A+

The #1 Apple II Magazine

IIGS VIDEO DIGITIZER

Thanks for the

MEMORY

A Guide to Apple IIgs Memory Expansion

VIP PROFESSIONAL
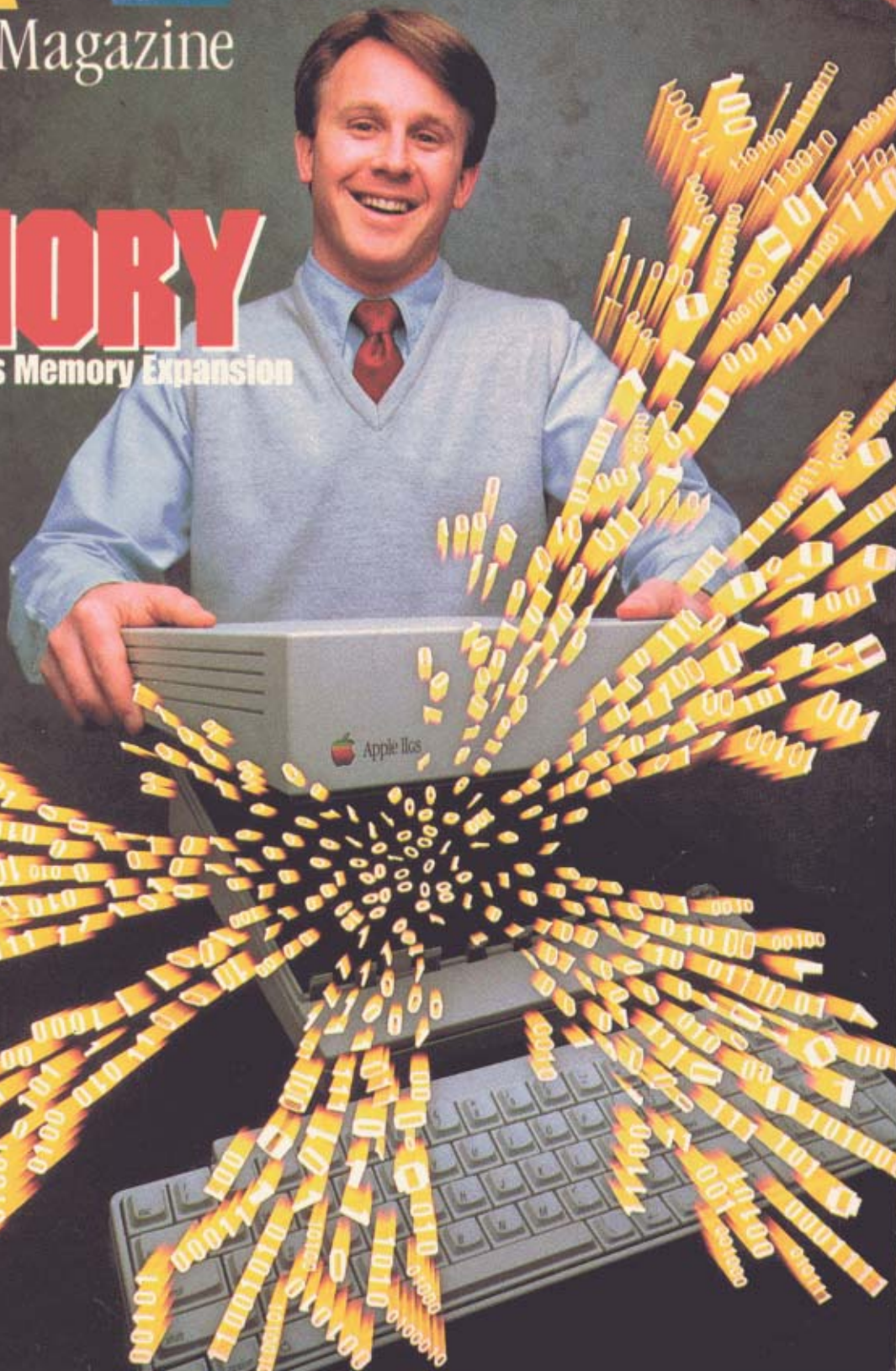An In-Depth Review

TEACHERS' TOOLBOX
Language Arts Programs
for Grades 4–6

DIVERSI-DIAL
Connect Up to
Seven Modems
to Your Apple

Apple IIGS

Thanks for the MEM

COVER STORY
BY GARY B. LITTLE

Extra memory that lets you

A standard Apple IIGS comes with 256K of RAM, twice the standard memory capacity of either the IIe or IIc. This configuration is perfectly fine for running IIe/IIc-style programs. As new IIGS owners will tell you, however, it just isn't enough to run the new IIGS applications that use the Macintosh-like desktop environment that the IIGS's software tool sets provide—these types of programs typically need plenty of memory to hold RAM-based tool sets, custom fonts, desk accessories, and so on.

A case in point is PaintWorks Plus, the first major IIGS-specific application to be released (see "Speaking of Graphics" in this issue). It requires a minimum of 512K, much to the chagrin of purchasers of minimal IIGS systems. The Apple IIGS Programmers Workshop (APW), for developing applications on the IIGS, requires a one-megabyte system!

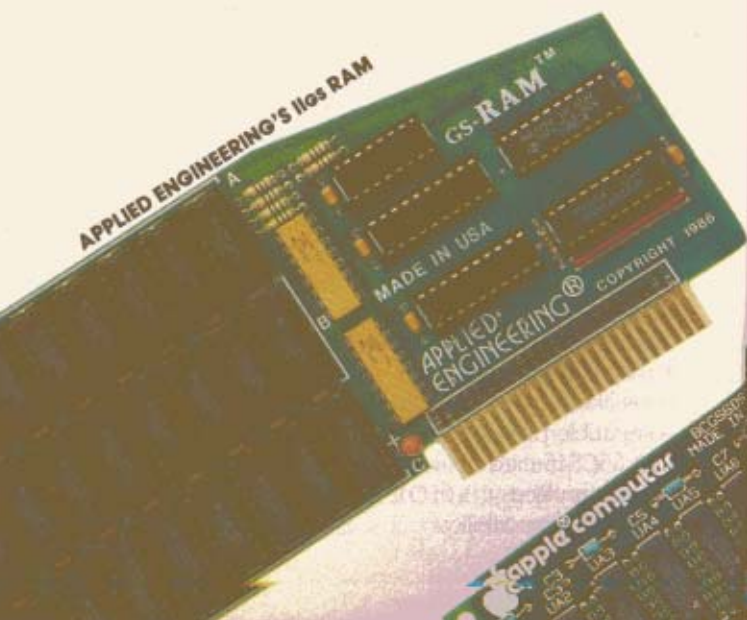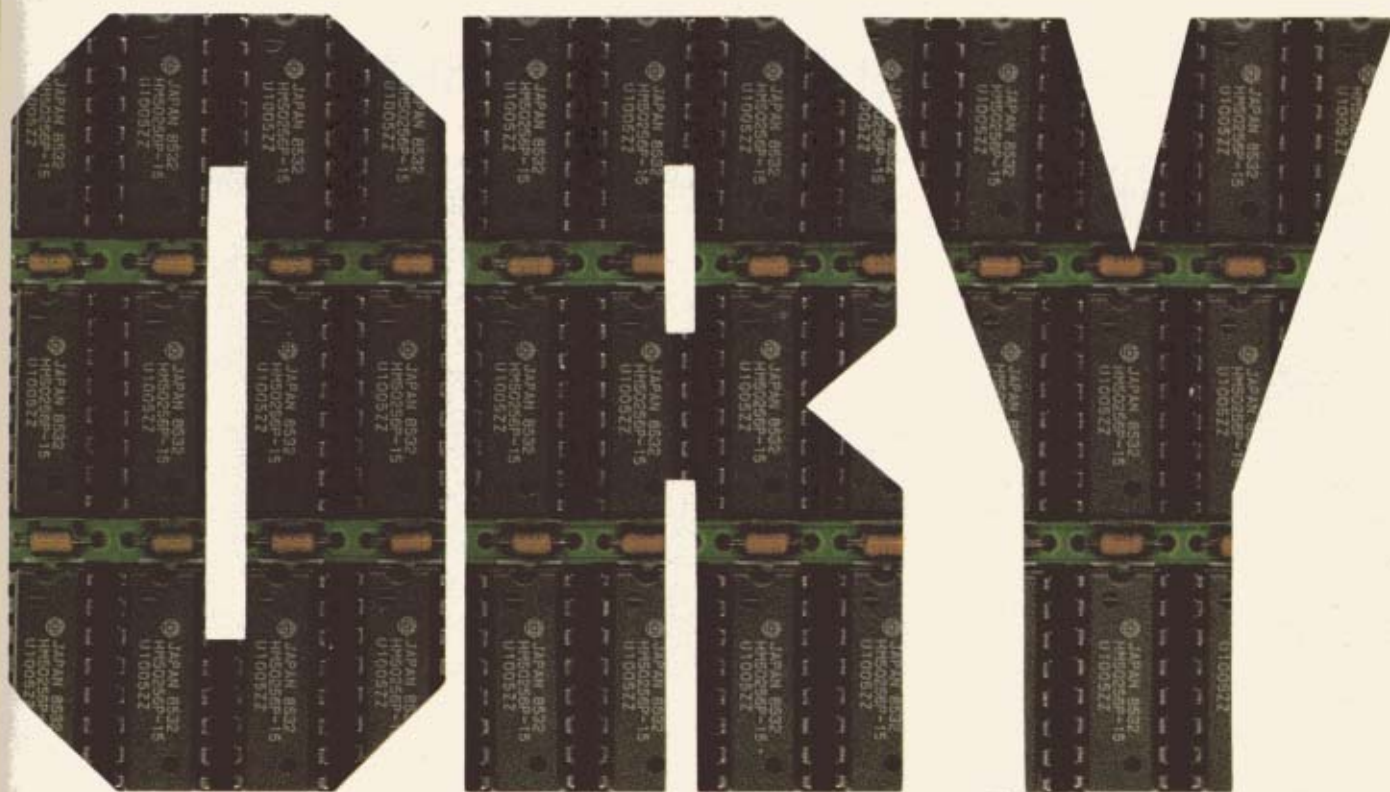For some application programs, you may not need extra memory, but

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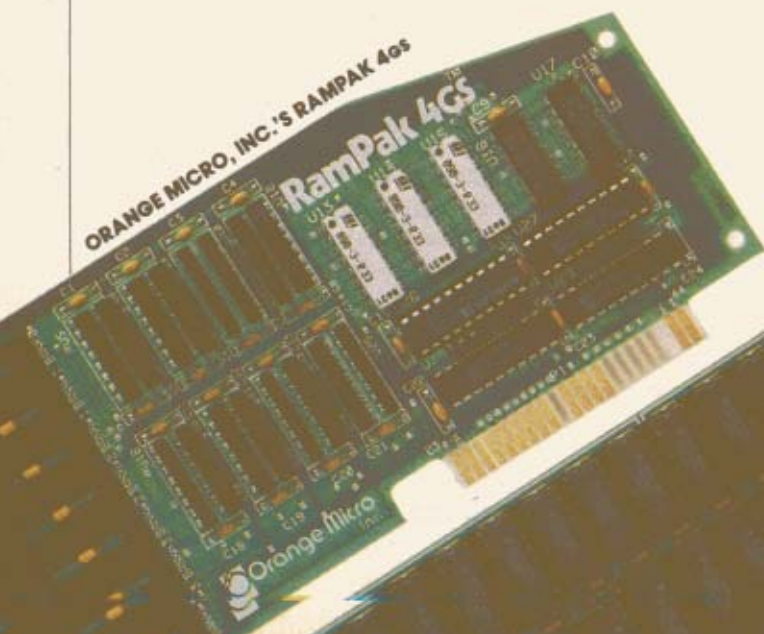
take advantage of IIGS software

the program will perform much better if you do have it. The best example is version 2.0 of AppleWorks. It uses extra memory to increase its desktop space to let you have several large files open at the same time.

You may also want to add extra memory to take advantage of utility programs that make the IIGS faster and more pleasurable to use. Here are some of the things extra memory is good for:

• a RAMdisk (emulation of a disk drive in the computer's memory)

• a disk-caching area (memory that holds disk contents and anticipates the reuse of that data, providing faster processing speed)

• a print-spooling area (memory that holds formatted data that is being fed to a printer, usually while the computer performs other functions)

• a buffer area for copying disks (memory for storing large portions of a disk's contents, allowing copying in fewer passes)

• a buffer area for digitized sound

APPLE'S IIGS MEMORY EXPANSION CARD

MDIDEAS, INC.'S OCTORAM

(memory for receiving real-time sound data)

The ability to use extra memory as a RAMdisk is actually a built-in feature on the IIGS. Using the Control Panel's RAM Disk command, you can allocate as much of available memory as you like for use as a RAMdisk.

In this article I look at all the memory cards available for the IIGS that plug into its unique memory-expansion slot. This slot is the one whose connector is located at the front right-hand corner of the motherboard, next to the Ensoniq sound chip. RAM on a card in this slot forms part of the 65816 address space, so programs can use it just as they would use the 256K memory core. The memory limit for such cards is eight megabytes.

Memory cards such as AST's SprintDisk, Applied Engineering's RamFactor, and the Apple II Memory Expansion Card, all of which plug into a standard I/O slot, also work on the IIGS. I am not covering them here because I described them in my article on memory expansion in the August 1986 issue of *A+* ("Turbocharge," pages 20-26). Also, keep in mind that since the memory on these cards is not part of the 65816's address space, they won't really help you run large IIGS applications—you can use this type of memory only as a RAMdisk.

Here is the bottom line: You absolutely, positively must buy a memory card for the IIGS that plugs into the memory-expansion slot. If you don't, you won't be able to take advantage of the exciting new software that's coming out for the IIGS. So let's take a look at what's currently available to help you out and consider the various chip configurations.

Thanks for the MEMORY

IIGS Memory Expansion Card

The first memory card to become available for the IIGS was Apple's own Apple IIGS Memory Expansion Card. It comes with 256K of RAM, but you can expand it to 512K or 1 megabyte (1M) by adding one or three rows of eight 256K × 1-bit memory chips to empty sockets on the card. (Apple doesn't recommend a 768K configuration because some programs can't handle it.) These chips are inexpensive, about $50 for a set of eight. (Eight chips gives you 256K of memory.)

The Apple card is definitely a plain-vanilla product. It comes with no software, not even a RAM diagnostic program for testing for bad memory chips. In addition, you cannot expand it past 1M or add any ROM to it. Nevertheless, it is an attractive card because of its low price and excellent owners' guide. The guide clearly illustrates how to install the card and add memory to it, and it contains a useful chapter describing how to allocate memory on the card for use as a RAMdisk.

Applied Engineering IIGS RAM

Applied Engineering is a well-known manufacturer of RAM cards for Apple II computers. Its two main products, RamFactor and (for the IIe only) RamWorks, have sold in the tens of thousands. It is no surprise, then, to see the company come out with a IIGS-specific memory card.

Applied Engineering actually has two such cards: IIGS RAM and IIGS RAM Plus. The IIGS RAM uses 256K × 1-bit RAM chips and can

hold up to 1.5M of memory. It is essentially the same as Apple's card but with two extra rows of eight RAM sockets.

The IIGS RAM Plus looks similar to the IIGS RAM, but it uses 1024K × 1-bit (one-megabit) RAM chips, meaning that each row on the card holds one megabyte of memory, so the capacity of the card is six megabytes. A set of eight of these chips is still expensive, about $400, but the cost is dropping fast.

Applied Engineering has a good upgrade policy that allows you to trade in your IIGS RAM for about 75% of its value when you buy a IIGS RAM Plus—something to keep in mind as the price of the megabit RAM chips drops.

Both cards contain an expansion port that you'll be able to use to add 2M more RAM, or ROM, via a piggyback card that Applied Engineering is planning to offer.

The IIGS RAM and IIGS RAM Plus come with diagnostic software and the AppleWorks 2 Expander program. The Expander enhances Apple-Works 2.0 so that it works even better than it already does with IIGS memory cards. The special enhancements it offers include

- More lines in the word-processing module (22,600 vs. 7250)
- More records in the database module (22,600 vs. 6350)
- More lines in the word-processing and database clipboard (2042 vs. 250)
- Display of the current time on-screen
- The ability to save large files to multiple disks
- A print buffer of up to 64K (vs. 2K)
- Single-key time entry in the database

The *IIGS RAM Installation Guide* is terse but understandable. It refers to

IIGS MEMORY CARDS: *A Comparison Chart*

	MEMORY RANGE	MINIMUM INCREMENT	RAM-CHIP SIZE	ROM CAPABILITY	UTILITY SOFTWARE
IIGS Memory Expansion Card	256K–1M	256K	256K × 1	none	none
GS RAM	256K–1.5M	256K	256K × 1	optional	diagnostics
GS RAM Plus	1M–6M	1M	1024K × 1	optional	AppleWorks enhancements
RamStak Plus	256K–1M	256K	256K × 1	on card	diagnostics, ROM programmer
plusRAM GS2	256K–2M	256K	256K × 1	optional	diagnostics
plusRAM GS8	1M–8M	1M	1024K × 1	optional	DOS 3.3 RAMdisk
OctoRAM	256K–2M	256K	256K SIMM	optional	diagnostics
OctoRAM	1M–8M	1M	1M SIMM	optional	diagnostics
RamPak 4GS	512K–4M	256K	256K × 4	none	diagnostics, caching, statistics

the *Apple IIGS Owner's Guide* for information on how to use IIGS RAM as a RAMdisk.

MDIdeas OctoRAM

The MDIdeas OctoRAM is an interesting memory card that contains eight standard SIMM (single in-line memory module) sockets that can hold 256K memory modules or 1M memory modules. Thus, the card's capacity is either 2M (eight 256K SIMMs) or 8M (eight 1M SIMMs). MDIdeas indicates that it is developing a piggyback card for ROM expansion, but it is not available yet.

A SIMM is a small printed circuit card with eight memory chips soldered to it. To add it to the memory card, you simply clip it into a socket on the card. SIMMs are new to the Apple II world, but Apple has already used them on the Macintosh Plus, which has four SIMM sockets to which you can add 256K SIMMs (1M total) or 1M SIMMs (4M total).

The 1M SIMMs are currently a bit more expensive than conventional memory chips and are more difficult to find since fewer manufacturers produce them. They are expected to drop in price, but at a slower rate than the 1024K × 1-bit RAM chips.

The only software OctoRAM comes with is a diagnostic program. The card's manual is brief and explains only how to install the card and the SIMMs. It does not explain how to use the card as a RAMdisk.

Orange Micro RamPak 4GS

Orange Micro's memory card is called the RamPak 4GS. As its name suggests, its maximum capacity is 4M. It is the only memory card that uses 256K × 4-bit memory chips, which means you can increase memory by 256K by adding only two chips. This arrangement makes the board less crowded than cards that use 256K × 1-bit RAM chips (where eight chips are necessary for 256K). Two 256K × 4-bit chips are still more expensive than eight 256K × 1-bit chips, however, because of their scarcity and nonstandard size.

The RamPak comes with a Memory Management Utilities disk, which contains a useful and easy-to-use program that verifies memory, reports disk-access statistics, and does disk caching.

This program installs itself as a desk accessory (like the Control Panel), so you can call it up at any time simply by pressing Control/open-apple/Esc.

Thanks for the MEMORY

The most interesting aspect of the RamPak software is its ability to enable disk caching for any disk device you use with ProDOS. Caching is the storing of disk blocks in memory so that when a read operation occurs, the computer can retrieve the block quickly from memory rather than from the relatively slow mechanical drive. If most of the disk is cached, file operations speed up dramatically.

The main advantage of caching over using a RAMdisk is that there's no danger of losing data, because only read operations are cached. Data always transfers to the disk when a write occurs. Another advantage is that you don't have to explicitly transfer files to the cache; the caching software takes care of it automatically the first time you load a program into memory.

The RamPak software is able to use up to 3.5M as a cache buffer. You can either tell the software how much memory to use as a cache or instruct it to allocate memory according to need.

The RamPak operators' manual is comprehensive and does a good job of explaining how to employ the memory-management utilities.

AST Research RamStakPlus

The AST RamStakPlus is interesting because it is the only memory card that contains sockets for ROM. Its maximum RAM capacity is 1M (four rows of eight 256K × 1-bit chips), the same as that of Apple's card. It's too bad it wasn't designed to hold more RAM, but squeezing more onto it would be difficult because the ROM sockets take up a lot of board space.

The RamStakPlus was not ready to ship when I wrote this article in February (it should be available now), but I was able to review a preliminary version of the *User's Manual* to discover the card's features.

The RamStakPlus has four ROM sockets, each of which can hold an 8K–64K EPROM (Erasable Programmable ROM) or a 2K–32K EEPROM (Electrically Erasable Programmable ROM). You will probably want to use an EEPROM, because you can erase them and program them simply by running a program. You need a special programming device to program an EPROM.

The RamStakPlus comes with a utility program that performs diagnostics and programs EEPROMs. Programming an EEPROM is sim-

ADDING MEMORY TO EXPANSION CARDS

If your memory-expansion card is not fully populated when you buy it, you will eventually want to add more RAM chips to it. (You can buy RAM chips at electronics-parts stores and mail-order warehouses.) At this stage, you will have to determine what types of RAM chips to buy and where to install them on the card.

Various manufacturers produce RAM chips to meet many different specifications, so you must be careful to choose the right ones for your card. For IIGS cards, you need RAM with a speed specification of 150 nanoseconds or faster that uses the "CAS before RAS" refreshing technique. The capacity and configuration of the RAM chips is also important; the possible choices are the following:

- 256K × 1 bit (8 chips = 256K)
- 1024K × 1 bit (8 chips = 1M)
- 256K × 4 bit (2 chips = 256K)
- 256K SIMM
- 1M SIMM

Consult your card's manual to determine what kind of RAM chip the card requires and how many chips you need (eight for 256K × 1 or 1024 × 1; two for 256K × 4; or one SIMM). If you want to play it safe, order the RAM chips directly from the card's manufacturer. You will probably pay a little more, but you won't have any headaches.

The order in which you fill rows of empty RAM sockets on a card is also important. If you don't fill the sockets in the proper order, the card will not work properly. Again, consult your card's manual for instructions.

ple; all you have to do is put all the files you want to place in the EE-PROM into a subdirectory and then run the EEPROM programming program that AST supplies.

In keeping with Apple's standard guidelines, the files in ROM are organized in the same way they are on a disk, so you will have created a ROMdisk. If the ROM contains the necessary operating-system programs, you can even boot from ROM by setting the Startup Slot in the Control Panel to ROM Disk. The big difference between a ROMdisk and a RAMdisk is, of course, that the ROMdisk doesn't disappear when you turn the IIGS off.

Thanks for the **MEMORY**

The RamStakPlus users' manual is comprehensive and clear. It describes in meticulous detail how to install the card and use the disk utilities. It also explains how to set up a RAMdisk.

Cirtech plusRAM IIGS

Cirtech was also nearing completion of two IIGS memory cards at my copy deadline; both should be available in late April. The cards are called plusRAM GS2 and plusRAM

GS8, and each has eight rows of eight RAM chips each. On the plusRAM GS2, you can fill these rows with 256K × 1-bit RAMs (2M total); on the plusRAM GS8, you can fill them with 1024K × 1-bit RAMs (8M total). Unlike the OctoRAM, Cirtech's 8M card uses conventional memory chips, not SIMMs.

Both of the Cirtech cards will have an expansion port for a piggyback card containing EPROM and either EEPROM or nonvolatile RAMs. (When I checked with company personnel, they had not yet made a decision about which one the company would use.) The cards will come with diagnostic software and a DOS 3.3 RAMdisk program.

Cirtech, a Scottish company, is currently looking for a North American distributor for its memory cards. In the meantime, these cards will be available by mail order directly from Scotland.

Software Products

Diversified Software Research doesn't sell IIGS memory cards, but it does have two great programs that work nicely with them.

The first is Diversi-COPY, a nifty copying utility for 800K 3.5-inch disks or 140K 5¼-inch disks. If you purchase only one 3.5-inch drive for your IIGS, you must have Diversi-COPY. If Diversi-COPY finds at least 800K of memory in the IIGS, it will copy an entire 3.5-inch disk in only one pass! Contrast this ability with the performance of the Apple IIGS System Utilities program, which requires an incredible 48 passes to complete a single-drive copy. (As they say on TV, "Don't try this at home." You'll either wear out your arm or your disk-eject button.) Instead of buying a second 3.5-inch drive, get a memory card and Diversi-COPY.

Diversi-CACHE is just as valuable as Diversi-COPY. It is a disk-caching utility similar in nature to Orange's RamPak program, but it works with the Apple 3.5 Drive only (not the UniDisk 3.5). An important difference is that it also speeds up the transfer rate from the 3.5-inch disk to RAM. It does so by installing a new, faster driver for the 3.5 Drive. With Diversi-CACHE installed, disk I/O is so fast that you might just stop using a RAMdisk.

Decisions, Decisions

With this analysis of IIGS memory cards by your side, you should be

FILL UP THAT EXTRA MEMORY

Now that you have all that extra memory, what can you do with it (besides run GS-specific programs that require it)? Well, thanks to a couple of utility programs, you can load a bunch of application programs into memory and have speedy access to them.

Applied Engineering plans to provide a two-megabyte piggyback card for its Apple IIGS memory expansion boards that will come with paritioning software to let you load multiple programs.

Another program called RAMUP lets you load several applications into extra memory and places the names of those programs on a menu. As soon as you quit one program, the menu comes up, and you can jump right into another application. If your RAM card has a battery backup, you can save all those programs so that they're sitting in RAM when you fire up the computer first thing in the morning. The RAMUP product originally came out for the Apple IIe and IIc but, at this writing, was about to debut in a GS version.

Then there's SoftSwitch, scheduled for release at about the time this issue of A+ hits the stands. Unlike RAMUP, SoftSwitch works only with the GS. Also, SoftSwitch doesn't require you to quit an application but instead suspends it and lets you switch among as many as three programs. Then, when you go back to the original application, you pick up

right where you left off.

Neither RAMUP nor SoftSwitch works with ProDOS 16 (Apple IIGS-specific) applications. According to the publisher of SoftSwitch, that's because the company wanted customers to be able to use the utility with as little as 512K of memory, and most GS-specific applications require that much memory all by themselves, leaving no room to load something else simultaneously. A ProDOS 16 version might be a possibility in the future, however.   —*Lisa Raleigh*

PRODUCT INFORMATION

RAMUP
Quality Computers & Applications
1365 Berkshire
Grosse Pointe, MI 48230
(313) 885-4270
List Price: $34.95
Requires: Apple IIe, IIc, or IIGS; 512K RAM; Apple or Applied Engineering memory card (with IIe or IIc) or any Apple-compatible memory board (with IIGS)
CIRCLE 366 ON READER SERVICE CARD

SoftSwitch
Roger Wagner Publishing, Inc.
10761 Woodside Avenue, Suite E
P.O. Box 582
Santee, CA 92071
(619) 562-3670
List Price: $59.95
Requires: Apple IIGS, 512K RAM
CIRCLE 367 ON READER SERVICE CARD

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able to choose a card that will suit your present and future memory needs. Keep in mind these key factors when deciding which card to buy:

- the base price of the card
- the cost of adding more memory
- the ease of adding more memory
- the upper RAM limit
- the ability to deal with ROM
- the availability of software utilities

If you have a limited budget, keep in mind that you can start with just a little RAM and add more when prices drop (or when you need it more). "Adding Memory to Expansion Cards," one of the sidebars that accompanies this article, explains how you can easily add extra memory yourself. Have fun with all those new IIGS programs you can now use! ✛

Gary Little's next book, Exploring the Apple IIGS, *will be published this summer by Addison-Wesley. Contrary to what previous biographical notes may have indicated, Little has no spare time.*