Microcomputer Newsletter

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Contents

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Test Drive Hardware in the Microcomputer HelpLine

As many of our readers know, one of the services the Microcomputer Center offers is a phone-in and walk-in HelpLine in 125 Shepherd Labs; the back page of this newsletter lists the Microcomputer HelpLine's hours and phone number. The Microcomputer Center has been providing computer advice and first aid for University employees and students since 1980.

The Microcomputer Center also provides before and after sales support for the *Microcomputer Discount Program* that the University established in June, 1984. This discount program is a joint venture between the Microcomputer Center and the Minnesota Book Center. We provide the technical support; the Book Center orders and dispenses computer products. You can stop in the Microcomputer HelpLine to test drive most of the hardware and software that is sold through the discount program.

Below we've briefly listed most of the equipment you will currently find in the Microcomputer HelpLine. If the Macintosh, IBM, Zenith, or Hewlett-Packard equipment that you want to test drive is not listed here, call the HelpLine at 626-4276. Since the equipment available in the Microcomputer HelpLine changes frequently, products may be on order or available elsewhere.

Complete Descriptions and Prices

Complete descriptions and discount prices for the products listed here are in our free handouts:

- IBM and Zenith Microcomputers
- IBM and Compatibles Software
- Printers and Peripherals for IBM and Zenith Computers
- Apple Macintosh Computers, Printers, and Peripherals
- Macintosh Software

Handouts are available in the Microcomputer HelpLine in 125 Shepherd Labs, in the hallway outside room 125, and from the *Bookstore* folder on the Mac Information Server (see the *Mac Information Server* article on page 173).

Test Drive continued on ..... Page 188

Public Microcomputer Labs and Special Services

Current students, faculty, and staff can use several public (public to the University of Minnesota community) microcomputer labs. At press time there were seventeen public labs available to the University community and four rooms that are available only as classrooms.

Lab Access Cards

To use any of these seventeen public labs you must buy a $30 *Microcomputer Access Card* each quarter and show a current university ID to the lab attendants. Departments that want to use a lab should contact the department responsible for the lab.

You can buy cards at any Bursar's office and the West Bank Union Periodical Shop (48 Social Sciences). The back of the Microcomputer Access Card lists the locations and phone numbers of the major labs. These cards are ***not transferable*** to other people; the labs' *Access and Use Policies* are reprinted on the next page.

If the Bursars' offices are closed, you can buy Microcomputer Lab Access and Printer Access cards from the lab attendants in Walter Library 9 or Classroom Office Building 135. Please note: payments at these locations must be made by check; attendants do not accept cash.

Overview of the Public Labs

Individual labs are managed by different departments. The departments set the lab hours and choose their own hardware and software. The labs have equipment such as IBM and Zenith personal computers, Apple Macintoshes, and impact printers. Some labs have special equipment, such as Apple IIs, flatbed scanners, and laser printers. (See the *Laser Printer Services* section for more information on laser printers.) The labs have word processing software, such as WordPerfect and Microsoft Word, as well as other categories of software.

The Microcomputer and Workstation Networks Center manages many of these labs, but the Microcomputer Center is not responsible for departmental labs. The table below lists the labs' locations, phone numbers, and the days the labs will be open during the normal school year. You should telephone the individual labs for detailed information about their available hardware, software, and hours of operation.

Public Microcomputer Labs

Building	Room	Phone	Classes†	Weekdays
East Bank				
Microcomputer Center labs, contact Jerry Larson at 625-7850				
Elliott Hall	121	624-0866	†	SMTWTFS
EE/CSci	4-204	625-9081		SMTWTFS
(IT students have priority use of the EE/CSci lab)				
Folwell Hall	14	625-4896	†	SMTWTFS
Lind Hall	26	626-0856	†	SMTWTFS
Lind Hall	306B	625-9032	†	–MTWTF–
Physics	130	626-1899	†	SMTWTFS
Walter Library	9	626-1899	†	SMTWTFS
Departmental labs				
Eddy Hall Annex	54	625-0314		–MTWTFS
Appleby Hall	117	624-8376		–MTWTF–
Architecture	148	624-9583		–MTWTF–
Moos Tower	8-425	625-1477		–MTWTF–
St. Paul				
Microcomputer Center labs, contact Jamil Jabr at 624-7766				
Cla. Office Bldg.	135	624-9226	†	SMTWTFS
McNeal Hall	305	624-5367	†	SMTWTFS
Departmental labs				
Central Library	B50	624-3269	†	SMTWTF–
Vet. Science	436	624-4281		–MTWTF–
West Bank				
Microcomputer Center labs, contact Shu-Fan DeJarlais at 624-0877				
Anderson Hall	170	624-6526		SMTWTFS
Blegen	90	classroom only	†	–
Blegen	10, 125, 130	classroom only	†	–
Wilson Library	B2	626-2205		SMTWTFS

† Instructors can reserve all or a portion of these labs for their *instructional use*. Generally instructors can reserve a lab for a short period of time at no cost, and extended use can be negotiated. To reserve a lab, contact the department responsible for the lab. The Central Library lab is managed by the St. Paul Computer Center; to use it contact Dick Rignell at 624-1248.

Blegen 10, 125, and 130 are lecture-only classrooms that are set up with an IBM-compatible microcomputer and a projection facility. The IBM-compatible is an 80386 machine with an 80MB hard disk, and through it the instructor has access to the Blegen 90 network and its IBM software. Call the Scheduling office at 5-6030 to reserve these Blegen classrooms. The Microcomputer Center can help you set up the classroom's computer equipment.

Access and Use Policies

The Microcomputer Access Card affords access to microcomputer labs for University of Minnesota students, faculty, and staff. The card is marked ***non-transferable***; this means that it is to be used only by the original purchaser and that person's signature and ID stamp should appear on the card. (The card will be stamped by the Bursars office or stamped the first time it is presented in a lab.) Access to lab facilities by individual card holders may be restricted or denied for the following reasons.

1. Unauthorized use of a Microcomputer Access Card, including but not limited to: ineligibility (lab users must be University of Minnesota students, faculty, or staff); using a stolen, found, or borrowed card; loaning your own card to someone else to use.
2. Unauthorized changes to lab hardware or software, including but not limited to: disconnecting and reconnecting or reconfiguring hardware; removing, changing, or reconfiguring files on lab disks; damaging lab hardware or software or removing any lab property from the lab.
3. Failure to observe lab policies, procedures and protocol, including but not limited to: refusing to sign in and out of the lab properly; moving from the assigned machine onto another without the explicit permission of the lab attendant; refusing to leave the lab promptly at closing time; refusing to respond to, or responding inappropriately to, requests made by the lab attendant (for example, a request to move to another machine or to delay printing due to a class being held in the lab) in the normal course of carrying out their job responsibilities; using threatening or abusive language or behavior directed at anyone in the lab.

Any violation under section 1 (above) will result in confiscation of the Microcomputer Access Card(s) involved and suspension of lab use privileges for at least one quarter. A first offense in either of the other two categories (above) may result in confiscation of (at the discretion of the lab attendant) the user's Access Card, pending an administrative review of the matter. Repeated violations may result in extended suspension or denial of lab use privileges and/or other sanctions.

Software

Although most lab attendants are not hired as consultants, they ***may*** be able to answer questions regarding the software their lab owns. Each lab has a wide variety of software available for use in that lab. The software categories include word processing, spreadsheet, database, statistics, graphics, and desktop publishing. If you are looking for a particular piece of software, call the labs to find out what is available. Generally the Microcomputer Center labs will have the current versions of software.

Software used in classes usually is available at only one or two labs. Check with your instructor to learn which lab stocks the software you will need to complete your course work. You can use your own or the lab's software on the lab's equipment, provided you follow the lab's Access and Use Policies and do not make unauthorized copies of software.

Laser Printer Services

The fourteen labs in the table below have laser printers. To use these laser printers you must buy a *Printer Access* card in addition to the Microcomputer Lab Access card. The Printer Access card costs $1 and does not have an expiration date. Your cost to use these laser printers is 10¢ per page. The Hewlett-Packard LaserJets are connected to IBM-compatibles; the Apple LaserWriters are connected to Macintoshes.

Microcomputer Lab	IBM or H-P	Macintosh*
East Bank Campus		
Appleby Hall	0	1
Eddy Hall Annex	0	1
Elliott Hall	1	2
Folwell Hall	1	3
Lind Hall 26	1	2
Lind Hall 306B	1	1
Moos Tower	0	1
Physics	1	2
Walter Library	1	3
St. Paul Campus		
Central Library	1	1
Classroom Office Bldg.	1	2
McNeal	0	1
West Bank Campus		
Anderson Hall	1	4
Wilson Library	1	0

* Apple LaserWriter Plus or LaserWriter IINT

Other Output Services

Two labs have other fancy output devices. Anderson has an Epson HI-80 4-color plotter. The Classroom Office Building has two HP plotters: 7475 and 7570. The HP 7475 is compatible with many business and technical applications, while the HP 7570 has been designed for CAD systems. You must have a Printer Access card to use these plotters. Currently your cost for using the HP 7475 is 30¢ per page; the 7570 costs 70¢ per page.

File Transfer and Disk Conversion

Several labs have Macintosh and IBM microcomputers connected directly (or via modem) to ACS-net or another network; these connections provide high speed access to campus mainframes from a microcomputer. All of the labs listed on the back of the Microcomputer Access Card have some or all of these capabilities. ACS-net computers include the ACS CYBER, VAX and Encore (UNIX) systems, the St. Paul (SPCS) IBM 4381, and the Health Science (HSCS) CYBER.

Some labs can also help you with disk format conversions. *You must not use the equipment in these labs to violate any copyright agreements.*

Macintosh to/from PC/MS-DOS disks

- You can use the Walter, Folwell, COB, and Anderson labs to transfer some kinds of files between Macintosh and IBM-PC compatibles. Contact the labs for more specific transfer information.

PC/MS-DOS 5.25-inch to/from 3.5-inch disks

- You can use any of the Microcomputer Center labs to transfer your files from one size disk to another. Contact these labs for specific details concerning which disk types can be converted.

Scanning

The McNeal, Lind Hall 26, and Elliott Hall labs have Apple's 300 dots-per-inch flatbed scanner. You can use this scanner to capture pictures and text on Macintosh disks.

To capture pictures, use Apple's scanner software and save the images in the MacPaint, TIFF, or PICT graphic file format.

To capture text, the labs use OmniPage, optical character recognition (also called OCR) software. OmniPage allows Apple's scanner to "read" text and save it as a text file. OmniPage can read many fonts and point sizes above 6 points; it even recognizes some foreign characters and attempts to keep multiple column documents in proper order. Once the text is saved to a document on your disk, you can edit, format, or read it with any software that will read plain text or ASCII documents.

Since each lab has only one scanner, you may want to call the lab to make sure that it is available for your use. The time limit is based upon demand.

Handicapped Access

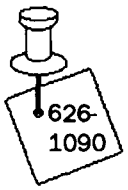
The Walter Library lab has large print and audio hardware and software connected to two IBM microcomputers; these machines are also connected to ACS-net.

The Folwell lab has a *Visualtek* large screen display connected to an IBM XT; this microcomputer is also connected to ACS-net. The Visualtek screen provides a large character display for vision-impaired computer users.

The EE/CSci Lab has several stations that provide capabilities similar to those described above, and they have additional input devices.

The Folwell, Walter, and EE/CSci labs have the Mac *inLARGE* software that is used with other software to provide larger screen images on a standard Mac screen.

Minnesota Faculty Resource Center (MFRC)



The Minnesota Faculty Resource Center (MFRC) is a faculty service provided by the Microcomputer and Workstation Networks Center. The services of the MFRC are available to all University of Minnesota faculty who are interested in using or creating instructional or research-related software. The MFRC can help you find and evaluate existing software or instructional courseware, or can provide a limited amount of free time to assist you with the design and preparation of custom software or courseware.

The MFRC can also help you select appropriate hardware, develop time and cost estimates for your projects, and can recommend authoring tools or other programming resources. You can check out selected equipment, such as portable microcomputers, on a first come first served basis. The MFRC office also has other equipment, such as disk format conversion systems and scanners, that you can use.

Throughout the academic year, the MFRC will offer free forums and workshops on topics related to the design, development, and selection of instructional and research software. These special-topic sessions will be announced in the Microcomputer Newsletter.

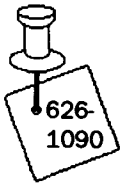
How to Reach MFRC

Currently our MFRC offices are in Nicholson Hall. Call the MFRC at 626-1090 to discuss your project or stop by Room 320 Nicholson Hall from 9:00 to 11:30 a.m. on

Monday, Wednesday, or Friday. We are available at other times by special appointment.

Adaptive Technology at the University of Minnesota

Adaptive Technology



For some persons with disabilities, recent technology provides access to information that was previously inaccessible and makes the world more accessible to some persons with disabilities. For example, with new scanning and artificial speech technology, a blind person has access to more books. New telecommunications equipment makes telephones more accessable to deaf persons. Adaptive software and hardware, can enable a person with a motor disability to operate a computer. Technology that circumvents a disability is generally referred to as "adaptive technology."

The University of Minnesota has a history of commitment to providing adaptive technology for persons on campus. In 1985, Academic Affairs allotted $50,000 to purchase a variety of adaptive technology for use by students. In 1988, IBM awarded a grant through its WOKSAPE program to further this effort. Academic Affairs has provided supplemental funds to pay for staffing at various times from 1988 to 1990.

The University's Commitment

On July 1, 1990, the University formalized its commitment to providing adaptive technology by establishing the University of Minnesota Adaptive Technology Center (UMATC). The Adaptive Technology Center has four primary goals:

1. Maintain a Lending Pool of Adaptive Equipment
   - Ensure availability of equipment on the Twin Cities campus.
2. Provide Fitting and Training of Adaptive Equipment
   - Ensure that equipment is fully and appropriately utilized by those who will benefit from it.
   - Introduce users to the latest technology.
   - Research new applications of adaptive technology to academic tasks.
3. Implement a Transcription Service
   - Ensure that information on campus is accessible by providing fast and comprehensive transcription between visual (text), tactile (braille), audio (cassette tape), and electronic (computer disk) mediums.
4. Promote Involvement and Information Dissemination
   - Involve users in decisions concerning what services are needed.
   - Assist other University campuses in establishing similar services.
   - Provide information about adaptive technology to the general public.

Work has Already Started

The goals of the Adaptive Technology Center are currently being implemented. UMATC is a part of the University's Microcomputer and Workstation Networks Center, and works closely with the Office for Students with Disabilities as well as the University Personnel Department. To learn more about UMATC or to use its services, contact Curtis Griesel, the UMATC coordinator, at 626-1090.

IBM Information Server

In October 1989, the Microcomputer Center introduced a public file server called the *IBM Information Server*. This server contains many useful programs, utilities, patches, and upgrades for MS/PC-DOS users and is located in the Microcomputer HelpLine. In this article we will review some changes made to the IBM Information Server and outline the software you can access.

Accessing the Server

Most public file servers are accessed over a network. The way you access the information on a file server depends on the network and file server setup. For example, the Macintosh Information Server is connected to the campus-wide network and can be accessed from any Macintosh that is connected to this network. The IBM Information Server, however, is currently not connected to the campus-wide network and must be accessed from a computer in the Microcomputer HelpLine.

Select Drive P

To use the IBM Information Server, simply locate one of the IBMs or Zeniths labeled *IBM Information Server* and at the C:> prompt type

```
P:
```

This will connect you to the server, and the prompt will change to

```
P:\INFO>
```

If Unable to Select Drive P

Occasionally you will be unable to connect to the server. If you don't see *P:\INFO>* or if you get a message stating

Invalid drive specification, you have not connected to the server. To establish a connection, simultaneously press these three keys to restart the computer:

Ctrl Alt Del

When you restart the computer, a menu will appear giving you the option to scan for viruses. You can forgo this option. Next, you will see a menu displaying various network options. Select the option that connects you to our Novell local-area network; the IBM Information Server is part of this network. Once you are connected, you will be returned to the C:> prompt. Now, follow the steps in the *Select Drive P* section above.

Software on the Server

The software on the IBM Information Server is organized into two subdirectories: *PUBDOM* and *DISTRIB*. The PUBDOM subdirectory contains public domain software. Some of this software is *freeware* and some is *shareware*. Freeware is software that is distributed at no charge. Shareware is distributed under the condition that if you keep it, you send compensation to the author of the software. The DISTRIB subdirectory contains software patches, upgrades, and utilities that fix bugs or enhance performance in previously purchased software or hardware. Generally, most of the software in the DISTRIB subdirectory is free. Within PUBDOM and DISTRIB are other subdirectories which contain software.

PUBDOM Subdirectories

The PUBDOM subdirectory contains three major subdirectories:

\COMMUN
applications used to communicate with a distant device

\VIRUS
virus detection and cleanup applications

\UTILITY
various utilities used to enhance your computing session

DISTRIB Subdirectories

The DISTRIB subdirectory contains five major subdirectories:

\PRNTDRV
print driver upgrades for various software packages

\ZENITH
extended/expanded memory drivers for the SupersPort; miscellaneous software related to Zenith microcomputers

\IBM
various patches for IBM PCs including Windows 386 and DOS patches; miscellaneous upgrades

\DEVREV
files referred to in the *Developer's Review*, a bimonthly publication from the Microcomputer Center

\OTHER
miscellaneous software

It's Indexed

A detailed list of the server's software is in a file called *INDEX.PUB*. The index is located in the P:\INFO subdirectory.

Navigating in the Server

To see all the software on the IBM Information Server, you must do a bit of navigating. You can type commands at the DOS command line or use Microsoft Windows 3.0 (a graphics-oriented operating environment that provides an alternative to MS/PC-DOS) to navigate in the server. Each method is described below.

Using DOS

If you use DOS to navigate, software will appear in many subdirectories. The name of a subdirectory represents the type of software in it. For example, the INFO subdirectory contains all the software on the IBM Information Server. By using the DOS commands *DIR*, *CD* and *TYPE*, you can move through the subdirectories and see what software is available. To see the contents of the INFO> subdirectory on the screen, type

```
DIR
```

at the prompt and press the Return key. The INFO> subdirectory contains two subdirectories and a readme document as shown below.

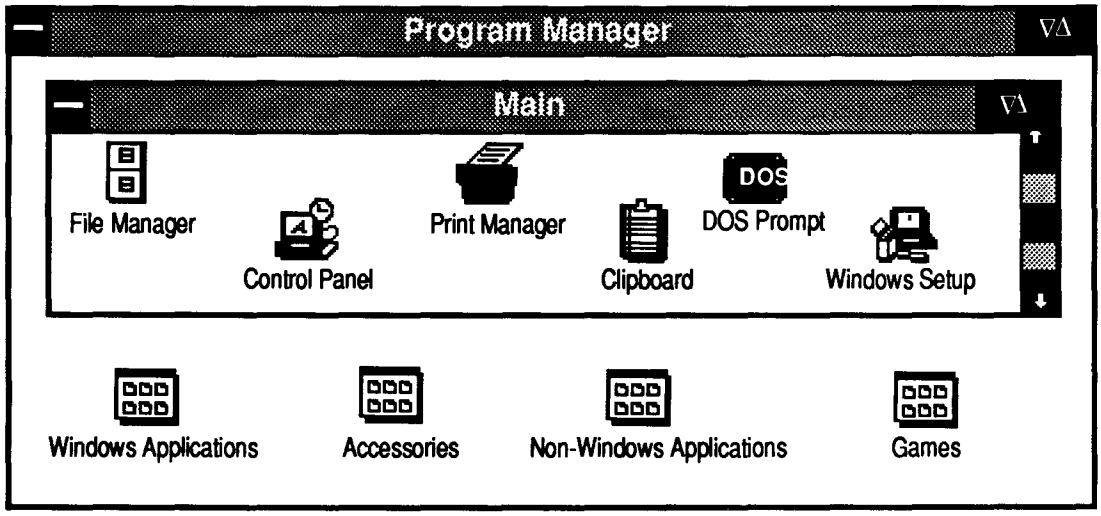
```
P:\INFO>
PUBDOM   <DIR>
DISTRIB  <DIR>
README      PUB
INDEX       PUB
```

Each subdirectory contains one or two README documents that contain instructions and/or precautions and explain what software is in the subdirectory. To see a README file on the screen, use the TYPE command. To see the README.PUB file shown above, type

```
TYPE README.PUB
```

at the INFO> prompt and press the [Return] key. If a README file is longer than one screenful of text, it will scroll quickly past you. You can stop the scrolling two ways. One way is to press the *pause* key; to resume the display, press any key. An older method of freezing the screen is to hold down the [Ctrl] key and type an [S]. To resume the display, type another [Ctrl] and [S] combination.

Figure 1: Program Manager and Main Program Group Windows



To move to a subdirectory one level below the prompt, such as the PUBDOM (public domain) subdirectory, type

```
CD PUBDOM
```

at the INFO> prompt and press the [Return] key. The prompt will change to

```
P:\INFO\PUBDOM>
```

Now you can use the DIR command to see the contents of the PUBDOM subdirectory. To go back one level to the INFO subdirectory, use two periods with the CD command, that is type

```
CD ..
```

and press the [Return] key.

Using Microsoft Windows 3.0

You can also use Windows 3.0 and a mouse to navigate in the server. Windows 3.0 displays subdirectories as folders on the screen, and you can see several folders at one time.

Before you begin working in Windows 3.0, make sure you are connected to the server. Follow the steps in the *Accessing the Server* section earlier in this article. To actually start up the Windows 3.0 software, you must type

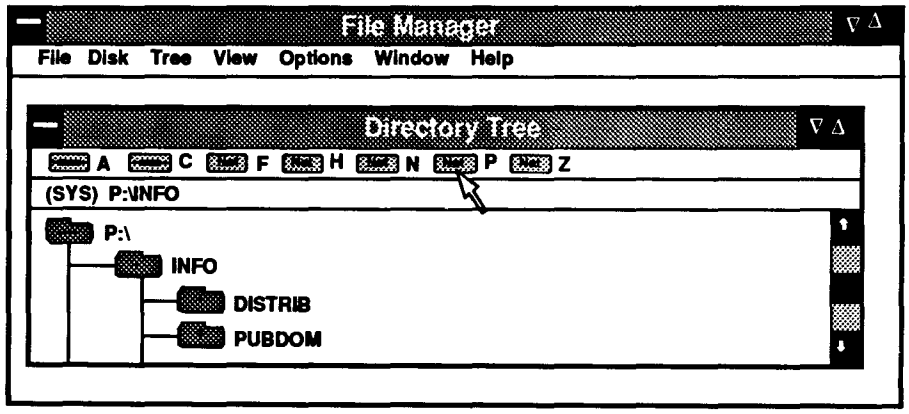
```
WIN
```

at the C:> prompt and press the [Return] key. Doing this opens the *Program Manager* window. To actually get to the IBM Info Server you must select *File Manager* from the *Main* program group. File Manager and the other Main program group icons are shown in Figure 1.

Once you have activated File Manager, you must still select the P drive ("P" is for public), by placing the mouse pointer on the button that represents the P drive, as shown in Figure 2, and clicking once. To actually see the PUBDOM and DISTRIB folders shown in Figure 2, you must click once on the INFO folder.

Now you can navigate through the IBM Information Server folders. A Windows 3.0 folder with a + sign in it means there are other folders (DOS subdirectories) nested inside. To display nested folders, click once on the + sign. A folder with a − sign in it means all the folders nested inside it are displayed on the screen. (To close the display of folders, click once on the − sign.) A blank folder means there are no nested folders inside, just files. To see the files, double click on the folder icon, and a window will appear displaying the files.

Figure 2: File Manager and Directory Tree Windows



Copying Software

To copy software from the IBM Information Server, you can use DOS or Windows 3.0. Place your floppy disk in the computer's disk drive and follow the DOS or Windows 3.0 instructions below.

Using DOS

The DOS command COPY allows you to copy software from the server. Navigate to the subdirectory that contains the files you want to copy and type

```
COPY FILENAME.EXT A:
```

where *FILENAME.EXT* is the name of the file and its three character extension that you wish to copy. When you've typed the COPY command and the file name, press the [Return] key.

If you want to copy the entire subdirectory, and you have room on your floppy disk, type

```
COPY *.* A:
```

and press the [Return] key. For more information on *, a DOS wildcard, refer to your DOS manual.

Using Windows 3.0

Navigate to the folder that contains the software you want to copy. Windows 3.0 lets you copy an entire folder or open the folder and copy individual files in it. When you copy a folder, it turns white and a box appears around the disk drive icon, as shown in Figure 3.

To copy something to your disk, place the mouse pointer on the icon you want to copy, hold the mouse button down, and drag it over the icon that represents drive A. If you cannot see the drive A icon, move the window. To copy several files, hold down the [Shift] key while you click on each file you want to copy. The files you clicked on will become highlighted. Place the mouse pointer anywhere on the highlighted area and drag the files over the drive A icon, as shown in Figure 4.

Caveat

Public domain software is often inadequately tested and documented. If you decide to use public domain software, do so as an advanture.

Since we cannot test everything we make available through the information server, we do not guarantee that the applications work correctly or that their information is accurate. *We only guarantee that the server has been checked for viruses.*

Figure 3: Copying a Folder to a Floppy Disk

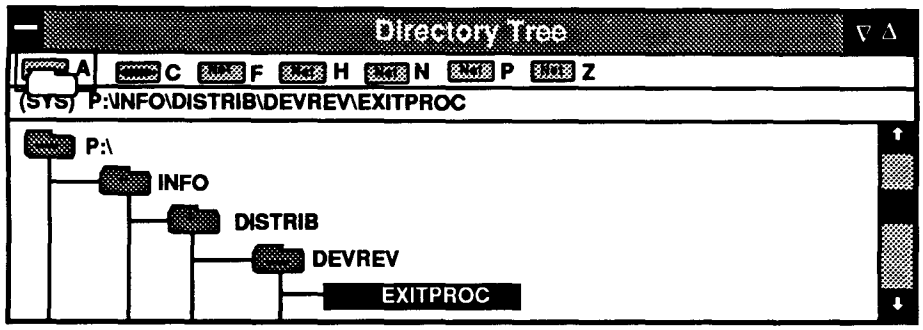
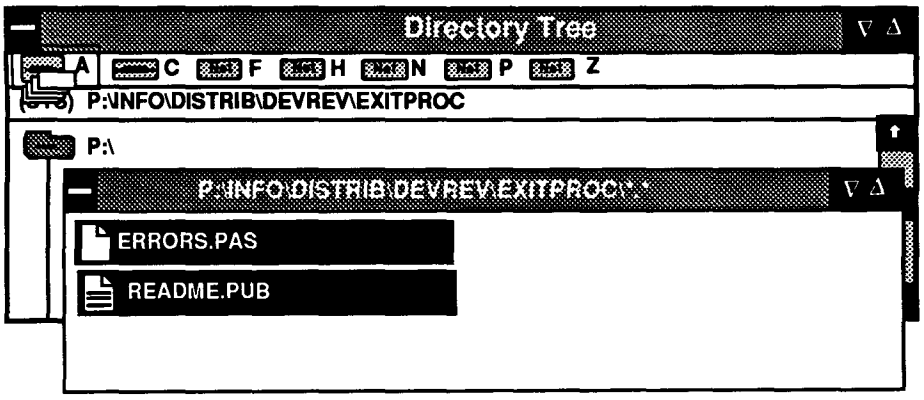


Figure 4: Copying Files to a Floppy Disk



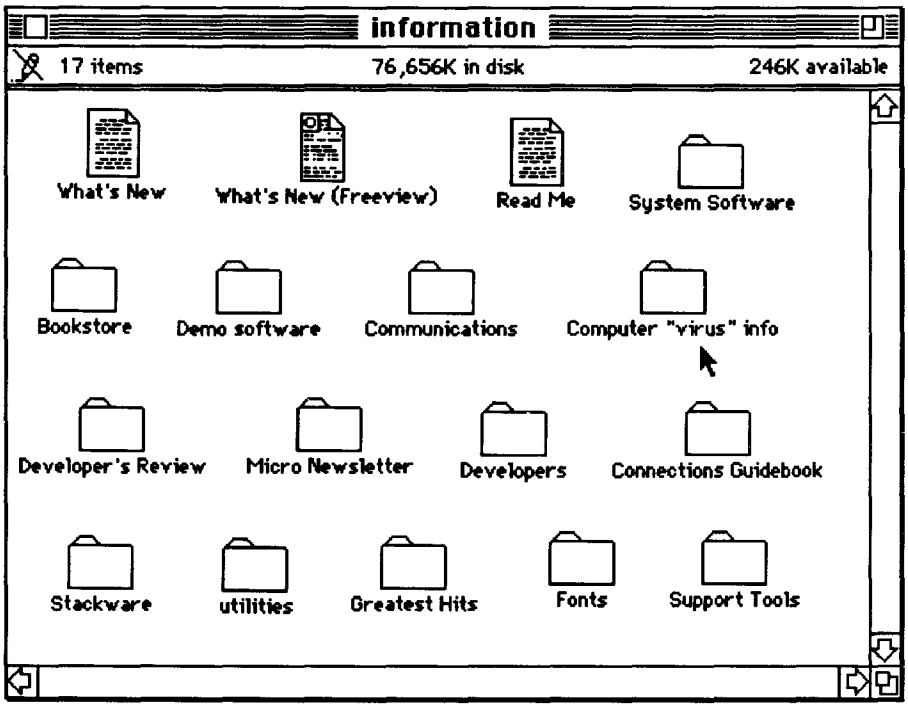
Mac Information Server

The Mac Information Server is actually two public-access file servers: Mac Information and Mac Information CD-ROMs. The servers contain public domain software – shareware and freeware as well as technical notes and other information of interest to Macintosh owners. The following paragraphs contain brief overviews of what is on the different volumes attached to these file servers. For those who have never used the Mac Information Server before we have included sections called *Accessing the Mac Information Server* and *Using the Server*.

Mac Information Volume

The Microcomputer Center maintains the volume called *information*; it is a hard disk with over 75MB of information stored on it. Occasionally we add new Macintosh software, such as the latest System Software and Virus detection utilities, and information, such as the latest copies of our product descriptions about the Microcomputer Discount Program, to this volume. To find out what is new and where information is located, look at the *Read Me* and the *What's New* documents. The Read Me document is in MacWrite format. The What's New document is in MacWrite and Freeview formats. (Freeview is free software developed by the Microcomputer Center; you can get a copy from the *utilities* folder.) Figure 1 shows you what is currently on the information volume.

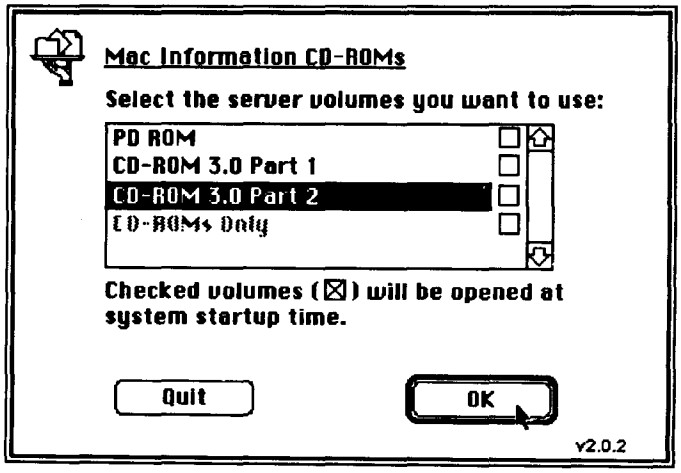
Figure 1: Mac Information Volume



Mac Information CD-ROMs

As shown in Figure 2, the server called Mac Information CD-ROMs has three accessable volumes attached to it: PD-ROM, CD-ROM 3.0 Part 1, and CD-ROM 3.0 Part 2. These volumes contain information we purchased on CD-ROMs (compact disk, read only memory). A CD-ROM acts like a huge read-only hard disk.

Figure 2: Volumes From Server Called Mac Information CD-ROMs



PD ROM

The volume called PD ROM is an old CD-ROM produced by the Berkeley Macintosh Users Group (BMUG); it contains over 290MB of public domain software and electronic messages from many bulletin board services. The information is categorized into folders called: BMUG Newsletters, Browsing Tools, Business, Desk Accessories, Education, Electronic Messages, FKeys, Fonts, Games, Graphics, Mac II, Pictures, Programming, Sounds, Stacks, Telecommunications, Text, Utilities, and Virus Protection.

EDUCOMP: CD-ROM 3.0

CD-ROM 3.0 volumes Parts 1 and 2 were purchased from EDUCOMP, a Mac user's group. Like the PD-ROM volume, Parts 1 and 2 contain public domain software that you will find arranged in folders.

CD-ROM 3.0 Part 1
Part 1 has over 180MB of information in folders called: Animations, Business, Clip Art/Pictures, Communications, Desk Accessories, Education, Fonts, Graphics, Laser Printer, Mac II, Misc, Productivity, and Programming.

CD-ROM 3.0 Part 2
Part 2 also has over 180MB of information on it and it has the following folders: Sounds and Music, Utilities, Stacks, and Word Processing/Layout.

Accessing the Mac Information Server

To access information on the two servers, you must: (1) have a Macintosh that is connected to the campus-wide AppleTalk Internet and (2) have a copy of the AppleShare workstation (client) software installed on the System disk used to start up your Macintosh.

The Microcomputer HelpLine has three Macs dedicated to accessing the information server. To use these machines, just insert your own floppy disk, click on the volume you want to access, and copy the software. If others are waiting to use these machines, your time on them is limited to 15 minutes. The Macs in the public labs that are managed by the Microcomputer Center also have ready to access the Mac Information Server.

If Your Mac is on the Campus Network

If the Mac on your desk is connected to a departmental network that is also part of the campus AppleTalk Internet, you can access the two servers from your office. (If you are using a Mac in your department, you may need to install the AppleShare workstation (client) software. The AppleShare software is included on the Utilities 1 disk of Apple's System Software, starting with Finder 6.1/System 6.0.)

Using the Mac Information Server

Using the server is easy if you are at all familiar with the Mac. Pull down the ⌘ menu and select *Chooser* so you can connect to a file server. Click on the *AppleShare* icon. (If you do not see an icon called AppleShare, then you must install AppleShare. If you do not see a box with the title *AppleTalk Zones*, your machine is not connected to the AppleTalk Internet.) When you select the *MicroCenter* zone, Chooser presents you with a list of file servers in that zone. As shown in Figure 3, select Mac Information CD-ROMs (or Mac Information) from this list.

Next you will be asked to log in to the server. There are two ways you can log in to an AppleShare server: as a *Registered User* or as a *Guest*. To access the information server you must select *Guest*. (Guest users do not need a password.) The last step is to select which volume you want to use. After you have selected a volume, a new disk icon will appear on your Mac screen.

That's it. Now you have access to the server and can copy files and folders as you would from any other Mac disk.

Time Delays

If you find something that interests you, copy it from the server onto one of your own disks. Then ***run the applications or read the documents from your own disk*** rather than from the file server. You will find that programs start up and run more quickly from a disk that is local to your machine than from the server. Since the Mac Information Server is on the University's internet, many other people could be accessing the server at the same time you are.

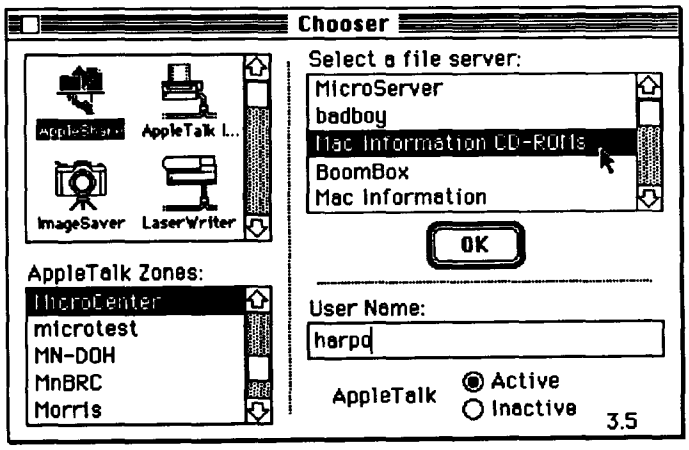
Once you have selected a volume, the time it takes to get a response or complete a transaction, such as copying, depends on how many other people are accessing the server and how much traffic is on the network.

Proceed Cautiously

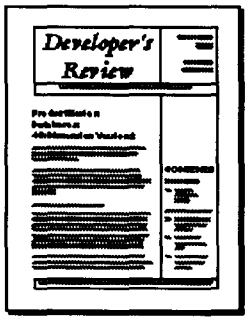
Public domain software is often inadequately tested and documented. In addition, customized software that worked with older Macs or older versions of the Mac's operating system might not work with updated products. If you decide to use public domain software, do so as an adventure.

Since we cannot test everything we make available through the Mac Information Server, ***we do not guarantee that the applications work correctly or that their information is accurate.*** We only guarantee that all volumes have been checked for viruses.

Figure 3: Accessing Mac Information Server



Developer's Review



Besides this general audience newsletter, the Microcomputer Center publishes a free newsletter for those who develop instructional software for desktop computer systems. This newsletter is called *Developer's Review*, and it is published six times a year. If you are considering using micro-computers or workstations as part of a course or your research and you want insights into which tools will make the software development process easier, you will want to subscribe to the Developer's Review. Back issues are in the *Developer's Review* folder on the *information* volume of the Mac Information Server (see page 173). Here is what you missed if you did not receive the last four issues:

Developer's Review Article **Month, 1990**

Technology Overview
- A Model for Developing Computer-Based Simulations ...March
- Object-Oriented Programming Languages for the Mac .....Jan.
- Selecting a Design Model for Your Project .....March
- Turbo Pascal Version 5.5 .....Jan.
- Videodiscs for Instruction .....July

- Creating Instructional Software:
  - Authoring Tools .....Jan.
  - Random Text Retrieval Systems .....July
  - Screen Design .....May

- Inside the IBM-PC:
  - Calling Assembly-Language Routings .....March

User Interface Design
- About the Macintosh:
  - Creating an Animated Cursor .....March
  - Creating Lists Part One: Using List Manager .....May
  - Creating Lists Part Two: Using MacApp .....May
  - Finding and Filing Documents .....May
  - Hierarchical Menus .....Jan.
  - Icons and the Finder .....July

- HyperCard Tips:
  - HyperCard Stack Development .....July
  - Hypertext .....March
  - HyperTalk Style .....May

- Inside the IBM PC:
  - Managing Memory in Microsoft FORTRAN Programming ....July
  - Turbo Pascal Exit Procedures .....Jan.
  - Using the PC for Laboratory Data Collection .....May

Success Stories
- A Simple Tutorial Authoring System for the IBM PC .....March

Product Review
- Introduction to NextStep .....May

Courseware Publishing
- Ready to Market your Instructional Software? .....May

Overview
- A HyperCard Primer .....July

Some of the articles in the Developer's Review are for beginners, such as *A HyperCard Primer* that was published in the July issue. This primer is reprinted on page 177 of this newsletter.

To get your name added to the Developer's Review subscription list, fill out the coupon below and mail it to:

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Graphics Arts Center

Space Science Graphics Arts Center, 624-9080

The Space Science Graphics Arts Center, part of the Space Science Center, has offices in the basement of the Shepherd Labs building. To reach the Graphics Arts Center, call 624-9080 or stop in room 8.

New Film Recorder for the Mac

To better serve the University Community, Space Science Graphics has purchased a new LFR+ Film Recorder for the Macintosh. With this new capability we hope to encourage more full color slide production. Not only will your presentations look professional, but the cost will be comparable to the white on blue diazo slides so frequently requested.

The LFR+ Film Recorder was rated the best film recorder by MacUser in 1989. We are among the first in the Twin Cities to offer LFR+ film recording to our clients. This service is available to University faculty, staff, and students who wish to present stylish, professional slides to their viewers at a cost comparable to other color slides.

Slide Services

We can convert your Macintosh text or graphic documents to full colored slides.

Here's what you must do with your text documents:

- Type your Presentation as an outline in MacWrite II, WriteNow or Microsoft Word 3.0. (If you use Word 4.0, save your document as 3.0.)
- Save as document file or text only file (ASCII).
- Bring in your disk for film recording.

By typing your own text slides you can enjoy a considerable cost saving.

We can also colorize the graphics you have in:

- Claris MacDraw II, MacPaint, Pixel Paint, or Deneba Canvas. (Some restrictions apply.)
- Aldus Persuasion and Power Point documents can also be recorded.

Once the designers at the Graphics Arts Center have your document, they will place it in a slide making program. Within minutes your whole presentation can be prepared with color text and multi-colored backgrounds.

Output Options for the Mac

Laser Prints

- 8.5 x 11-inch and 8.5 x 14-inch
- Plain paper or Transparencies
- Glossy paper or Hammermill Laserplus paper

Colored Slides

- Laser prints: Handouts, Speaker Notes, and Outlines

Colored Thermal Prints

- 8.5 x 11-inch and 11 x 17-inch

Colored Thermal Transparencies

- 8.5 x 11-inch clear background
- 8.5 x 11-inch full color background (print 11x17)

Cibachrome Transparencies and *Cibachrome Prints*
4 x 5 Transparencies

Visit Us

Drop by 8 Shepherd Labs soon and see what's new at the Graphics Arts Center. We are open Monday through Friday from 9-noon and 1-4:30 p.m.

Please note: as of September 1st we no longer offer blueprinting, canon copying, laminating, or binding.

Computer Rental

Terry Kalata, 624-9836

Office Equipment Services

Office Equipment Services is a University department that rents personal computers to University departments and staff. This service includes delivering and setting up the equipment, removing it when the rental period expires, and a service contract that includes a loaner if the equipment malfunctions. Rental departments are responsible for the security of the equipment and for removing all their information from the hard disk. Please note: this service is not available to students or to any group that does not have a University budget number.

Rent a Macintosh SE with a 20 megabyte hard drive, standard keyboard, mouse, HyperCard and FullPaint. WriteNow, Microsoft Word, and some versions of MacWrite and MacPaint are also available upon request.

Mac SE: Weekly Rental $110
Mac SE: Monthly Rental $180

A HyperCard Primer

This primer is reprinted from the **Developer's Review**.


Home

What follows is a brief overview of HyperCard's key concepts. Although the best way to learn HyperCard is to use it, this information should help you get started.

The basic unit of HyperCard is a card. Cards are organized into stacks, which are programs created by HyperCard. A single computer screen represents one card. These cards are always the same size as a Mac Plus or SE screen, even though you may have a larger monitor. Only one card is displayed at a time.

Cards

The card is made up of two layers, a transparent top layer, referred to as the *card*, and a bottom layer, referred to as the *background*. Any number of cards can share the same background, and they need not be contiguous in the stack. However, the card layer can only be displayed over its original background.

Objects

Two types of objects can be placed on either the card layer or background layer. These objects are called *buttons* and *fields*. A button defines an area where the user can click the mouse to perform some action, such as displaying a different card. A field defines an area in which text can be placed onto the screen.

Graphics

HyperCard can display graphics on either the card layer or background layer. Graphics placed onto the background layer will be displayed on all the cards that share a particular background (unless they are covered by something else on the card layer). Graphics placed on the card layer will only be displayed on that card.

HyperTalk

You use a language called *HyperTalk* to program stacks. The HyperTalk language consists of English-like commands and functions that are written with a relatively natural syntax. For example, assigning the value 3 to a variable called TheNumber is done through the statement "put 3 into TheNumber."

HyperTalk program segments are called *scripts*, which are linked to stacks, backgrounds, cards, fields, or buttons. The scripts are comprised of units called *handlers*. A script may contain any number of handlers. The handler is executed when it is called by a *message*. HyperCard is always "talking to itself" by sending messages to buttons, fields, cards, and so forth. For example, when you point at a button and click the mouse, a mouseUp message is sent to that button. If that button contains a mouseUp handler in its script, the handler will respond by executing the commands specified in that handler. Otherwise the mouseUp message is passed along to the card containing the button. If the card does not contain a mouseUp handler in its script, it passes the message to the background. If the background does not contain a mouseUp handler, it passes the message to the stack. Even when you are doing nothing, a message called *idle* is sent to the current card.

HyperCard scripts can also send their own messages, which enables a script to send a message to another handler that may be attached to a different object. This allows you to program frequently used routines in separate handlers, which then can be accessed by other scripts.

HyperCard has many more elements than what has been presented in this article. For more information, you should consult the *HyperCard User's Guide, HyperTalk Beginner's Guide: An Introduction to Scripting, The HyperCard Script Language Guide*, or any of several independently published HyperCard references.

Training

The Microcomputer Center owns several HyperCard training packages, which are available to University of Minnesota departments, and current employees and students. To reserve or check out materials, phone 625-1300 or stop in 132 Shepherd Labs, Monday-Friday, 8:00 am to 4:30 pm.

Courtesy, Consideration, and Common Sense

This article covers a potpourri of topics, such as: making and using data and catching computer errors; privacy or lack of it; browsing or obtaining someone else's information; and using shared or free resources. Much of what is discussed follows from basic courtesy and common sense.

Using and Creating Data

Computers are powerful symbol manipulators. Certainly arithmetic is manipulating symbols, but so is word processing and graphic design. Computers are another way people can manipulate and generate data so that the fact that the "data" contains no content or erroneous content is obscured.

The lights are on. Is anybody home?

For example, when laser printers first became accessible to personal computer users, students became aware of two byproducts. First, laser printing gave documents an authoritative look compared to ordinary typing. Second, research papers printed on laser printers tended to get higher grades than papers printed other ways. Most folks in the university community are more sophisticated now. They know that junk often lies behind beautiful fonts and dazzling graphics.

Similarly, when a stack of paper (especially numbers) produced by a computer is dropped on your desk, a common reaction is simply to accept what is written as true, that is, to read the conclusion and ignore 450 pages of tables and figures. Those 450 pages of numbers were probably much easier for the user, aided with a computer, to manufacture than they are to evaluate.

What should you do? You should at least make a quick back-of-the-envelope calculation to see if the final tallies would be predicted by common sense. You could also cross check the results against special "known" cases or against known theory to see if the tallies appear consistent. A recurrent theme in this article is: *Do what people can do very well - use a big dose of skepticism and common sense.*

Here's another example. A colleague or student gives you a disk full of research data to be analyzed. Since the data is in machine readable form, it was not only entered into a computer, it may have been produced or simulated by a computer. Should you trust the validity of the data? Could accidental errors or deliberate biases be living quietly in that megabyte of data? Since you know that the larger the data set the more likely that there will be errors or inaccuracies in it, apply common sense. Use your own computer to do things like plotting the data, looking at ranges, medians, scatter, or allowable values. Simulated data should be cross-checked against known special cases or theory. To increase your confidence in the data, you can do a quick and dirty one-time analysis with a spreadsheet or even with a personal toolkit such as HyperCard. Whatever you do, *it is important to take the time to perform checks.*

Think before hammering

Now that you have a desktop computer and are well versed in using your favorite software, many problems that don't require a computer look like they can be solved using one. This is a replay of the old adage about all problems looking like nails when you have a hammer in your hand.

Although you may be able to perform the task using your computer, there may be simpler, more straightforward ways to do it as well. Can you get the result you want just by a little thought or algebra? Would a general symbolic solution be better than a specific or approximate one generated on the computer by brute force? Is this data really amenable to being placed in a database on a computer rather than just residing in the manila folders in your desk drawer? Would a handwritten note be better than one done on your printer?

But it wasn't in USA Today!

Recently it became possible to use LUMINA to check the "card catalogs" in the University libraries using the computer on your desk. Now folks with mold and dust allergies no longer have to paw through stacks of cards. Knowledgeable people can access many information sources electronically - from encyclopedias, dictionaries, and citation indices to certain newspapers and magazines. Daily, more research materials are converted into machine readable forms that are available to the researcher's desktop computer.

However, all this computer accessibility should be tempered by some caveats. First, since cutting and pasting large chunks of material is as easy as the flick of a mouse, it is equally easy to forget from where you "lifted" a particular passage. Through simple forgetfulness, the ugly finger of plagiarism could be pointed at you. Second, you could be tempted to ignore much of the material that you cannot browse electronically. Since most older archives and publications have not been scanned into computer readable form, effortless biases and outright holes in research could

also await you. *Thoughtless reliance on the sea of electronic information could sink a promising future.*

Privacy or Lack of It

Idle curiosity can get you in trouble.

If you don't use a network or share a computer with someone else, then you are free to prowl all over your computer and hard disk and learn all you can about it.

On the other hand, if you share a computer, browsing becomes more complicated. You could intentionally or accidentally stray into someone else's files. Sharing a computer comes in many forms; for example, using a timesharing system such as UNIX or VMS, two people using one microcomputer at different times, or several people using a shared hard disk, such as a file-server.

But it was just lying there...

Many people depend on a timesharing system. The system software and every user's stored information probably lives on different parts of the same hard disk. Frequently it is possible to peek at areas where the system software is located. On certain systems peeking is allowable and even encouraged because documentation is notoriously poor or unavailable, and the only way for users to find out what is out there is to look around. In this case, it is a pretty safe assumption that if you *are* able to look at certain *system* software directories, then it *is* okay to do so. But it's not okay to destroy things.

Often it is possible to peek into someone else's private directory. On many systems, particularly academic ones, a spirit of trust prevails and things are set up so that sharing information is easy. One might safely surmise that browsing around someone else's directory is okay if *explicit* permission has been granted for you to do that. But how about implicit permission? Apply common sense to this train of thought: "Since it is not protected from access by the world, I have permission to copy." Could the person whose information you are browsing take umbrage if he knew what you were doing? And be forewarned - there are probably a half-dozen ways (some not at all apparent) for a user to find out that someone else "has been here."

Or, someone could poke around *your* stuff. If you are a private kind of person, the simplest barrier you can erect is to deny access to anyone but yourself. If you are not sure if your documents are protected, read those computer manuals or ask your system administrator about security.

We have not discussed all the variants of the privacy issue. If you haven't guessed by now, there is no such thing as a totally private file on a shared computer system. There is always at least one person who administrates and keeps the system running. And yes, it's likely that they can do whatever they want with your files regardless of whether or not you protect them because the person with physical possession of the computer or hard-disk can do just about anything with them. *Sensitive information does not belong on a shared system.*

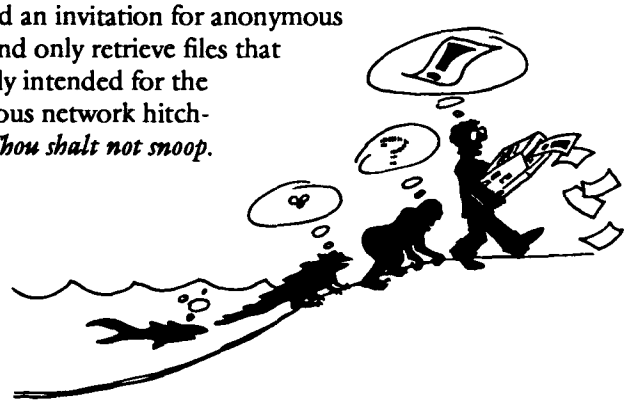
Hitchhiking the network

The situation becomes less clear cut when we bring networks and network services into the picture. Using the Telnet protocol (and Telnet software), it is possible to connect to and use any remote computer on the Internet for which you have a valid username and password. (The Internet is a collection of thousands of computers worldwide that are directly or indirectly connected and speak a common protocol. The University's campus network is connected to the Internet.) Further, you can send and get whole files from remote computers on the Internet using the FTP protocol (and FTP software).

However, even *attempting* to Telnet to a system for which you do not have a valid username and password is a very bad idea. Although the attempt to log in will probably fail (due to wrong username/password), an administrator who notices the failed attempt can only draw two conclusions: it was a mistake or it was an unauthorized but intentional attempt at entry. Many systems keep track of such occurrences, and it is possible for network sleuths to emerge, quite upset, at your desk. The same caution goes for using FTP. Many systems on the Internet allow "anonymous" FTP sessions for users to get public domain software or utilities. This anonymous convention allows those without a valid username and password to log onto the host computer. Some systems also allow "guest" logins via Telnet, usually for local purposes.

One may think that such systems are "fair game" for any network access. Think again: an analogy might make it clearer. Say I customarily leave the workshop in my garage unlocked so that my neighbor can come in and use my tools. This does not imply that everyone is welcome to come in and borrow my facilities. Likewise, if you go from garage to garage checking to see if any doors are unlocked, your actions will not be interpreted as innocent.

Only connect to systems that have published an invitation for anonymous access, and only retrieve files that are clearly intended for the anonymous network hitchhiker. *Thou shalt not snoop.*



I can't live without my e-mail

If you are connected to the campus Internet and have access to a machine that serves as your "post-office," electronic mail (e-mail) can make reaching thousands of institutions and organizations worldwide as easy as reaching your colleague in the next office.

However, e-mail has hidden qualities that have a lot in common with telephone calls and paper mail. Like phone calls, e-mail may travel over wires, fiber-optic cable, or even satellite links on the path to its destination. As with telephone calls, messages can be intercepted at various points along the route. This does not mean that hordes of hackers are reading your e-mail anymore than nosy operators or wire-tappers are intercepting all your phone calls or faxes. Nevertheless, if total security is imperative, then e-mail (and phone calls, faxes, and paper mail) is not an appropriate vehicle for delivery of that information.

I am who I am

Users of most e-mail packages know that the name (or electronic mail address) of the sender is included "automatically" with each message received. What is not apparent is that this sender-information is not foolproof.

E-mail software must accomplish two distinct tasks: fetch and send mail. When fetching mail, to keep the mail from falling into the wrong hands, the software must make sure that a user who claims to be "Burton" actually *is* "Burton." To do this, it asks the user for a password. This is similar to the postal clerk asking for identification when you attempt to collect a package that's been held for you. Whereas, when you wish to send a letter, you walk up to any convenient mailbox and drop in your letter. The mailbox does not ask you to verify that you are the person who signed the letter. Most electronic mail protocols operate in the same fashion; they allow you to send a message and mark it as having come from Albert Einstein.

While most e-mail packages will not let you send messages before validating who you are, a determined person could bypass the software and inject their message into the "mail-stream." This implies that you do not have an absolute guarantee that a message from "Burton" actually came from "Burton." So what should you do? Use your common sense to filter all your messages. Conversely, lest you be tempted to send anonymous or fraudulent messages, mail software often retains a log of information on each message sent or received, including the address of the computer from which it originated and the time the message was sent. This information often makes it possible to trace messages back to your computer.

Passe passwords

Since access to e-mail, and logins on shared workstations, is usually keyed on matching a username and password, anyone who learns your password could impersonate you. Studies have shown that people often choose obvious passwords: a spouse's name, a social security number, phone number, and dog's name are examples of passwords that could easily be guessed. Similarly, if your password is short, and all lower case alphabetic characters, a computer program could generate all possible combinations in a reasonable time. The best passwords are at least eight characters long and have a mix of characters: uppercase, lowercase, numbers, and special characters.

Using Shared and Free Resources

As personal computing evolves into collaborative computing, we must share certain limited resources. Network bandwidth and services, dial-in ports, database files, printers, FAX machines, modems, disk space, and spool space on mail-servers are examples of shared resources. If you use a system that other folks are also using simultaneously (including multiuser time-sharing systems such as UNIX), then the processor's attention (CPU cycles) is also a shared resource.

Resource hogs

Let us briefly examine some of these resources. A segment of network can carry a maximum amount of information per unit of time. This carrying capacity is shared by all users of that segment of network. As a network is utilized more heavily, its performance for individual users degrades: file servers appear to be sluggish, keystrokes in terminal sessions appear to slow down, file-transfers seem to take forever. Transferring files, accessing a remote database, or running an application that resides on a remote server are particularly bandwidth intensive. The busiest times are usually mid-morning to mid-afternoon on work days. Busy times on campus networks often occur during final exam weeks. If your bandwidth intensive task (such as transferring a huge file) can wait until a less busy time, it would be very considerate of you to do so.

Telnet, file-transfer, file-service, dial-in ports, or mail-transmission, are others examples of network services. When many simultaneous demands are placed on smaller systems, service slows down or becomes unavailable. If you are not actively using the service, close your connection with the remote computer so it can serve others more effectively.

Expensive resources such as laser printers or hard disks may be on a network to be shared

by everyone in your department. Be considerate: ask around or wait until a quiet time before printing your 400 page report that will tie up the printer. Since many people share the disk space of a file-server, using more than your fair share of space marks you as a glutton. Many people also share the limited space on a mail-server or mail-gateway computer (one that holds and forwards outgoing mail). A very large message (50K or bigger) may overwhelm some mail-servers or gateways or final clients. Break up large messages into smaller messages. Send large messages selectively and cautiously if you must send them. *With your network privileges come certain obligations.*

Meet me after work

Many computer sites contain repositories of software accessible by *anonymous ftp*. The anonymous access is provided as a service to the network; the computer providing it may primarily be used for other more important tasks. Starting an anonymous ftp session in the middle of the working day may seriously hinder the host computer's "real" work, causing the owner or administrator of the system to reconsider offering the anonymous ftp service. Never transfer games during working hours. *And, whenever possible, use the local time of the remote host to conduct anonymous ftp sessions during non-working hours.*

Practice Safe Computing

Finally, we come to using software obtained from shared public-domain sources such as bulletin boards, anonymous ftp, or file-servers. Note that we are not talking about making unauthorized copies of commercial software: it goes without saying that this is as harmful and illegal as shoplifting. Public domain software is created by folks who see a need and donate a free solution to the community of computer users.

Some public domain software is excellent and very useful. Much of it, however, has bugs that the authors do not know about or have not corrected. After all, the software was free and as folks from New York say: "Whadda ya expect for nothin?" The bugs could just make the software quirky or could cause your system to crash or could damage data on your hard disk. Of course, there is always the possibility that the software you got from a bulletin board, by anonymous ftp, or off a friend's disk is infected by a virus. We are not saying avoid all public domain software. *However, you are taking a risk, so take the necessary precautions.*

A Computer Credo

As a human behind that keyboard, do what humans do well. Think critically about what your computer presents to you. And don't forget to practice simple courtesy, consideration, and common sense.

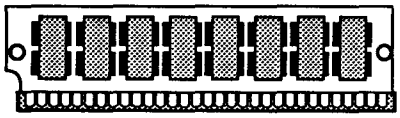
Memory in IBMs and IBM-Compatibles

Since more IBM-type microcomputers are packaged with at least one megabyte of RAM, more people have questions about using this additional memory in their PC/MS-DOS microcomputers. In addition, callers to our Microcomputer HelpLine express confusion with terms like random-access memory (RAM), extended memory, and expanded memory. For example, someone called recently to ask the following question: "My database program was running out of memory, so I purchased Expanded memory for my microcomputer. Since I added the Expanded memory, my database program still gives me the 'database full' error message. And my word-processing and spreadsheet programs, which were working fine before!, won't run at all due to 'insufficient memory'! What's going on?"

Confusion about memory is understandable, because any discussion of memory is technical by nature, and unfortunately, the terminology used in the industry is often ambiguous. However, since memory is becoming a more important issue for selecting and using hardware and software, we feel that it is important for all computer users to have a basic knowledge of how memory works.

Therefore, in this article, we will present an overview of the different types of memory, discuss the dynamics of PC/MS-DOS memory usage in IBM and compatible microcomputers, and discuss how you can ensure that your computer's memory is sufficient for your needs. Finally, as a review of the principles covered in this article, we will present some frequently-asked Microcomputer HelpLine questions concerning memory, including the question asked by the HelpLine caller quoted above.

What Is Memory?



Memory is the component of your computer which roughly functions like short-term memory in humans. A computer's main memory is sometimes called RAM (random-access memory). RAM is computer hardware; it is made up of tiny silicon chips that have been soldered to a board inside your computer's case. Think of RAM as your computer's *temporary* storage depot. Your computer uses

RAM as a scratch pad area, and it can access information stored there very quickly and efficiently. Memory is *not* permanent storage. Once you turn your computer off (or if there is a power interruption for any reason), all information in RAM is lost. To preserve your work permanently, you must save your data to a disk storage device, usually a floppy or hard disk. In other words, it is important to remember that RAM storage is not the same as disk storage: these storage terms are often confused.

Computer programs (software) use available RAM in a variety of ways. Each program requires a minimum amount of RAM before the program will run. Some programs can use excess amounts of RAM beyond the minimum amount required to improve their performance.

Memory's basic unit of measurement is the byte, and memory size is often expressed in units of kilobytes (K) or megabytes (MB). One kilobyte is equal to 1024 bytes of information, and one megabyte is equal to 1,048,576 bytes. A byte is small. One byte is large enough to hold the symbol for one character, such as H, h, 4, or *. A computer with 512K of memory has enough room for 524,288 characters on its scratch pad. Assuming five characters per word, and little overhead for instructions, you could store over 100,000 words on this scratch pad.

Memory from 0 to 1 megabyte is referred to as *Low memory*. Memory in excess of 1 megabyte is referred to as *High memory*. High memory can be either *Extended* or *Expanded*. Expanded memory is also known as EMS (Expanded Memory Specification) or LIM (Lotus/Intel/Microsoft) memory. We will discuss the differences between Expanded and Extended memory shortly.

Not all memory is equal. To understand the differences, we must look at the various microprocessor chips used in different models of IBM PCs and the chip's various limitations. Microprocessors are also called Central Processing Units or CPUs. (For more information on how CPUs influence performance see *IBM and IBM Compatibles: Performance Issues* in our September 1990 newsletter.)

8088/8086 CPUs

In the original IBM PC and XT, IBM used the Intel 8088 CPU. The 8088 (and the 8086 used in some IBM-clones) can, in theory, easily access the first 1 megabyte of memory. In practice, IBM allocated only the first 640K of the potential 1 megabyte space for RAM. (This 640K portion of *low* memory is often called *conventional* memory.) The remaining 384K is reserved for video cards and other specialized uses. Therefore, the original IBM-PC and XT can easily access only the 640K of low memory. This is often referred to the "640K DOS barrier." However, on the PC and XT the barrier is not so much a limitation of DOS but of the hardware design of the PC. Therefore, any program that runs on IBM PC/XT-level microcomputers will probably be able to use only up to 640K of memory, *unless the program designers took heroic measures to access more memory*. Since most programs do not go to extra lengths to access extra memory, most IBM PC programs are limited to using the first 640K of memory.

80286 CPU

Later models from IBM (such as the PC/AT, PC/XT286, PS/2 models 30/286, 50, 50Z, and 60) use a somewhat enhanced CPU: the Intel 80286.

Real and Protected Modes

The 80286 can run in two modes, *real* mode and *protected* mode. In "real" mode, it acts just like the 8088 CPU; it can potentially access up to 1 megabyte of memory. "Protected" mode is quite different from real mode. In protected mode, the 80286 can access up to 16MB of memory. So in theory, a PC/AT or XT286 can access 16MB of memory. Unfortunately, PC-DOS, MS-DOS, and 99% of programs *cannot* run in protected mode. DOS itself, and most programs written for DOS, *must run in real mode*. So if you use PC/MS-DOS on a machine with an 80286 CPU, or use most DOS software, you cannot take advantage of the protected mode of the 80286 and its much larger potential memory space.

Windows 3.0

A notable exception is the Windows 3.0 environment, which runs in cooperation with the DOS operating system. (Windows 3.0 by Microsoft is a relatively new operating environment for computers with 80286 and 80386 CPUs. Windows uses a graphical user interface rather than DOS's command-driven user interface. For more information on Windows 3.0, read its review in our July 1990 newsletter.) In protected mode, Windows applications that have been *specifically modified* to run in protected mode can make use of more than 640K.

In addition, with an 80386 CPU you can run multiple DOS applications "inside" of Windows 3.0, assuming that your computer has sufficient RAM. With an 80286 you can run one DOS application "inside" of Windows 3.0.

80386 CPU

The 80386 is a significant advance over the 80286. In real mode it has the same limitations as an 8088. In protected mode it can address 4 Gigabytes (4000 megabytes) of RAM. The 80386 is used in advanced IBM PS/2s, such as

models 55SX, 65SX, 70, and 80. Note: DOS on 80386 computers can run only in real mode, limiting you to 640K of RAM.

80486 CPU

In terms of memory use, the new 80486 is functionally the same as the 80386. However, it is intrinsically faster than the 80386.

The 640K Barrier

When the IBM-PC was first released in 1981, it had only 64K of RAM. In 1981 a 640K barrier didn't seem very limiting. As programs have grown (i.e., have added more features) and as they try to manage larger amounts of data, the 640K memory barrier means there isn't always enough memory to go around.

In addition to individual applications getting bigger, there are other factors that have caused the 640K barrier to be limiting to many users. The portion of the DOS operating system that *always* stays in memory has grown bigger with each version, leaving less RAM for applications. If you run RAM-Resident applications (also called Terminate-and-Stay-Resident or TSR) such as Sidekick, the TSRs will consume some of your 640K of RAM. Device drivers installed in your operating system with the CONFIG.SYS file as well as other parameters specified by the CONFIG.SYS can also consume low (conventional) memory. For example, if your computer operates on a LAN (Local Area Network), the network device driver consumes low memory. So, in addition to individual applications requiring more memory, we are seeing more configuration options competing for scarce low memory.

The shaded area in Figure 1 shows the amount of RAM available for applications once DOS and TSR memory requirements have been satisfied.

Breaking the 640K DOS Barrier

Various methods have been devised to allow DOS application to take advantage of high memory, i.e., memory in excess of 1MB. High memory comes in two flavors: *Extended* and *Expanded*. The similarity in the terms is *very* unfortunate and has led to a lot of confusion. The two terms are *not* interchangeable.

Figure 1: RAM for Applications

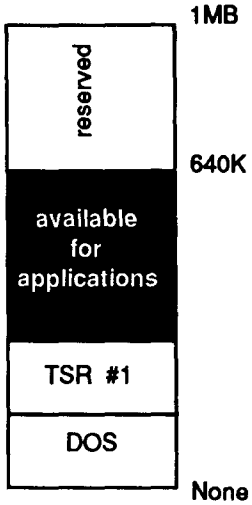
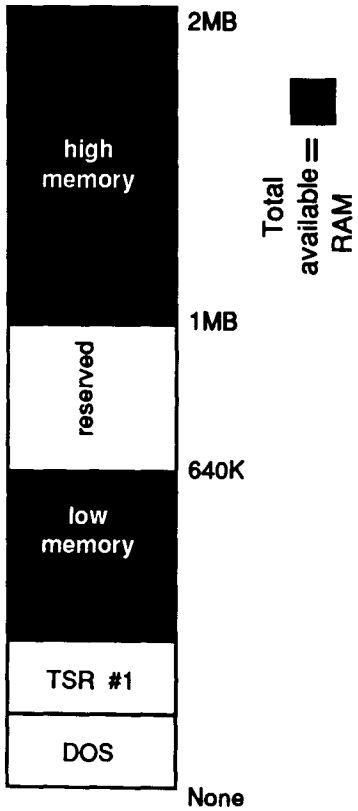


Figure 2: Extended Memory Map



Extended Memory

Extended memory lives above the 1MB mark. Microcomputers that use the "original" 8088 or 8086 CPUs *cannot* use Extended memory; they have no way of talking to memory addresses that are above 1MB. Extended memory can only be used on the newer 80286, 80386, and 80486 family of Intel microprocessors.

How Applications use Extended Memory

If your program has been *designed* to use Extended memory, your software will use any Extended memory installed in your machine *automatically*. Two examples of such programs are Excel and Lotus 1-2-3, version 3.0.

Figure 2 shows a memory configuration which includes Extended memory. The shaded areas indicate memory available for use by applications programs.

There are usually some restrictions on a program's use of high memory. Generally, the program's code (the executable instructions) must run in the lower 640K, while high memory is often limited to storing data. Therefore, adding Extended memory may not help you if your program doesn't run because there isn't enough low memory to hold the program code itself.

How DOS Uses Extended Memory

By switching temporarily to protected mode, DOS can use Extended memory for several purposes. For example, DOS can use Extended memory to create and use a RAM-disk, also called a *virtual disk*. A RAM-disk takes an area of RAM and configures it to behave as if it were a standard DOS floppy disk or hard disk. Like floppy and hard disks, this RAM-disk needs a letter designator; typically the RAM-disk becomes

D:

Once you have created a RAM-disk, you can read and write files to it just as you would a hard or a floppy disk. RAM-disks are fast since they have no physical moving parts.

A potential disadvantage to RAM-disks is that you lose whatever is stored in RAM when you shut off your machine or if you have a power failure. You can, of course, copy whatever is stored on the RAM-disk to a real (rather than a virtual) disk.

A RAM-disk device driver, called VDISK.SYS, is included as a part of PC/MS-DOS versions 3.0 and above. To setup a RAM-disk, copy VDISK.SYS to your working disk and add a "device =" line to your CONFIG.SYS file. A sample line is shown below.

```
DEVICE = VDISK.SYS 512 /E
```

(Configuration files are discussed in the *Ma Micro Notes* column of our May 1989 newsletter.) In this example, 512 is the size of the RAM-disk (in kilobytes) and the /E flag installs the RAM-disk above 1MB. If you omit the /E flag, the RAM-disk will be installed below 640K, and it will take memory away from your application programs.

DOS can also use Extended memory for print spoolers and disk caching software. A *print spool* is a temporary storage area in memory that holds the contents of your print file. A print spooler enables you to use your computer for other tasks while your file is printing. The term *disk cache* refers to temporary RAM storage of information from your hard disk. A disk cache enables frequently-needed information to be retrieved more rapidly. The IBM PS/2s come with a device driver program called IBMCACHE.SYS that can use *Extended* memory for a disk cache.

Expanded Memory: EMS or LIM

Expanded memory is essentially old technology. Expanded memory was designed to overcome the limitations of the original PC and XT computers that used the 8088 CPU (which addresses only 1MB of RAM). Once applications written for these machines began to require more memory, the Expanded Memory Specification, or EMS, was developed. You will also see EMS referred to as *LIM*, for Lotus, Intel, and Microsoft, the three companies jointly responsible for developing the Expanded specification. Expanded memory works on all DOS PCs.

Install Specialized Hardware and Software

Expanded memory (EMS), unlike Extended memory, is not an extension to random-access conventional memory. Rather, EMS requires *specialized* hardware and software. Think of EMS as "separate memory." EMS is the only kind of high memory that can be used to expand a microcomputer that uses the 8088 or 8086 CPU. Since software programs must be *specifically* designed to use EMS, if your application is not *EMS-Aware*, then installing EMS memory in your computer will not benefit you at all.

EMS Emulation

There is another level of complication. The only high memory some programs can use is EMS. IBM PS/2s come with Extended memory, not EMS (Expanded) memory. So any popular programs, such as WordPerfect, Lotus 1-2-3 prior to version 3.0, and Paradox prior to version 3.5, cannot use the type of memory that comes on many of these PS/2s and other newer computers. As software is updated, we expect to see a gradual move away from EMS in favor of Extended memory.

In the meantime, a patchwork solution to this problem is to use EMS emulation software. With PC-DOS version 4.0, IBM provides a special software driver that makes IBM Extended memory look like EMS memory when used with an *80386*-based computer.

Real EMS

To add real (hardware) EMS, you must buy and install an EMS board inside your computer. Not all memory expansion boards are EMS boards. The two most popular EMS (Expanded) memory boards are the Intel AboveBoard and the AST RamPage. (The Book Center does not carry any Expanded memory boards.)

Many programs on the market are EMS-aware. For example, Lotus 1-2-3 (version 2.0 and above) can store portions of your spreadsheet in EMS memory. Paradox (version 2.0 and above) can use EMS memory to store tables, and WordPerfect versions 5.0 and above can store pages of your document in EMS memory. If your system has EMS memory, these programs will run faster with large data sets (documents, spreadsheets, databases) because they don't have to read from the disk as often. The new versions of Turbo Pascal (version 5.5) and Turbo C (version 2.0) can use up to 64K of EMS memory for the editor buffer, freeing up memory below 640K for program compilation and execution. The new Borland Debugger (version 1.5) can use EMS to store its symbol table, again freeing up memory below 640K for program execution.

Future Trends

Although most PC/MS-DOS applications are limited to using 640K of RAM, there are ways of using memory in excess of the 640K barrier to enhance the performance of DOS applications.

The industry trend toward the Windows and OS/2 operating system environments means that applications will be written to utilize ever larger amounts of RAM. OS/2, which runs only in protected mode, cannot use EMS. Similarly, Windows is designed to perform optimally with machines that have Extended memory. Therefore, although some older applications now run only with EMS, we expect software companies to continue to adopt the use of Extended memory in future versions, making Extended memory the preferred type of memory for the future. Unfortunately, these trends make it hard to decide what memory to buy and use today.

Caveats

Memory issues are complicated, and several topics, such as EMS installation and configuration, are too detailed to cover within the scope of this article. We strongly advise you to consult the Microcomputer HelpLine staff before purchasing any additional memory. In general, when considering the purchase of a new IBM or compatible microcomputer, we recommend those with 80386 or higher CPUs for two reasons. First, these newer CPUs have built-in improved memory-handling capabilities. Second, OS/2 version 2, set for release later this year, will not work with 80286 or earlier CPUs.

Sample IBM Memory Questions

● What's going on? When I added more memory, things got worse.

My database program was running out of memory, so I purchased Expanded memory for my microcomputer. Since I added the Expanded memory, my database program still gives me the 'database full' error message. And my word-processing and spreadsheet programs, which were working fine before!, won't run at all due to 'insufficient memory'! What's going on?

Answer

First, your database program didn't need more RAM, it needed more disk space. This confusion is common. Databases are disk-intensive applications and usually when a database fills up, it lacks disk space, not memory space.

To compound the problem, when you added EMS to your microcomputer, you lost available low (conventional) memory because the EMS device driver itself resides in low memory. So, paradoxically, adding memory resulted in your having less available RAM for your more memory-intensive programs.

● What happened to my 8MB of memory?

I know I added 8 megs of Expanded memory to my computer, but when I boot my XT the number that prints out on the screen is 512K. Where did my 8 megs go?

Answer

You have:

- 512K of available conventional (low) memory;
- 384K of reserved memory that resides in 640K–1MB (this 384K is not reported because it is reserved for video RAM and other technical resources);
- 8MB of EMS which comes on a separate add-on board and requires special software to utilize it. EMS is not counted at all by DOS when you boot up your machine.

If you use PC-DOS 4.0, you can use the MEM.EXE command to see how much memory is in your system, broken down by kind (low, Extended, Expanded). To do this type MEM at the DOS prompt. Note that even the MEM command does not report the reserved memory from 640K to 1MB.

● Does EMS 3.2 work with EMS 4.0?

I want to buy an EMS board for my computer. The manual for my software says that the application runs with EMS version 3.2. The EMS board I saw at my computer store is version 4.0. Will this EMS board work with my software?

Answer

Yes. There are two versions of the LIM/EMS standard. Applications designed for version 3.2 will work with Version 4.0. However, applications designed to work with EMS Version 4.0 probably will not work with EMS boards designed to meet version 3.2 specifications, i.e., they are not downward compatible.

● I need 4 megs of EMS. What should I buy?

I have 640K of RAM. I want to use a program that requires 4MB of EMS. What should I buy?

Answer

What you buy depends on what computer you have.

a) If your computer has an 8088 or 8086 CPU, you must buy an EMS board (add-on hardware with an EMS software driver included).

b) If your computer has an 80286 CPU, you should buy an EMS memory board that supports Expanded and Extended memory simultaneously, because this will allow you the flexibility to run software that depends on Extended memory.

c) If you have a computer with a 80386 or 80486 CPU *and* you run PC-DOS version 4.0, you do not need to buy an EMS add-on board. You can simply add more Extended memory and use the software device drivers XMA2EMS.SYS and XMAEM.SYS provided by PC-DOS 4.0 to convert up to 16MB of Extended memory into emulated-EMS memory.

However, the EMS driver in PC-DOS 4.0 is designed to *work only with IBM's Extended memory* (from the motherboard or an IBM memory expansion board). If you use third party memory expansion boards, the EMS driver may not work.

● What does it mean to have 1MB of memory?

I just bought a PS/2 computer with one megabyte of memory. What does this mean?

Answer

According to industry standards, RAM specified for a computer running DOS refers to *available user memory* and does not include the memory in the reserved (conventional or low RAM) area between 640K and 1MB. Therefore, a computer with 1MB of RAM really has 640K of low memory and 384K of Extended memory, (in addition to the 384K reserved area in low memory, which is unreported).

● How did I lose 128K of memory?

I own an IBM PS/2 Model 70 that runs at 25 MHz. When I bought my Model 70, I know it came with 2MB of RAM. Why does my set-up program report that 128K of my Extended memory is unusable?

Answer

The PS/2 Models 70 and 80 that have clock speeds of 20 MHz or greater use 128K of Extended memory to achieve improved performance. This is normal and you cannot change it.

Ma Micro Notes: Complex Printing

Windows 3.0 and HP LaserJet IID

The Microcomputer HelpLine has been getting more questions about using Hewlett-Packard's laser printers to print complex pages using Windows 3.0 and Windows compatible software. For example:

Why do I get incomplete images?

When I try to print my full page graphic from Word 5.0 on an HP LaserJet Series IID, it prints only half of the image on one page and the other half on a second page. Besides cutting one sheet and pasting it onto the other to get a full page, how do I fix this?

Why don't my Soft Fonts print?

I'm trying to use downloadable fonts from PageMaker on my IBM PS/2 and a LaserJet IID printer. I'm using Windows 3.0 and PageMaker 3.01. When I select Print, it appears that my document is sent to the printer, but nothing is ever printed. What's wrong, and what do I have to do to fix it?

Both of these problems are related. The LaserJet Series IID comes with 640K of memory. This is sufficient memory to print normal text pages and even small pictures. However, it is not enough memory to handle full page graphics and will allow only a few soft fonts to be downloaded to the printer.

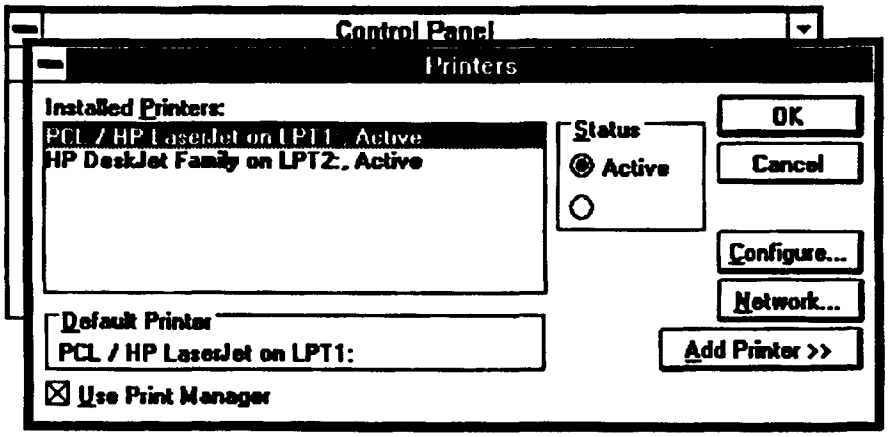
LaserJet Series IID Memory Options

To solve their printing problems, these people need to add memory to their LaserJet. Hewlett-Packard sells both 2MB and 4MB add-on memory boards. The LaserJet Series II printers have *one* expansion slot, allowing you to use one or the other of the boards. If you have complicated large graphics or if you use many downloadable fonts, even if they are not used in every document you print, you should consider purchasing the 4MB add-on board. If you buy the 2MB board and find that it does not provide the full capabilities you require, you can buy the 4MB board later.

Printers and Windows 3.0

Older versions of Windows required that you install drivers into your software applications, such as drivers for your printer. Windows 3.0 has simplified this process by managing these resources itself. When Windows 3.0 compatible applications want to use these resources, they simply request the resource from Windows. Software users only get involved when they add printers or make changes to printers they already have. For example, if you add memory to your HP printer, you must tell the Windows 3.0 driver what you have done. This is an easy process, and the steps you need to follow in Windows 3.0 are shown below.

Figure 1: Select Control Panel's Printer Icon



Reconfiguring a Printer In Windows 3.0

Double click the cursor on the *Control Panel* icon in Window's *Main* program group. When you double click on the Printer icon, you will see a screen similar to the one shown in Figure 1. This *Printers* window shows the printers whose drivers you have installed in Windows 3.0 and their current status.

Figure 1 shows two printer drivers, one for the LaserJet (which is connected to the parallel port LPT1) and one for the DeskJet (which is connected to parallel port LPT2). To change the memory setting for the LaserJet, click once on the LaserJet entry; then click on the *Configure...* button.

Clicking on the *Configure* button causes the *Printers - Configure* window shown in Figure 2 to be displayed. To actually select configurations, click on the *Setup...* button. Selecting this button will bring up the window shown in Figure 3. Proofread the window to be sure the proper printer (LaserJet IID), is shown in the *Printer:* portion.

To display the possible memory choices for the LaserJet IID, click on the ↓ arrow on the righthand side of the *Memory:* selection. Then, click on the selection that matches your printer configuration. If you added the 4MB memory board,

Figure 2: Reconfiguring a Printer in Windows 3.0

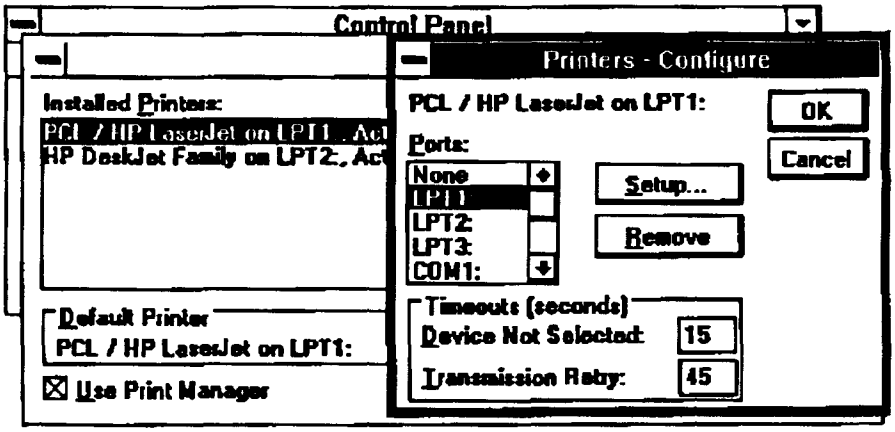
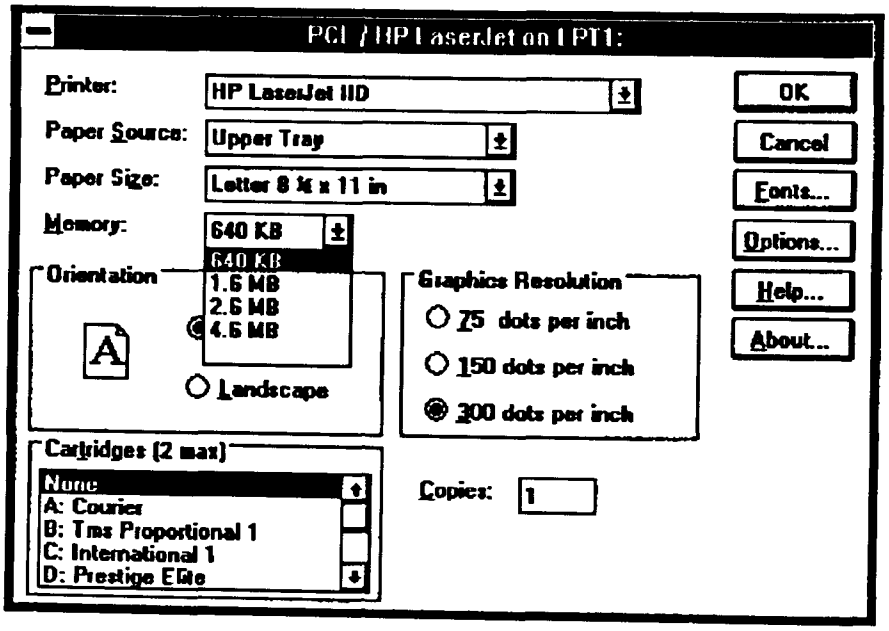


Figure 3: Tell Windows which Memory Board You Added



click on 4.6MB; if you added the 2MB board, click on 2.6MB.

Finally, click on the OK button in each of the screens to get back to the Windows 3.0 command mode.

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Apple Macintosh

Currently the Microcomputer HelpLine has the Macs named below on display. Most of the Macs on display have Apple's 1.4MB SuperDrive. The SuperDrive enables Macs to read and write PC/MS-DOS, OS/2 SE, and ProDOS disks. The Mac Plus does not come with the SuperDrive, and the HelpLine has an older Mac SE, which did not come with the SuperDrive. You can try out Apple's standard and enhanced keyboards on these machines: Mac SE, Mac SE/30, Mac IIcx, Mac IIx, Mac IIci, and Mac IIfx. The Mac Plus and Portable use different keyboards.

Macs with Built-in Monitors

The *Macintosh Plus* runs at 8 MHz and has one 800K floppy drive. The machine in the HelpLine has 1MB of memory and is connected to an external Rodime 20 megabyte hard drive.

The 8 MHz *Mac SE* in the HelpLine has an internal 20MB hard drive and 2.5MB of memory.

The 16 MHz *Mac Portable* in the HelpLine has a 40MB internal hard drive and 1MB of memory; its dedicated processor manages power, enabling the portable to run up to 12 hours on a single battery charge.

The 16 MHz *Mac SE/30* in the HelpLine has 4MB of memory, an internal 40MB hard disk drive, a 68030 microprocessor, and a 68882 math coprocessor. The SE/30 has the computing power of a Mac IIcx.

The Mac II Family

All machines in the Mac II family come with a 32-bit 68030 processor and a 68882 math coprocessor. The different models of the Mac II differ in the speed of their microprocessors and memory as well as in how many expansion slots they have.

Currently the four Mac IIs in the HelpLine are connected to one of these monitors:

Part	Apple Monitor
M0400	11-inch monochrome
M0401	13-inch color
M0402	21-inch 2-page monochrome
M0404	15-inch portrait monochrome

The 16 MHz *Mac IIcx* in the HelpLine has 5MB of memory and an internal 40MB hard disk. Currently Apple's 11-inch monochrome monitor is connected to the IIcx using Apple's Mac II video card (part M0322); the card has the extra video RAM installed on it.

The 16 MHz *Mac IIx* in the HelpLine has 4MB of memory and an internal 80MB hard disk. Apple's 21-inch two-page monitor is connected to the IIx by Apple's two-page video card.

The 25 MHz *Mac IIci* in the HelpLine has 4MB of memory and an internal 40MB hard disk. Apple's 15-inch portrait monitor is connected to the IIci using its built-in video port.

The 40 MHz *Mac IIfx* in the HelpLine has 4MB of memory and an internal 80MB hard disk. Currently Apple's 13-inch color monitor is connected to the IIfx using Apple's 8•24 video card.

IBM PS/2s

All IBM PS/2s currently sold through the discount program come with an internal 3.5-inch 1.44MB floppy drive and IBM's enhanced keyboard with 12 function keys. In most cases you can attach any analog VGA display to the PS/2's built-in VGA display adapter. All these PS/2s, except the Model 30/286, come with IBM's Micro-Channel expansion bus. The Model 30/286 has classic-PC style expansion slots.

80286 CPUs: Models 30/286 and 50Z

The HelpLine has two 10 MHz *Model 30/286* machines. One 30/286 has 512K of RAM and a 20MB hard disk; it is available for test drives. The other 30/286 contains a self-running demo of IBM's special software bundles.

The 10 MHz *Model 50Z* in the HelpLine has 1MB of RAM and a 30MB hard disk.

80386 CPUs: Models 70, 55SX, and 80

The HelpLine has the least expensive *Model 70*, i.e. the 16 MHz model with a 60MB hard disk. The Model 70 in the HelpLine has 3MB of RAM. The Model 70 is also available in 20 and 25 MHz models; these models are not on display.

The 16 MHz *Model 55SX* in the HelpLine has 4MB of RAM and a 30MB hard disk.

The 20 MHz *Model 80* in the HelpLine has 2MB of RAM and a 70MB hard disk. The Model 80 also comes in a 25 MHz model, which is not on display.

Zenith Microcomputers

All Zeniths currently sold through the discount program come with an internal 3.5-inch 1.44MB floppy drive and a Zenith keyboard. The desktop machines' keyboards are detachable and have 12 function-keys. In most cases you can attach any analog VGA display to Zenith's built-in VGA display adapter.

80286 CPUs: Models Z-248/12 and Z-286 LP/8

The 12 MHz *Z-248/12* in the HelpLine has 1MB of RAM and a 40MB hard disk.

The 8 MHz *Z-286 LP/8* in the HelpLine has 1MB of RAM and a 20MB hard disk.

80386 CPU: Model Z-386/33

The 33 MHz *Z-386/33* in the HelpLine has 2MB of RAM and a 150MB hard disk.

Zenith Portables

These Zenith portables come with a 3.5 inch, 1.44 megabyte floppy drive, a 79-key keyboard that includes function keys, and a built-in fluorescent backlit page white screen.

The *SupersPort SX* in the HelpLine has an internal 40MB hard disk. This portable uses an 80386SX CPU running at 8 or 16 MHz, and it has an expansion bus connector as well as a slot for an optional 2400 baud modem.

The *TurbosPort 386* has an 80386 CPU, an internal 40MB hard disk, and a detachable keyboard.

Monitors

The IBM 8503 is a 12-inch analog monochrome monitor that displays either white-on-black or black-on-white. Colors are represented by 64 shades of gray.

The IBM 8512 and 8515 are 14-inch analog color displays.

The IBM 8513 is a 12-inch analog color display. The resolution of the 8513 and 8512 is the same; but since the 8513's 12-inch image is condensed, it looks better and is more expensive than the 8512.

The Zenith ZCM-1492 is a 14-inch analog color display that features Zenith's Flat Tension Mask CRT.

The Zenith ZMM-149-P is a 14-inch analog color display that comes with a switchable power supply.

Sun Workstation

The HelpLine has a Sun 3/50 with a Motorola 68020 processor running at 16 MHz and SunOS, Sun's version of UNIX. (A Sun SPARC station is on order.)

The NeXT Computer

The HelpLine's NeXT computer uses a Motorola 68030 processor running at 25 MHz, the UNIX operating system with a graphical interface, PostScript for screen display and printing, and it includes a built-in 256MB read/write erasable optical disk and drive. (The new NeXT Station is also on order.)

Printers

The HelpLine has print sample books that let you compare one printer's output against another's and see how the printer performed with real documents. You can arrange to print a limited number of test documents on these printers. To print reports, course papers, your thesis, etc., you must go to one of the public microcomputer labs. For more information on the University's public labs, see the *Public Microcomputer Labs and Special Services* article on page 166.

● ***Available for testing with Macintoshes***

Apple ImageWriter II

This is a 9-pin dot matrix impact printer capable of draft or near-letter-quality print at 75 DPI (dots-per-inch).

HP DeskWriter

Hewlett-Packard designed the DeskWriter for the Mac; it is an inkjet printer that prints at 300 DPI.

Apple LaserWriter IINT

Apple's IINT is a PostScript 300 DPI laser printer that prints at a maximum speed of 8 pages per minute (ppm).

Apple Personal LaserWriter IINT

Apple's Personal IINT is a PostScript 300 DPI laser printer that prints at a maximum speed of 4 ppm.

- ***Available for testing with IBM and Zeniths***

HP Laser Printers: IIP, III, IID

The HelpLine has three 300 DPI (dots-per-inch) Hewlett-Packard laser printers: the LaserJets IIP, III, and IID.

The LaserJet IIP prints at a maximum speed of 4 pages per minute (ppm). The HelpLine's IIP has the standard 512K of memory and the optional 250-sheet paper tray. Both the LaserJet III and IID print at a maximum speed of 8 ppm. The HelpLine's III has 3MB of RAM (standard RAM on the III is 1MB), and the HelpLine's IID has 4.6MB (standard ram on the IID is 512K).

HP DeskJet PLUS

The DeskJet PLUS is an inkjet printer that prints at 300 DPI. The largest character you can print on a PLUS is 30 points.

IBM 4019 Laser Printer

IBM's 4019 is a 300 DPI laser printer that prints at a maximum speed of 10 pages per minute. IBM's 4019 includes built-in support for IBM PPDS, HP LaserJet printer emulation, as well as IBM 7372 and HP 7475A plotter emulation.

Mice for IBM and Zeniths

You can test drive the IBM, Microsoft, and Logitech mice that are attached to some of the HelpLine's PC/MS-DOS machines. Since you must go through special installation procedures to use mice with DOS machines, you may not be able to easily move these mice to other machines in the HelpLine.

The IBM and Microsoft mice have two buttons, but Logitech's mouse has three-buttons.

Scanners

A scanner is a hardware device that works with specialized software to enable you to convert a printed image into a computer document. Some scanned images require a lot of disk space and memory.

HP ScanJet Plus

The Hewlett-Packard ScanJet Plus comes with software called *Scanning Gallery* that treats the scanned document as a graphics (not text) image. This flatbed scanner can handle a wide variety of documents, from stamps to full-size drawings; it is attached to a PC/MS-DOS machine.

Apple Scanner

Apple's scanner is directly connected to a Mac. This is a flatbed scanner capable of scanning documents up to 8.5-inch x 14-inch at 75 to 300 DPI.

Other Equipment

The HelpLine does not have displays of all the parts sold through the discount program...we have budget and space limitations. Here are some of the miscellaneous parts and peripherals that are on display in the Microcomputer HelpLine and that you can buy through the Book Center.

Modems

The HelpLine has two external modems: Apple's 1200 baud personal modem, and Hayes 2400 baud Smartmodem. A modem is a device that enables your microcomputer to send and receive signals across a telephone line. You can send or receive files between your computer and your colleague's computer or to mainframe computers with telecommunications capability.

External 5.25-inch Floppy Drive

The HelpLine's 5.25-inch disk drive attaches to an IBM PS/2 so users can read from and write to 360K floppy disks. To use the drive you must also buy a drive adapter.

Apple CD ROM

CD-ROM stands for "compact disk, read only memory," and it is a mass storage device. Apple's CD-ROM player connects to the SCSI port on a Macintosh.

Older Equipment

Space permitting, the HelpLine also houses some older equipment. If you have similar machines, you may want to use this older equipment to try out software rather than use the new machines.

Training Resources

The Microcomputer Center owns training packages for many popular software programs. We also teach courses and hold orientation sessions for new computer owners.

Free Orientations

We offer free weekly orientation sessions for all new computer owners. These one- or two-hour sessions cover the basics of setting up and using your machine. Registration for these orientation sessions is handled by the Minnesota Book Center's office at 625-3854.

Training Library

These training materials are available to University of Minnesota departments and current employees and students. There is no fee for using these materials, and you may check them out for 48 hours. However, before you can check them out, you must sign a *Usage Agreement* and leave your University of Minnesota ID with us. We will return your ID when you return the training materials. To use these materials you must supply your own equipment, such as computer, cassette or video player, and relevant software. To reserve or check out materials, phone 625-1300 or stop in the Microcomputer Center office in room 132 Shepherd Labs, Monday-Friday, 8 am to 4 pm.

Generally the PC/MS-DOS (IBM and compatible personal computers) disks are available on 5.25-inch 360K and 3.5-inch 720K disks; the Macintosh disks are 800K

We have over 100 training packages that you can check out. Here is an abbreviated list.

Title	Version	Machine	Media
Chart & Multiplan	1.0	Mac	disk
Claris CAD	-	Mac	video
dBASE II/III	4.2/4.2	IBM	disk
dBASE III Plus	III Plus	IBM	disk
dBASE IV	IV	IBM	video
DOS	various	IBM	various
Excel	various	Mac	various
FileMaker	4	Mac	audio
Framework © 1984	-	IBM	disk
Freehand	2.0	Mac	audio
HyperCard	various	Mac	audio
Illustrator 88	-	Mac	audio
Lotus 1-2-3	various	IBM	various
Mac, How to Use	various	Mac	various
PageMaker	various	Mac	various
PageMaker	3.0	IBM	audio
Paradox	2 and 3	IBM	audio
Symphony © 1985	-	IBM	disk
Wingz	1.1	Mac	various
Word	various	Mac	various
Word	3.0+	IBM	audio
WordPerfect	various	IBM	various
On Becoming a Desktop Publisher © 1988	mixed	mixed	video

❖ New: Advanced Training for Lotus 1-2-3 Release 3

We recently added the following audiocassette training material from FlipTrack to our library. To use this material you need a DOS machine with at least one floppy drive and a hard disk as well as your own copy of Lotus 1-2-3 Release 3. Each of these training packages contains 4 audiocassettes, a data disk with practice files, and a *Quick Reference Guide*. The advanced training consists of four hands-on lessons of a couple hours each. The contents of the four tapes are listed below.

Tape 1 - Functions and Features

Course requirements and assumptions; creating a subdirectory and copying the Fliptrack disk; the UNDO key; the @TODAY function; the @DATE function; the "slash method"; the @INT or Integer function; the @MOD or Modulus function; the @IF function; a file retrieval shortcut; some financial functions - the @RATE function and @PMT or payment function; the @CHOOSE function; and combining/linking files.

Fliptrack options: Relative and absolute cell addresses; string functions - @VALUE, @UPPER, @LOWER, @PROPER, @LEFT, @RIGHT, @LENGTH, and @FIND; the @NPV or Net Present Value function; multiple worksheet files; multiple files in memory; linking files in memory; saving multiple files; and deleting a file from memory.

Tape 2 - Creating and Using Macros

Creating and naming a macro; invoking a macro; examples of basic macros; keywords in macros; debugging a macro in Step Mode; terminating a macro; programming with macros; IF statements in macros; the @CELL and @CELLPOINTER and BRANCH.

Fliptrack options: Using the Record Buffer; assigning longer names to macros; password protection; saving a file with a password; retrieving a password protected file; and removing password protection from a file.

Tape 3 - Increasing Productivity
Documenting a macro; using range names in macros; naming a range; mailing label macros; concatenation formulas; subroutings; FOR statements in macros; the MENUBRANCH and MENUCALL commands; User-interactive macros; the GETLABEL and GETNUMBER commands; building a menu with macros; the LET and BEEP commands; auto-execute macros; macro library files; a listing-macro; and Lotus Multibyte Character Set (LMBCS).

Fliptrack options: Using the Protect command; screen-controlling macro commands; and practice with custom menus.

Tape 4 - Projecting Results
The Data Fill command; data tables and distribution; @VLOOPUP function; Label Lookup; Linear Regression Analysis; predicting dependent variables in the future.

Fliptrack options: Importing and creating print files; other releases of 1-2-3; double lookup; the @@ or double AT-sign function; the @NA or Not-Available function; and comparing predicted and actual values.

Courses

Each quarter we fill our calendar with short courses for microcomputer, workstation, and network users. Classes are filled in the order registration is received. Course fees range from $0–$101 and differ for the following three groups: University students, University employees, and others.

For registration information, call the Microcomputer Center office at 625-1300. In our September newsletter we announced our short course schedule for Fall Quarter; many classes are already full. For those who missed the September issue, we have listed what we are teaching below.

Short Course	Category
4th Dimension, Introduction to	Mac
Designing Local Area Networks	General
DOS, Introduction to	IBM
Excel 2.2, Intermediate	Mac
Excel 2.2, Introduction to	Mac
Excel, Introduction to	IBM
FileMaker, Intermediate	Mac
FileMaker, Introduction to	Mac
HyperCard, Introduction to	Mac
HyperTalk, Using	Mac
Lotus 1-2-3, Beginning	IBM
Macintosh Fundamentals	Mac
Macintosh Graphics Fundamentals	Mac
MacWrite II, Intermediate	Mac
Novell Network, Introduction to	General
Orientation for IBM Campus Network Users	IBM
Orientation for Mac Campus Network Users	Mac
OS/2, Introduction to	IBM
PageMaker 4.0, Introduction to Desktop Publishing with	Mac
Paradox, Introduction to	IBM
UNIX System Administration, Introduction to	General
Windows 3.0, Introduction to	IBM
Word, Customizing	Mac
Word, Intermediate	Mac
Word, Introduction to	Mac
WordPerfect 5.0/5.1, Introduction to	IBM
WordPerfect 5.1, Intermediate	IBM
Writing DOS Batch Files	IBM

Software Site Licenses

The University has site licenses and volume discount agreements for a variety of microcomputer and workstation software. These software savings are coordinated or handled by different departments. We have listed the savings agreements we know about in Figure 1.

Site License Forum

If you have information on other site licenses or discounts and want to survey the University community to find other interested parties, contact Sandra Welch at 625-9091. Sandra Welch, Information Systems, coordinates a Site License Forum. The forum's purpose is to make it easier for everyone at the University to take advantage of savings agreements.

Qualifications

The software in Figure 1 that is marked with a ♥ is available to all members of the University community. Software marked with a ◇ is available only to those who can pay for the package with a University budget number; that is, the software is not available to individual faculty, staff, or students.

The Microcomputer Center's Role

The Microcomputer and Workstation Networks Center administers site licenses and discount agreements for some software owned by the University. To lease any of these

software packages, the lessee must sign a *Registered Authorized User Certificate* or a *Usage Agreement*. The restricted site licenses, those marked with a ◇ in Figure 1, have additional requirements. As administrator of the restricted site licenses, the Microcomputer Center is authorized to make multiple copies of program disks and lease them to interested departments. Departments pay an initial license fee; this fee enables the department to use the software for one year. Departments are not authorized to make *multiple* copies of the software. If a department wants more than one copy, it must lease more than one copy. If a department wishes to continue using the software after the first year, it will be charged an annual renewal fee.

Departments interested in leasing one of the restricted programs administered by the Microcomputer Center can contact the Microcomputer Center office in Room 132 Shepherd Labs, 625-1300. Departmental Journal Vouchers should credit the Microcomputer Center account 0950-1612-07, class 469.

Generally, the initial fee covers the disks only; manuals must be purchased separately. Manuals that you must purchase are available from the Minnesota Book Center in Williamson Hall. The Microcomputer HelpLine has copies of most of the manuals.

Generally, the license also includes free upgrades as they become available. Figure 1 includes a list of software fees, and Figure 2 lists fees for manuals. Descriptions of the individual packages follow these tables.

Figure 1: Software Discounts

(a) Administered by the Microcomputer Center

Software	Computer	First Year	Renewal
◇ AppleShare for Mac	Mac	$75	$50
◇ IMSL math and stat libraries	IBM	75	50
◇ Macintosh Programmers Workshop:			
MPW, Pascal, C, Assembler, etc.	Mac	85	50
MacApp	Mac	60	0
Allegro Common Lisp	Mac	75	50
♥ MacTCP	Mac	free	free
◇ PC Scheme (see TI Personal Consultant Plus)			
♥ ProComm	IBM	free	free
◇ SPSS for Mac	Mac	75	50
◇ SPSS/PC+ Base	IBM	75	50
◇ SPSS/PC+ Advanced	IBM	30	20
◇ SYSTAT for Mac	Mac	75	50
◇ SYSTAT for MS/PC-DOS	IBM	75	50
◇ TI Personal Consultant Plus	IBM	295	100
♥ TinCan	Mac	free	free
◇ TopDraw	NeXT	150	na

(b) Obtained from Other Sources

Software	Computer	First Year	Renewal
◇ AutoCAD	Mac	$750	na
◇ AutoCAD	IBM	750	na
♥ Mac-MATLAB	Mac	500	na
♥ PC-MATLAB	IBM	500	na
◇ SAS/PC	IBM	75	75
♥ Theorist	Mac	100	na
♥ YTERM	IBM	7	na

♥ available to all members of the University community
◇ available only through University budget number

Figure 2: Manuals for Discount Packages Administered by the Microcomputer Center

Manuals	Book Center Price
AppleShare for Macintosh	**
AppleShare Administrators Guide	**
IMSL	
STAT/PC Library: three 3-ring binders	$ 50.00
or one softcover book	18.00
MATH/PC Library: three 3-ring binders	$ 50.00
or one softcover book	18.00
MacTCP	*
Macintosh Programmers Workshop	
The manuals are at Beckwith Copy Center, 700 Washington Avenue SE; contact Beckwith at 378-1433 for the price of a copy of the manuals.	
ProComm	*
SPSS/PC+ for IBM	
v2.0 Base Manual	$ 29.95
v2.0 Advanced Manual	19.95
Update Manual for v3.0 and v3.1 *(for both base and advanced)*	7.95
SPSS for Macintosh	
Base System User's Guide	$ 24.95
Reference Guide	34.95
Advanced Stat. User's Guide	19.99
Operations Guide	8.95
SYSTAT	
IBM	$ 23.00
Macintosh	45.00
TI Personal Consultant Plus	
The manuals are at Beckwith Copy Center, 700 Washington Avenue SE; contact Beckwith at 378-1433 for the price of a copy of the manuals.	
TinCan	*
TopDraw	$ 55.00

* The documentation is on the software disk; you can print your own copy of these manuals.
** Price unavailable at press time.

AppleShare

This site license covers the AppleShare Server software for the Mac. AppleShare Server software runs on dedicated Macs that act as a file server for other machines on a network. This license is administered by the Microcomputer Center.

To share access to an AppleShare file server, Macs and IBM-type microcomputers must run the workstation (client) portion of the software. AppleShare client software for Macs is included with recent releases of the Macintosh system software. IBM-compatible client software must be purchased separately from the Book Center.

AUTOCAD

AutoCAD is a computer-aided-design program that can be used for a wide range of drafting applications; it runs on IBM-compatible computers and the Mac SE/30, IIci, IIcx, IIx, and IIfx. The minimum system requirements for PC/MS-DOS machines are 512K RAM, a hard disk, and a graphics display. A mouse and numeric co-processor are highly desirable. The hardware requirements for the Mac are 1.2MB RAM and at least a 20MB Hard Disk.

AutoCAD is available to University departments as a one-time purchase at reduced cost. There is no renewal fee charged or upgrades provided. The software is available by sending a University Purchase Order directly to the vendor whose address is: Autodesk, Inc., 2320 Marinship Way, Sausilito, CA 94965. If you have questions about AutoCAD, you can call Autodesk at 415/332-2344 or fax them at 415/331-8093.

IMSL

The IMSL site license includes the IMSL STAT/PC Library and the IMSL MATH/PC Library for IBM-compatible computers. Each library contains a set of FORTRAN subroutines which can be called by a FORTRAN program. The STAT library includes subroutines for: basic statistics; regressions and discriminant analysis; analysis of variance; nonparametric statistics and tests for goodness-of-fit; time series analysis; random number generation; and probability distribution functions and their inverses. The MATH library includes subroutines for: differential equations and integration; Eigensystem analysis; error functions and gamma functions; interpolation, approximation, and smoothing; linear algebraic equations; vector/matrix arithmetic and sorting; and zeros and extrema.

To use the IMSL libraries, you must have your own copy of Microsoft FORTRAN versions 4.2 or 5.0. The library consist of about 90 disks. To get a copy, registered IMSL users can sign out the set of disks and copy the subroutines they want onto their hard disk or to their own floppy disks. This license is administered by the Microcomputer Center.

Macintosh Programmers Workshop

The Macintosh Programmers Workshop is a development environment available from Apple Computer. You can lease three different systems. The first includes MPW, Pascal, C, Assembler, ResEdit, MacsBug, SADE, and Toolbox Interfaces and Libraries. The second is MacApp. The third is Allegro Common Lisp. This license is administered by the Microcomputer Center.

Mac-MATLAB: See MATLAB.

MacTCP

MacTCP is Apple's network software driver for the TCP/IP protocols. The MacTCP drivers are in the Telnet folders on the Mac Information Server. The Telnet folders are in the *Communications* folder of the *information* volume. (You also get a copy of MacTCP when you get POPmail for the Macintosh.) The Mac drivers are files (CDEVs) that you drag into your Mac's System Folder.

Since the Microcomputer Center's site license limits the University to distributing MacTCP for use by the University of Minnesota only, other schools and commercial organizations who want to use MacTCP should contact Apple to acquire the MacTCP software.

MATLAB

MATLAB (matrix library) is interactive software that helps you with scientific and engineering numeric calculations. MATLAB provides easy access to matrix software developed by the LINPACK and EISPACK projects. MATLAB is a completely integrated system; it includes graphics, programmable macros, IEEE arithmetic, and many analytical commands. Typical uses of MATLAB include general purpose numeric computation, algorithm prototyping, and solving the special purpose problems with matrix formulations that arise in disciplines such as automatic control theory, statistics, and digital signal processing (time-series analysis).

MacMATLAB runs on Macintosh IIs, and PC-MATLAB runs on PC/MS-DOS machines. You must have a graphics interface and a math co-processor to run MATLAB. MATLAB is a one-time purchase at reduced cost. No renewal fee is charged; no upgrades are provided. You can order MATLAB through the Minnesota Book Center.

PC-MATLAB: See MATLAB.

PC Scheme: See TI Personal Consultant Plus.

ProComm version 2.4.2

ProComm is communications software for MS/PC-DOS microcomputers; it works with Hayes-compatible modems and can emulate these ten terminals: ANSI-BBS, IBM 3101, ADDS Viewpoint, Wyse 100, Lear Siegler ADM-3/5, Heath/Zenith 19, DEC VT-100 and VT-52, Televideo 910/920 and 925/950.

To get a free copy of ProComm, bring a formatted 5.25-inch or 3.5-inch disk to the Microcomputer HelpLine. The documentation for ProComm is stored on the disk in a format known as "Arc'd". This format is used to save disk space. ProComm files with the `.ARC` extension are compressed files. You must un-Arc these files before you can use them. After you have un-Arc'd the ProComm files, you will find the reference manual in a file named `PROCOMMP.DOC`. This license is administered by the Microcomputer Center.

SAS/PC

Base SAS is an all-purpose data management, retrieval, and report-writing tool featuring a full-screen windowing facility for IBM-compatible computers. Current mainframe SAS users will find that SAS/PC contains many of the same data step commands and non-computer-system dependent procedures described in the SAS User's Guide. Since Base SAS takes up over 4MB of storage, you need at least a 10MB hard disk. SAS has these different products: 1) Base; 2) STAT; 3) GRAPH; 4) ETS; 5) SFP; 6) IML

This license is administered by St. Paul Computing Services and is available only to faculty and staff. To obtain the software, call for 4-7788 for an application form or stop by 50 Coffey Hall. The cost is $75 per product per year. You can purchase the manuals at the St. Paul Underground Bookstore.

SPSS/PC+ V3.1 Base and Advanced

SPSS/PC+ is a statistical package written for IBM and compatible computers. It requires at least a 10MB hard disk and 512K of memory (640K if you also have Advanced SPSS). A larger hard disk and a math coprocessor are recommended. Advanced SPSS/PC+ is also available under the site license. In order to lease Advanced SPSS/PC+, you must first have the SPSS/PC+ base program. This license is administered by the Microcomputer Center. You can examine the manuals in the Microcomputer Center office in room 132 Shepherd Labs to see what statistical routines are provided with these packages.

SPSS V4 Base and Advanced for the Mac

SPSS V4 is a statistical package for both mainframe and Macintosh computers. Version 4 is the same version of SPSS which runs on mainframe computers. To run SPSS v4 on a Macintosh, you need System version 6.0 or higher, at least 2MB of RAM, a hard drive with a minimum of 6MB of available disk space, and a Macintosh with a co-processor. (The Mac SE/30 and the Mac II family come with a built-in co-processor.) To install and run all of SPSS under MultiFinder, you need at least 15MB of available disk space and a minimum of 4MB of RAM. In order to lease Advanced SPSS, you must first have the SPSS base program. (For more information, see the July 1990 Microcomputer Newsletter's review.)

This license is administered by the Microcomputer Center. You can examine the manuals in the Microcomputer Center office in room 132 Shepherd Labs to see what statistical routines are provided with these packages.

SYSTAT

SYSTAT is a statistical package that is available in several different versions. The version for IBM and compatibles requires at least two floppy disk drives and 256K of RAM. For the Macintosh, you must specify if you are going to use it on (1) a 512K Mac, (2) a Mac Plus or SE or (3) a Mac SE/30 or the Macintosh II family.

This license is administered by the Microcomputer Center. You can examine the manuals in the Microcomputer Center office in room 132 Shepherd Labs to see what statistical routines are provided in this package.

TI Personal Consultant Plus

Personal Consultant Plus Expert System Development Tools is a set of software utilities that enable you to develop an expert system. Personal Consultant Plus requires an IBM or compatible with 640K of memory and at least 1.5MB of working space on a hard disk. Included with Personal Consultant Plus is *PC Scheme*, which must be installed before you install Personal Consultant Plus.

The manuals for Personal Consultant Plus are part of the site license and can be copied by licensed users. The manuals are: 1) the TI Personal Consultant Plus manual, 2) the TI Scheme manual, which is the reference manual for Scheme, and 3) the PC Scheme manual, which explains how to run Scheme on an IBM-compatible computer. This license is administered by the Microcomputer Center.

Theorist

Theorist is a symbolic algebra and graphing program for the Macintosh. Theorist is a one-time purchase at reduced cost. No renewal fee is charged; no upgrades are provided. You can purchase Theorist from the Electronics Desk in the Williamson Hall Book Center. The Book Center's price includes manuals and co-processor support.

TinCan version 3.0

TinCan is communications software written at Yale University that provides terminal emulation, file transfer, and local printing. Not all University of Minnesota mainframes support all of these functions from TinCan. Call the help line for the mainframe that you use for information on the software available for TinCan file transfer and local printing. If the mainframe does not have full file transfer capability, simple file transfers are still possible. To get a free copy of TinCan, you can bring a formatted disk to the Microcomputer HelpLine.

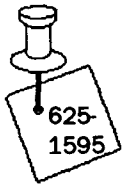
TopDraw

TopDraw is a drawing program for the NeXT computer. The cost for one copy of TopDraw is $150, about 75% off the retail price of $595. TopDraw is distributed by copying the program onto a NeXT optical disk that the purchaser provides. TopDraw is a one-time purchase at reduced cost. There is no renewal fee charged or upgrades provided. This license is administered by the Microcomputer Center.

YTERM

YTERM is communications software developed by Yale University for IBM-compatible computers that provides terminal emulation. On some mainframe setups it also provides file transfer capability. YTERM is available to University faculty, staff, and students. To purchase YTERM contact the St. Paul Computing Services Center at 50 Coffey Hall, phone 624-7788.

Hardware Warranty, Repair, and Upgrade Services



If you have trouble with your microcomputer equipment, your first call should be to the Microcomputer HelpLine. The HelpLine will help you determine if the problem is with your hardware or software. If the symptoms point to the hardware, call ACS Engineering Services at 625-1595.

Warranty Service

Engineering Services, the maintenance department of ACS (Academic Computing Services), provides warranty service to departments, employees, and students on most equipment sold through the Microcomputer Discount Program. Warranty service is provided free if you carry your equipment to the Engineering Services shop at the ACS Lauderdale Computing Facility at 2520 Broadway Drive where free parking is available. For warranty service, ***keep track of your invoice and other purchase papers*** showing the date it was purchased as well as the model and serial number of your equipment.

Post Warranty

ACS Engineering Services offers three levels of service contracts: carry-in, on-site, and on-site with loaner. If you contact Engineering Services before your warranty expires, they will arrange for coverage to begin on the day it expires.

If you do not buy a service contract but wait until something goes wrong to have your equipment serviced, you will be charged on a time and materials basis. When Engineering Services repairs equipment on this basis, they charge $40 per hour with a one hour minimum – plus an additional transportation fee for on-site service. On-site service is available for campus business addresses (within a 5 mile radius). Some departments use the Campus Courier service (626-0707) for pickup and delivery of their computers.

Engineering Services also handles hardware upgrades for many microcomputer products.

Book Center Notes

These offers are made to University departments, employees, and students; the regular Microcomputer Discount Program rules of eligibility apply. If you have questions about availability, phone the Electronics Desk at *625-3854*.

● Computer Supplies

Besides obvious items, such as software and floppy disks, the Williamson Electronics Desk carries a wide variety of computer supplies. Here is a sample of what you can find.

Printer Ribbons

Besides the models mentioned below, you can buy ribbons for Data Royal, NEC, Teletype, Toshiba, and Xerox printers.

- Dec: DecLa 34 and DecLa 180.
- Diablo: Hytype II and Universal.
- Epson: EX-800/1000, LQ-800, LQ-1000, LQ-1500, LQ-2500, LX-80, MX/FX-100, and MX-70/80.
- IBM: Proprinter 4201 and 4202 as well as 1443/DecLa 30.
- Okidata: Microline, Microline 80 and 84 as well as Pacemaker 2350.
- Qume: Qume IV and Qume/IBM 6420.

InkJet Cartridges

You can buy black inkjet cartridges that work in the HP DeskJet, DeskJet Plus, and DeskWriter for $15.95.

Black ink cartridges for the HP PaintJet cost $17.95, while color cartridges cost $20.60.

Laser Printer Supplies

The Book Center carries labels and other special laser papers as well black toner cartridges for the printers listed below.

Toner	Use with Printer...	Book Center Price
92275A	• Hewlett-Packard LaserJet IIP • Apple Personal LaserWriter NT and SC	$75
92285A	• Apple LaserWriter (original) and LaserWriter Plus • Hewlett-Packard LaserJet, LaserJet Plus	75
92295A	• Hewlett-Packard LaserJet Series II, IID, and III • Apple LaserWriter IINT, IINTX, and IISC	75
—	• IBM 4019 and 4019e	115

Anyone who has been tempted to cut costs by using recycled, rather than new, toner cartridges should heed the following warning. When cartridges are refilled, the cases *exceed their designated life*. Since most manufacturers consider using refilled toner cartridges as inadequate maintenance, service calls involving refilled cartridges probably will not be covered under warranty.

Templates

We carry keyboard templates for these PC/MS-DOS products: DOS, Lotus 1-2-3, Turbo Pascal, and Microsoft Word. The Word templates are available in 12-function or 10-function keys layouts. We also carry a create-your-own template.

Diskette Carriers and Holders

You can buy diskette carriers for 5.25-inch and 3.5-inch disks that hold from 5 to 100 disks.

● IBM PS/2 Bundles: Correction

We goofed. In our September 1990 *Book Center Notes* article about IBM's bundles, we said:

> All the PS/2 specials are sold with ... IBM's 8512 14 inch color display - except the portable P70 ...

We should have said:

> All the PS/2 specials are sold with ... an IBM color display - except the portable P70...

Only one machine comes with the 8512 monitor. The others come with the 8513 or 8515 monitors. We are sorry for any inconvenience this may have caused you. To learn which special is matched with which monitor, see the *revised table* on pages 198-199.

What Bundle?

For those who missed our September article, here are the details on the bundles: IBM is offering some of their PS/2 microcomputers at special prices. All the PS/2 specials are sold with IBM's mouse, Microsoft Windows 3.0, and an IBM color display - except the portable P70 which has a built-in display. The P70 special comes with a nylon carrying case. All the specials also come with PC-DOS (every IBM the Book Center sells includes PC-DOS).

Some machines are bundled with additional software; all the software that comes with the IBM specials is already copied onto the machine's hard disk. Although you get academic versions of the software, the only difference between this software and other versions is that the manuals are stamped "Academic Version."

Some machines come with more RAM* than those machines offered at the normal discount.

The table on the next page lists the ten machines IBM is offering as special bundles. The table includes columns for IBM's special price and the Book Center's normal price. The difference between these two prices is shown in the column called *Difference*.

* **Editor's Note:** You may want to read *IBM and IBM Compatibles: Performance Issues* in our September 1990 newsletter and *Memory in IBMs and IBM-compatibles* on page 181 of this issue to help you understand whether or not this extra RAM would be useful to you.

You will also find a column called *Partial Value of Extras*. This column gives you the amount of money you would have to spend at the Book Center to buy the items IBM has bundled with their machines. The amount, however, does not include the value of hDC windows Utility, ZSoft SoftType, Asymetrix ToolBook, or Arts and Letters Graphics Editor since the Book Center does not carry these items. Check the prices of these items at your favorite commerical software source.

The features that are standard for *all* the IBM PS/2s listed in this table, regardless of whether you order the machine at the regular discount or the special price, are:

- one built-in 3.5-inch 1.44MB floppy drive
- one built-in hard disk
- one serial port and one parallel port
- one mouse port
- a built-in VGA display adapter
- PC-DOS 4.0

Monitors

The monitors offered with IBM's bundle are analog VGA-compatible color displays that include a tilt/swivel base. Their graphics resolution is 640 x 480. Text displays on the 8512 and 8513 can address a 720 x 400 dot matrix; on the 8515 the matrix is 720 x 480 or 720 x 350. They are also compatible, via VGA hardware, with the older CGA and EGA graphics modes.

Regular Discount

Currently the Book Center does not carry all the items bundled with the IBM PS/2 specials. Here are the Book Center's normal prices for the items they do carry.

Part	Description	Regular Discount
Software		
-	Microsoft Windows	$ 67
-	Word for Windows *	125
-	Microsoft Excel	115

Complete descriptions of the IBM PS/2s shown here are in the **IBM and Zenith Microcomputers** handout.

Handouts are available in the Microcomputer HelpLine in 125 Shepherd Labs, in the hallway outside room 125, and from the *Bookstore* folder on the Mac Information Server.

Performance Specifications

A. DOS/Windows offerings include this software: Windows 3.0 and PC-DOS 4.0.

	Model	CPU Speed	Clock Speed	Wait States	Hard Disk	Disk Access	RAM Speed
1.	30/286	80286	10Mhz	1	30MB	27ms	120ns
2.	55SX	386SX	16MHz	0-2	60MB	27ms	85ns
3.	70	80386	16MHz	0-2	60MB	27ms	85ns

B. Solution offerings include this software: Windows 3.0, PC-DOS 4.0, Word for Windows as well as hDC Windows Utilities, and ZSoft Softtype.

	Model	CPU Speed	Clock Speed	Wait States	Hard Disk	Disk Access	RAM Speed
4.	30/286	80286	10Mhz	1	30MB	27ms	120ns
5.	55SX	386SX	16MHz	0-2	30MB	39ms	85ns
6.	55SX	386SX	16MHz	0-2	60MB	27ms	85ns
7.	70	80386	16MHz	0-2	60MB	27ms	85ns

C. Advanced Academic † offerings include this software: Windows 3.0, PC-DOS 4.0, Word for Windows, Excel, hDC Windows Utilities, ZSoft Softtype, Asymetrix ToolBook, and Arts & Letters Graphics Editor.

	Model	CPU Speed	Clock Speed	Wait States	Hard Disk	Disk Access	RAM Speed
8.	55SX	386SX	16MHz	0-2	60MB	27ms	85ns
9.	70	80386	20MHz	0-2	120MB	23ms	85ns
10.	P70	80386	20MHz	0-2	120MB	23ms	85ns

† The Advanced Academic offerings include additional software: faculty-written demonstration programs, hDC foreign language keyboard mapper, and a formula editor. In addition, some classroom presentation options are available from IBM; look for a coupon and more information with your packaging.

Hardware

-	IBM Mouse	$ 60
8512	14-inch VGA color display	384
8513	12-inch VGA color display	463
8515	14-inch VGA color display	570
6450604	2MB 85ns RAM Expansion Kit	597

* Please note: *Word for Windows* and *Microsoft Word* are different software packages. The Book Center's price for Microsoft Word is $82.

Deadlines

If you buy a PS/2 special before December 31, 1990 you can purchase a Hayes 2400 baud modem for $99; this modem offer includes a three-month subscription to PRODIGY, an information service.

And Books, Too

If you cannot find the computer books you want in the Book Center's Reference section, tell us what books you want to buy. Send specific titles or areas of interest to: Maureen O'Brien, 160 Williamson Hall, Minnesota Book Center, 231 Pillsbury Drive SE, Minneapolis, MN 55455. Here's what is new in the Reference section.

- ✔ *Scientific Visualization and Graphics Simulation* by Thalmann, a John Wiley publication for $49.95.
- ✔ *PageMaker 4.0 for the Macintosh Made Easy* by Matthews, an Osborne-McGraw-Hill publication for $19.95.
- ✔ *The First Book of WordPerfect 5.1* by Barnes, a Sams publication for $14.95.

	Revised IBM Specials and Prices				Regular Discount Prices			Difference	Partial Value of Extras*
	Special	**RAM**	**Monitor**	**Price**	**Normal**	**RAM**	**Price**		
1.	8530-T31	1MB	8512	$1,649	8530-E31	1MB	$1,612	$ 37	$511
2.	8555-T61	2MB	8515	2,699	8555-061	2MB	2,452	247	697
3.	8570-T61	4MB**	8515	4,399	8570-E61	2MB	3,412	987	1,294
	Special	**RAM**	**Monitor**	**Price**	**Normal**	**RAM**	**Price**		
4.	8530-U31	1MB	8513	$1,799	8530-E31	1MB	$1,612	$187	$715
5.	8555-U31	2MB	8513	2,349	8555-031	2MB	2,212	137	715
6.	8555-W61	2MB	8515	2,799	8555-061	2MB	2,452	347	822
7.	8570-W61	4MB**	8515	4,499	8570-E61	2MB	3,412	1,087	1,419
	Special	**RAM**	**Monitor**	**Price**	**Normal**	**RAM**	**Price**		
8.	8555-U61	4MB**	8515	$3,749	8555-061	2MB	$2,452	$1,297	$1,534
9.	8570-121	4MB**	8515	5,499	8570-121	2MB	3,952	1,547	1,534
10.	8573-121	4MB	built-in	5,579	P70-121	4MB	5,092	487	478

* (a) Includes cost of color monitor, mouse, and Windows; some specials also include, Excel, Word for Windows, and extra RAM. The P70 does not include a monitor; it includes a nylon carrying case whose discount price is $111.
(b) Does not include cost of hDC Windows Utility, ZSoft SoftType, ToolBook, or Arts and Letters. Check the prices of these items at your favorite commerical software source.

** These Specials come with more RAM than the machines sold at the regular discount price.

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(1) If you want back issues of volumes 3 to the present issue, Kinkos will make them for you for a nominal fee. The master copies are downstairs at the Kinkos shop at 306 15th Avenue SE. This shop is open Sunday to Saturday. (2) The Information server, accessible to Macintoshes directly connected to the University's internet, has the six most recent issues of the newsletter.

October 1990