.0.4	The enhanced version of System 5 for the Apple IIGS. The software comes on a set of two 3.5-inch disks and CD-ROM.
HyperMover 1.1	HyperMover is a set of HyperCard stacks that translates Macintosh HyperCard stacks to HyperCard IIGS format. It can also translate HyperCard IIGS stacks to Macintosh format. The software comes on a set of two 3.5-inch disks — one disk for the Apple IIGS and one disk for the Macintosh.
System 3.3	Contains ProDOS 8 v2.0, Basic.system, FastCopy, and the Apple System Utilities. The software comes on one disk in either 5.25-inch or 3.5-inch media.
System 3.2	Contains ProDOS 8 v1.9, Basic.system, FastCopy, and the Apple System Utilities. The software comes on one disk in either 5.25-inch or 3.5-inch media.
DOS 3.3	The DOS 3.3 System Master.
Apple IIe Card Software 2.0	The operating software for the Macintosh LC's Apple IIe Card. The software comes on a set of three 3.5-inch disks: two high-density disks that contain the IIe Installer Disk and the IIe Startup Disk. A third disk contains the IIe Startup Updater program that updates the software to version 2.0.1.

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.