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Getting Started with the IBM PC Convertible

John Warnock
IBM Corporation

This article tells you how to get started using the newest member of the IBM Personal Computer family, the IBM PC Convertible.

The IBM PC Convertible is a new laptop computer that retains compatibility with the existing IBM Personal Computer family. The PC Convertible's small size, light weight and battery power let you use it virtually anywhere.

The PC Convertible comes with 256KB of memory and two diskette drives. If you ordered additional memory or the internal modem, your first step is to install these features.

Memory Expansion

The system memory is easy to access. Two cover release buttons (located under the front handle) let you raise the Liquid Crystal Display. The carrying handle conceals two keyboard release slots. Pressing a coin into each slot until you hear a light click lets you tip the keyboard up by the lower right and left corners. The memory cards are located beneath the keyboard.

Each Memory Expansion Module slides into the preceding module and clicks into the case. Each module holds 128KB of memory, so you can add up to two for a maximum of 512KB of memory. Replacing the keyboard is easy. The back floats against the diskette drives, and the front clicks into place.

Battery Operation

One major difference between the IBM PC Convertible and the rest of the IBM PC family is that the PC Convertible can run using a built-in battery pack. The battery pack does not come charged. The AC Adapter plugs into a standard electric socket, and the other end plugs into the PC Convertible. The battery pack should charge for 24 hours for the first time before using it to power the system.

You normally get six to ten hours of use from a fully-charged battery pack. If you use the diskettes frequently, or use the printer, then the charge may not last as long. (You can set several system options to conserve the battery power, as we will see later.) If the battery pack runs low, the system beeps three times and the screen flashes until you press a key. This continues every two minutes until you charge the battery pack, or the battery pack loses power.

Once you have initially charged the battery pack, you need only recharge it for 12 hours to restore it to full strength.

As long as the AC Adapter is plugged in, you can use the PC Convertible at the same time the battery pack is charging. This is also true for the optional Automobile Power Adapter.

Differences in the Keyboard

The keyboard is compact, yet has full-sized keys. (See accompanying illustration.) Some keys serve more than one function. The Fn (function shift) key makes this possible. Press the Fn key and the arrow keys to get the PgUp, PgDn, Home, and End keys. The Fn and Num Lock keys activate and deactivate the numeric keypad, which is imbedded in the typewriter keys. The function keys occupy the top row along with the Escape, Pause, Break, Insert and Delete keys.

The key combinations used with the rest of the IBM Personal Computer family still work on the PC Convertible. For example, the Ctrl key does the same things it did on other IBM Personal Computers. When pressed with the Scroll Lock key, it causes programs to stop. When pressed with the Num Lock key, it causes programs to pause. When pressed together with Alt and Del, it restarts the system.

There are some new key combinations as well. For example, pressing the Fn and Scroll Lock keys activates and deactivates the speaker. The Fn key plus the Caps Lock key activate and deactivate the clicking sound that you get when you press the keys. The Fn key also turns the F1 key into F11, and the F2 key into F12. Together with the Esc key, the Fn key performs a SysRequest and lets you suspend or resume applications, as we will see later.

In addition, a new key combination resets keyboard locking conditions which result from a "system hang." Because the PC Convertible is battery-powered, it can retain the contents of memory when you turn off the system. Included in these contents are conditions that cause the keyboard to lock. When you turn the system back on, the keyboard may still be locked. However, by pressing the Ctrl, Fn and Del keys, you can clear all the retained memory and conditions, and restart the system with the power-on self-test.

New Diskettes

The IBM PC Convertible uses hard-shelled 3.5-inch diskettes. These new diskettes don't require a protective envelope. The diskettes have a metal shield over the read/write slot that automatically retracts when the diskette is inserted. The new 3.5-inch diskettes hold 720KB of data compared to 360KB for the 5.25-inch diskettes.

Starting the System

If you start the PC Convertible with no diskettes, you will see it check memory by displaying the memory address in the upper left-hand corner of the display. In a few seconds, the PC Convertible beeps, and an image (called an icon) of a clock appears on the screen with flashing question marks in the center. This is a reminder to set the day and date for the internal clock. This is necessary only when the PC Convertible has been without power. Otherwise, it remembers the date

and time that you originally set when you selected system options.

In a few more seconds, an icon of the PC Convertible appears, showing a diskette going into the first diskette slot, and the F1 key being depressed. This reminds you to insert a diskette with DOS, the Start-Up program, or the Application Selector on it. If you insert a diskette without DOS, the icon shows the diskette coming out of the slot and appearing to break. If you press the F1 key without inserting a diskette into drive A, Cassette BASIC starts.

Using the Start-Up Diskette

The Start-Up program displays a menu on the screen with three options:

- F1 starts the introductory program, Exploring the PC Convertible.
- F2 does software set-up. This creates a diskette with an application selector, the SystemApps (if you have PC Convertible Model 002), and optionally DOS.
- F3 lets you run diagnostics if there is a problem.

The F1 key begins the Exploring program. Pressing the down arrow key gives you instructions. The Esc key lets you continue. After you complete or bypass the instructions, you can choose from six sections of the Exploring program. Each section has panels of information about the PC Convertible. The possible key choices appear at the bottom of the screen, with the recommended choice in reverse video. The six sections are:

1. *System Overview,* describing the system unit, software and documentation.
2. *Keyboard,* describing the keys.
3. *Application Selector,* describing the menu program and its choices—loading and suspending applications, displaying help text, and displaying messages.
4. *Tools,* describing the program that personalizes the PC Convertible and performs diskette utility tasks.
5. *SystemApps,* covering the four application programs that come with PC Convertible Model 002.
6. *Software Setup* program, describing the program that helps you start to use the system software.

You normally get six to ten hours of use from a fully charged battery pack.

All six sections use graphics and on-screen animation to illustrate concepts. Some sections have samples of display screens. Many examples show steps for using applications. For example, in the Tools section, you learn to enter a new date and time in the System Profile. In the Set F Keys example, you define a function key to load your own application.

After you complete the Exploring the PC Convertible program, you should next use the Software Setup program to build an Application Selector diskette that contains the Application Selector program, System Tools, SystemApps, and DOS 3.20.

The Software Setup program

The Software Setup program builds an Application Selector diskette, and optionally merges the SystemApps and DOS 3.20 onto the diskette. You must have DOS to perform some of the System Tools tasks and to merge your own applications onto the Application Selector diskette.

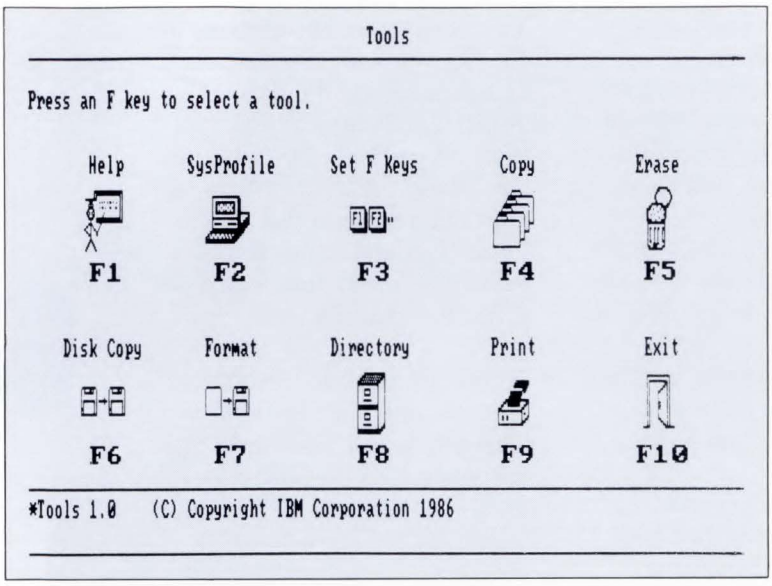
To use the Software Setup program, you must be in the Start-Up Menu. (You return to this menu after you complete the Exploring program.) The F2 key begins the Software Setup program. The instructions tell you to label a blank diskette and insert it in drive B. Pressing the Enter key starts the creation process. While it is running, the Software Setup program provides status messages.

After it creates the Application Selector diskette, the Software Setup program prompts you to remove the Start-Up diskette from drive A. At this point you could move the Application Selector diskette from drive B to drive A and use it. If you insert the DOS 3.20 diskette in drive B and press the Enter key, the DOS merge process begins. You want to do this if you need some of the added functions of DOS, or want to use the Application Selector menu to call your own programs. After DOS 3.20 has been merged, you can remove the DOS diskette from drive B. You can now begin to use the System Tools and SystemApps.

The next step is to use the System Tools to set the correct date and time, and to personalize the system.

System Tools

The F2 key accesses System Tools. The Tools menu appears,



displaying several icons that represent tasks such as copying, erasing and printing diskette files, as well as adding your own applications to the Application Selector menu. The function keys let you select the various tasks. The F1 key accesses help information.

Pressing the F2 key again displays the SysProfile screen. You now can personalize your PC Convertible. All configuration information appears on the SysProfile screen at once.

For example, you can set the system date and time for the battery-powered clock. The date and time formats are the same as in the rest of the IBM Personal Computer family. You would enter the correct date and press the down arrow key. The same steps work to enter the correct time.

You wouldn't change the display options unless you were running an application that requires monochrome mode or 40-character graphics mode. (In monochrome mode, the icons do not appear on the menus.) You'll probably want to leave the display mode and LCD intensity substitute options unchanged by pressing the down arrow twice.

Unlike the other members of the PC family, the PC Convertible lets you save the contents of memory when you turn off the system. When you turn it on again, you can restore the memory contents and resume from that point. The power-on option gives you the choice of saving the contents of memory or clearing memory when you turn off the computer. To save memory, you select RESUME mode; to select clearing memory, you select IPL mode. (Note: If you use the optional CRT Adapter, you cannot choose the resume option.)

The arrow keys work to set the display defaults for width, mode, and reverse image. (Reverse image and underlining are used where you would normally see high intensity.) You can set several power-saving options as well. For example, you can make the internal modem work only when a power adapter is plugged in. You can tell the PC Convertible to turn off the display, or to turn off the system itself, if a key isn't pressed within a time you specify. You can set these options initially and change them later.

At the bottom of the screen, the System Profile shows your current configuration. The F10 key saves the changes and exits from the SysProfile menu.

Back in the System Tools menu, the Set F Keys option presents you with a chart of keys, menu labels, and DOS file names associated with the keys. You can add your own labels and application file names to this list easily. For example, to add BASIC to the menu, type BASIC as the label of the next available key (which is F8 if DOS is installed). Press the tab key, you would type BASICA.COM as the DOS file name. The F10 key saves the changes. The Application Selector menu now shows BASIC as key F8.

With System Tools, you can perform common diskette utility tasks such as copying files or diskettes, erasing files, formatting diskettes, listing diskette directories, and printing diskette files. Unlike the DOS versions of these tasks, you get menus with prompts. Some of the Tools (FORMAT, PRINT, etc.) require you to merge DOS 3.20 on the Application Selector diskette.

Because you added BASIC to the Application Selector menu, you also need to copy BASICA.COM from the DOS diskette to the Application Selector diskette. To do this, use the Application Selector version of the copy program. This method of copying files provides functions in addition to those in DOS. When you select the Copy option from the menu, a screen appears with prompts for the "from" and "to" files. You

can enter the same information (e.g., global characters, drives, and paths) as you would enter using DOS.

If you can't remember the name of the file you want to copy, you can press the Dir key (F8) to get a list of files. Let's assume you can't remember the name. Insert your DOS diskette in drive B, and press the F8 key. A prompt appears at the bottom of the screen, asking which drive and path you want to use. Type the letter B over the A. Press Enter; the directory of B appears. Use the up and down arrows to highlight the BASICA.COM file, and press Enter. BASICA.COM appears after the "copy from" prompt. All that's left is to press the down arrow and type A: after the "copy to" prompt, and press Enter to start the copying process. This makes working with files much easier because you have less to remember.

SystemApps

The SystemApps, which come with the PC Convertible Model 002, are four application programs designed to improve your personal productivity and to serve as a good introduction for the novice. Accessed through the Application Selector, each program has a status area at the top of the screen. All the SystemApps make extensive use of the function keys and have a Help key (F1) if you have problems or questions.

Notewriter lets you write, edit, print, and save notes, memos, letters, and other documents. Typing is as easy as using a typewriter. Notewriter lets you set margins, and it automatically wraps words to the next line. You can review, revise, save and print notes.

Saving a note (with the F3 key) also saves the margin and paragraph indentation settings for that note. When you set the margins, the F6 key adjusts the margins of revised paragraphs to fit within the margin settings. You also may want to adjust a paragraph's margins after you use the Block key (F7) to move, copy or delete blocks of text. In addition, Notewriter lets you insert or delete individual characters or whole lines, and join or split lines of text.

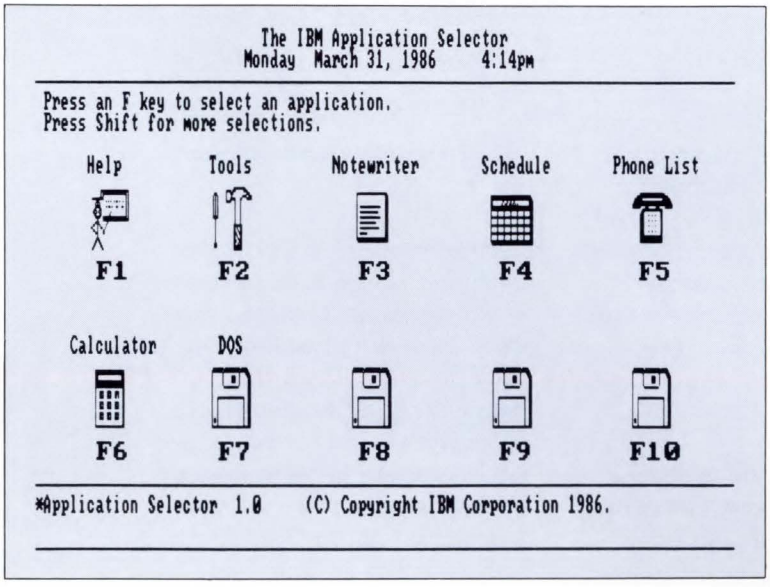
Just as Notewriter lets you save notes on diskette, it lets you recall notes from diskette to revise or print. Pressing the Get key (F2) retrieves a note from diskette. You will be prompted for the name of your note. If you forgot its name, the Directory key (F8) displays a list of the contents of your diskette. The up and down arrows let you highlight the name of the note you want, before pressing Enter.

Notewriter is also a handy text editor, so you can easily modify system files such as CONFIG.SYS and AUTOEXEC.BAT as well as ASCII-format data files.

Schedule organizes your appointments and reminders, and lets you view them on a daily, weekly, or monthly basis. When selected from the Application Selector, Schedule automatically shows your daily schedule for the current day in half-hour intervals.

You enter appointments into your schedule by using the up and down arrows to go to the time of day you want. Just type the appointment as you want it to appear. Optionally, you can press the Alarm key (F7) to have Schedule beep you and display a message when it's time for the appointment. A Reminder key (F8) lets you flag that day on your weekly or monthly calendar as one to remember. Additionally, the daily schedule accepts to-do items; simply type notes on the schedule but don't specify any times.

Moving to other days can be done by pressing the Next key (F6), the Prev key (F5), or by pressing the Day key (F2) and entering the day you want to move to. The F3 key puts you in the weekly schedule, and the F4 key displays a calendar for the month.



The weekly schedule shows your appointments, to-do items, and reminders for the week in a shortened form. In this section of Schedule, you can press the F7 key to see the first six open times in your schedule. Pressing F7 again reverts to displaying your appointments. You can use the Prev key (F5), Next key (F6), or Day key (F2) to move to other weeks, just as in the daily schedule.

The monthly schedule shows the days for that month, and shows any appointments or reminders. You can use the cursor keys to select a day, and use either the Day key (F2) to go to the daily schedule for that day, or the Week key (F3) to go to the weekly schedule. The Next key (F6) and Prev key (F5) let you move to the following or previous month. The Month key (F4) lets you enter the month to view. The Delete key (F7) erases all entries for the month on display.

Phone List lets you keep your important phone numbers current. With Phone List, you can create and maintain multiple phone directories, look up numbers easily, and (if you have the internal modem) have the computer dial the numbers for you.

Phone List uses a default directory called PHONE.LST to store names, numbers and addresses. You use the Edit key (F4) to add new entries to a directory. The F3 key lets you save the changes to the PHONE.LST directory, or to any other directory you name. Each time you save a list, the list is alphabetized.

You retrieve different telephone directories with Phone List in the same way you retrieve different notes with Notewriter. The Get key (F2) allows you to retrieve a phone list from diskette. You are prompted for the name of the phone list. If you don't remember the name, pressing the Directory key (F8) displays a list of the contents of your diskette. The up and down arrows will highlight the name of the phone list you want. Pressing Enter puts the phone list name after the prompt.

Looking up entries is easy with Phone List. Press the F4 key to enter Find mode. A look-up box appears on the screen. As you type each letter of the last name, Phone List scrolls to a new line in the directory, narrowing its search. If you have the optional internal modem connected to the phone, you can dial the number by pressing the F3 key. The automatic dial feature supports the numbers 0-9, *, and #. The letter **p** instructs the dialer to use pulse code like a rotary phone. The letter **t** switches to tone dialing. A comma in the number tells the dialer to pause for two seconds.

With its light weight and full-function portability, the IBM PC Convertible is the go-anywhere office

Calculator turns the PC Convertible into a simple desk calculator with basic math functions. You can add, subtract, multiply, divide, calculate percentages, and optionally print the results. To make work easier for you, Calculator automatically activates the numeric keypad when it loads. Calculator prints a tape of your activity as you go along, and also has memory functions (add, subtract, recall, and clear).

Suspend/Resume

A new feature in the PC Convertible is called suspend/resume. With this feature, you can call up a program from the Application Selector, suspend it, call up one of the four SystemApps, use the program, end the SystemApps program, then resume the original application.

Here is an example. Suppose you call up Notewriter to write a memo giving everyone the day off for your birthday. As you type your memo, you realize you don't know what day of the week your birthday falls on. Pressing the Fn and Esc keys, you return to the Application Selector menu. The Notewriter icon appears in reverse image, indicating it is suspended. Pressing the F4 key starts the Schedule application and displays today's schedule. When you press the F2 key, you are prompted to enter a date. Entering 09-15-1986, you see that your birthday falls on a Monday. The F10 key returns you to the Application Selector menu. Pressing the Notewriter key (F3) returns you to the point in the memo where you left off.

You should not suspend programs that perform communications or share the printer. Only SystemApps programs can be run while the first program is suspended.

Now That You're Started ...

The new functions and friendly utilities available on the IBM PC Convertible make it a useful tool for the modern professional. With its light weight and full-function portability, the IBM PC Convertible is the go-anywhere office.

What's New in DOS 3.20

John Warnock
IBM Corporation

DOS version 3.20 supports new commands, new functions, new diskette media, and the newest member of the IBM Personal Computer family, the IBM PC Convertible. This article explores the new features of DOS 3.20. BASIC interpreter enhancements will be covered in a future article.

DOS 3.20 includes all the function of DOS 3.10, plus:

- Support for 3.5-inch diskettes and diskette drives
- Support for the IBM PC Convertible
- Support for the IBM Token-Ring Network
- Command enhancements
- New commands
- New BASIC 3.20 interpreter

The command enhancements are:

ATTRIB sets read/write and archiving attributes on files.

CHKDSK supports the 720KB 3.5-inch diskette.

COMMAND lets you set environment size.

GRAPHICS supports aspect ratio of Liquid Crystal Display (LCD).

DISKCOPY supports the 720KB 3.5-inch diskette.

DISKCOMP supports the 720KB 3.5-inch diskette.

FORMAT supports the 720KB 3.5-inch diskette, and offers greater protection against accidental erasure.

MODE supports LCD display in color or monochrome mode.

The new commands are:

REPLACE selectively replaces all occurrences of files on a target disk.

XCOPY copies files, directories, and subdirectories to like or unlike media.

DRIVER.SYS device driver that supports external and logical disk drives.

3.5-Inch Media Support

With the announcement of the new models of IBM Personal Computer XT, IBM Personal Computer AT, IBM PC Convertible, and External 3.5-Inch Diskette Drive, the 3.5-inch diskette is available for the entire IBM Personal Computer family. DOS 3.20 supports this new size through changes to the existing commands FORMAT, CHKDSK, DISKCOMP, and DISKCOPY. These commands operate as usual, but now support the 720KB format of the new diskettes.

IBM PC Convertible Support

DOS 3.20 supports the new features in the battery-powered IBM PC Convertible. To conserve battery power, you can set the IBM PC Convertible to enter a wait state after a set period of inactivity. DOS 3.20 is unaffected by the wait state, and can be reactivated by an interrupt from the BIOS (Basic Input/Output System).

Some IBM Personal Computer AT features are available on the IBM PC Convertible. DOS 3.20 supports the real-time clock and date functions of the PC Convertible as it supports the clock on the Personal Computer AT. DOS 3.20 also supports the diskette change line as supported in the Personal Computer AT. The change line detects the opening of the diskette door, and warns that the diskette may have been removed.

The GRAPHICS command, which lets you copy the screen to a printer, has been updated to support the PC Convertible's Liquid Crystal Display (LCD). You can now type:

```
[d:][path\]GRAPHICS /LCD|/NLCD
```

where

[d:] is the drive for the file

path is the path to the file

/LCD sets the aspect ratio to print the screen horizontally compressed, the way it appears on the LCD

/NLCD sets the aspect ratio to print the screen as it would appear on a CRT (cathode ray tube) display

(Note that in this article a '|' means logical or.)

Because DOS 3.20 is the only version that supports 3.5-inch diskettes, it is the only version that runs on the IBM PC Convertible.

Token-Ring Network Support

DOS 3.20 is required to support the IBM Token-Ring Network. Other products that support the Token-Ring Network include the IBM Token-Ring NETBIOS Program, Advanced Program-to-Program Communications for the IBM Personal Computer (APPC/PC), the IBM Token-Ring Network/IBM PC Network Interconnect Program, and the IBM Asynchronous Communications Server Program for the IBM Token-Ring and IBM PC Network. With the Adapter Handler Program and NETBIOS Program, you can use the IBM Local Area Network Program Version 1.10 to operate the IBM Token-Ring Network under DOS 3.20.

Command Enhancements

Many existing DOS commands were enhanced in version 3.20. Some commands that weren't changed to support the new diskette media have been changed for greater function or ease of use.

The descriptions below discuss only the added functions. Existing features continue to work as in previous versions and are not discussed.

ATTRIB formerly only set the read-only status bit in a file; it now lets you set the archive bit as well. This gives you more control over the BACKUP and XCOPY commands. To use the new feature, type:

```
[d:][path\]ATTRIB [d:][path\]
filename[.ext] +A|-A
```

where

[d:] is the drive for the file

[path\] is the path to the file

filename is the name of the file

[.ext] is the file extension

+A activates the archive bit

-A deactivates the archive bit

Suppose you start to back up all your unarchived files using the BACKUP command. After the first file (COMMAND.COM), you stop the process to get more diskettes. If you start the backup process again, you will miss the COMMAND.COM file. So, before you restart the backup, you should reset the attribute bit by typing:

```
attrib +a command.com
```

COMMAND lets you call up a secondary command processor. It's useful if you need to call up DOS from the BASIC interpreter or TopView. Now DOS lets you set the size of the environment that holds system values and constants. The command format is:

```
[d:][path\]COMMAND [/E:nnnn]
```

where

[d:] is the drive for the file

[path\] is the path to the file

[/E:nnnn] specifies environment size, where nnnn is the number of bytes between 160 and 32768. It is rounded up to the nearest paragraph boundary.

Suppose you wanted to pause in a BASIC program to list a disk directory and set the environment to 1024 bytes. Your program might have the statement:

```
10 SHELL "COMMAND /E:1024 /C DIR"
```

FORMAT lets you format disks and diskettes. In earlier versions of DOS, if you typed FORMAT without specifying the drive, unexpected results could occur. This new version requires you to name the target drive. DOS will prompt for a label if it is present. The command format is:

```
[d:][path\]FORMAT d:
```

where

[d:] is the drive for the file

[path\] is the path to the file

d: is the target drive (required)

To format your fixed disk, for example, you must type

```
format c:
```

to start the process.

SELECT is for a new installation of DOS. This version of SELECT sets up the disk and lets you specify the source and target drives. It formats the target disk, copies system files using XCOPY, then creates AUTOEXEC.BAT and CONFIG.SYS files with the appropriate country and keyboard support. SELECT simplifies a DOS installation. To use it, type:

```
[d:][path\]SELECT [[A:|B:] D:[path\]] xxx yy
```

where

[d:] is the drive for the file

[path\] is the path to the file

A: or B: is the source drive

D: is the target drive (required if the source is specified)

xxx is the country code

yy is the keyboard code

You would type:

```
select A: C: 001 us
```

to install DOS on your fixed disk for the United States.

New Commands and Features

DOS 3.20 contains several new commands and features that make DOS easier to use.

REPLACE works like the COPY command, except it lets you replace all occurrences of a file, or add only new files to a disk or subdirectory. The command looks like this:

```
[d:][path\]REPLACE[d:][path\]
filename[.ext][d:][path\]
[/A][/P][/R][/S][/W]
```

where

[d:] is the drive for the file

[path\] is the path to the file

[/A] adds files to the target

[/P] prompts you for selective replacement or addition

[/R] replaces read-only files on the target

[/S] searches all subdirectories for matching files

[/W] waits for you to insert diskettes before starting

A good use of REPLACE is to install DOS on an existing fixed disk system, particularly where you might have copies of COMMAND.COM in subdirectories. You start by inserting your DOS 3.20 diskette in drive A. Use the SYS command to install the system files, then type:

```
REPLACE A:*.* C:\ /s
```

to replace all occurrences of the DOS files. To add the new DOS files and omit non-US keyboard and country files, you then type:

```
REPLACE A:*.* C:\ /p
```

to choose which new files to add.

XCOPY selectively copies groups of files, and can copy subdirectories. This is very useful for an application subdirectory that has subdirectories of its own. Its format is:

```
[d:][path\]XCOPY [d:][path\]filename[.ext]
[d:][path\]filename[.ext]
[/A][/D]=|>date[/E][/M][/P][/S][/V][/W]
```

where

[d:] is the drive for the file

[path\] is the path to the file

filename is the name of the file

[.ext] is the file extension

[/A] copies if the archive bit is on

[/D]=|>date copies according to file date (equal or greater than)

[/E] creates a subdirectory on the target even if it is empty after all copying

[/M] copies files with the archive bit on, then sets the archive bit off

[/P] prompts before copying

[/S] copies files in the directory and its subdirectories

[/V] verifies the copying

[/W] waits for you to insert diskettes

Assume you had a directory for Personal Editor II called PE2, and subdirectories within it called LETTERS and MEMOS. You have just added another subdirectory called MEMOIRS, but have not yet put anything in it. You want to copy new files in PE2 and its subdirectories to a special diskette, rather than onto your regular backup diskettes. Type:

```
XCOPY C:\PE2 A:/s/m/e
```

to copy all new files in PE2, LETTERS and MEMOS; then copy the empty subdirectory, MEMOIRS; then turn off the archive bit.

XCOPY selectively copies groups of files, and can copy subdirectories.

DRIVER.SYS is a new device driver for external 3.5-inch diskette drives. DRIVER.SYS also lets you use a single physical drive as two logical drives. DOS automatically assigns the next available device letter.

Add the following to your CONFIG.SYS file:

```
DEVICE=DRIVER.SYS /D:ddd[/T:ttt][/S:ss]
[/H:hh][/C][/N][/F:f]
```

where

/D:ddd specifies the physical drive number. ddd is 0-255, where 0 denotes drive A, 1 is drive B, 2 is the external diskette drive, 128 is the fixed disk drive C, 129 is drive D, and so on

[/T:ttt] is the number of tracks per side. 80 is the default

[/S:ss] sets the number of sectors per track. The default is nine

[/H:hh] is the number of heads. 2 heads is the default

[/C] specifies using changeline support (applies to Personal Computer AT and PC Convertible only)

[/N] indicates a nonremovable device

[/F:f] sets the device type based on the table below:

Value	Device
0	160/180KB
0	320/360KB
1	1.2MB
2	720KB

Suppose you have an IBM Personal Computer with a diskette drive and a fixed disk drive. If you add a 3.5-inch external diskette drive to your Personal Computer, and want to be able to make copies, you should add these statements to your CONFIG.SYS file:

```
DEVICE=DRIVER.SYS /D:2 /F:2
```

This assigns the 3.5-inch external diskette drive as drive D. The next statement,

```
DEVICE=DRIVER.SYS /D:2
```

reassigns the 3.5-inch external diskette drive as drive E. You can now copy files from drive D to drive E.

Reload COMMAND.COM From RAM Disk

Tom Puckett
Melbourne PC Users Group

The file COMMAND.COM needs to be reloaded into memory by PC-DOS whenever an executing program requires so much memory that it overlays the transient portion of COMMAND.COM that existed at the top of available RAM. To reload the file, PC-DOS tries to access the A drive, if the system booted from A:. This is bothersome if you don't happen to have a disk in that drive with COMMAND.COM.

If your system runs a RAM disk program, there's a way you can have COMMAND.COM loaded from a RAM disk when it's needed. If your RAM disk is drive C, just enter these two lines:

For DOS 2.00 and DOS 2.10:

```
C:COPY A:COMMAND.COM C:<return>
C:COMMAND C:<return>
```

For DOS 3.00, 3.10, 3.20:

```
C:COPY A:COMMAND.COM<return>
C:SET COMSPEC=C:\COMMAND.COM<return>
```

Once you do this, the operating system will turn to drive C whenever COMMAND.COM needs to be loaded. Make sure that COMMAND.COM is actually copied onto the RAM disk. Otherwise, the operating system will prompt you continually to insert the appropriate disk into drive C — a physical impossibility that you can resolve only by rebooting the system.

If you want to switch back to the default so the system looks for COMMAND.COM on drive A rather than the RAM disk, simply enter the command EXIT.

When you use this technique, keep two points in mind. First, making the COMMAND call will take up at least 3K more memory than previously. Second, the new version of COMMAND will throw away any path settings you made previously; at the point you type in EXIT, the old path again will take effect.

IBM's Drawing Assistant

Steven A. Brown
Poughkeepsie IBM Club Microcomputer Club

Ever since I bought the Enhanced Graphics Adapter and Enhanced Color Display for my PC, I longed to see an affordable graphics program that could justify my purchase. I found it in IBM's Drawing Assistant. Drawing Assistant is a versatile graphics tool that can be used apart from the other Assistant Series software, or as a supplement to the existing Assistant Series software, especially Graphing, Reporting, and Writing Assistant.

Taking Advantage of Hardware

To take full advantage of your PC's hardware configuration, Drawing Assistant offers you five modes from which you select the one that best utilizes your hardware.

Mode	Display Resolution	Number of Colors
1	640 X 200	Black on 1 of 8
2	640 X 200	16
3	640 X 350	3 shades
4	640 X 350	4
5	640 X 350	64 (16 at any one time)

Drawing Features

Let's Draw. Once you select the mode (and other setup options), you load Drawing Assistant and choose the main menu's Draw option, which brings up the drawing screen (see Figure 1). The drawing screen offers you five pull-down menus, 12 functional icons, up to 64 colors (sixteen at one time), five line-width selections, some indicator boxes, and 30 patterns (30 additional patterns are available when running in modes 2 through 5).

The five pull-down menus are shown in Figure 2. These menu options provide different ways that the files, the icons, and the patterns can function as you draw on the screen. They are very important in getting the most out of Drawing Assistant.

Drawing Assistant lets you draw anything from exact diagrams to freehand sketches. You can draw concentric circles, exact squares, parallel lines, and 45-degree lines simply by selecting the Constrain On and Grid On menu options and the appropriate icon, then moving the pointing device from the point you designate as the corner of a square, center of a circle, or beginning of a line. Drawing Assistant makes the shapes exact. If you need to create an ellipse, rectangle, or line that is not at a 45-degree angle, you can change to the Constrain Off and Grid Off menu options and selecting the appropriate icons. Room and office layouts are a cinch with Drawing Assistant.

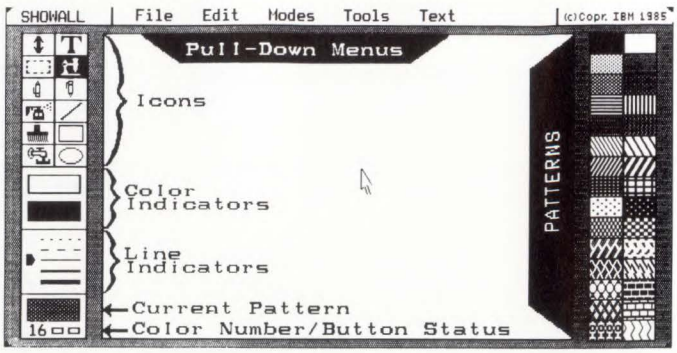


Figure 1. Draw Option Screen.

If you prefer a more creative flair, you can draw freehand using the Pencil icon that draws pixel by pixel as you move your pointing device. Or, you can use the Paintbrush icon in a variety of shapes and sizes. You can even use the Spraypaint icon to get varying shades of the same color and to get a light-to-dark shadow effect. All the lines, brush strokes, and spray effects can be done in at least 30 different patterns.

If a shape is enclosed, you can fill it with any pattern as you draw it, or you can fill it later using the Fill icon (faucet). If the shape is not enclosed, you must use the paintbrush to lay down a specific pattern, because when you "pour" a pattern into a shape to fill it, the pattern spills out of all boundaries that are not completely closed.

Correcting Mistakes

Mistakes are seldom a problem. You can erase everything you drew with the active icon by selecting the "Undo" menu option. However, once you select a different icon, the undo memory is cleared. You also can choose the Erase icon (upside-down pencil) to erase selectively. If you erase a piece of your drawing that you intended to keep, you can restore it by placing the erasure square over the inadvertently erased section and selecting button 2 of your pointing

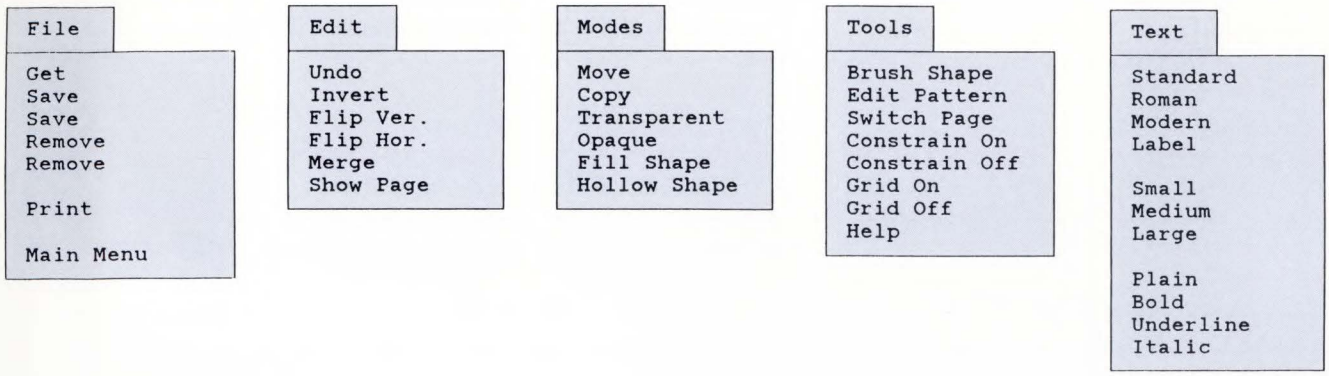


Figure 2. Pull-Down Menus.

device. You can restore anything erased during an erase session as long as the Erase icon remains active.

Detailed Pixel Work

Should you need to touch up an area of the drawing or do very detailed work in an area, you can select the Zoom icon (microscope) and edit the area pixel by pixel, color by color. During a zoom session, the upper left corner of the drawing retains an active, non-magnified window of the zoomed area, so you can see how your drawing is changing as you manipulate the pixels.

Moving and Copying

Drawing Assistant also makes it easy to change the position of the shapes on the screen as well as the placement of the drawing on the page. Using the Select icon, you can block a portion of the screen and move or copy it to another position on the screen. Using the Modes and Edit menu options, you can overlay the "selected" portion of the drawing onto an existing part so that it either blocks out what is drawn under it (Opaque menu option), or allows what is drawn under it to show through the overlay (Transparent menu option). You also can use the Select icon to clear the portion of the drawing you have selected. This makes it easy to create arcs from circles, open boxes from squares, or a variety of other shapes from those already drawn.

Using other options from the pull-down menus, you can copy a "selected" portion of the screen from one file to another. Any two .ART files can be active simultaneously, and you can switch back and forth between the two using the Switch Page menu option. This allows you to use the eleven-file art library that comes with Drawing Assistant, or to create your own libraries of drawings that you will use over and over again. However, to properly use the Switch Page menu option, you need 25KB of memory beyond the 256KB required for the program when running in modes 2, 3, or 4. To use the Switch Page option when running in mode 5, you need 110KB of additional memory.

Also, when you are working in Modes 3, 4, and 5, often you are not able to select and move the entire drawing screen. In modes 1 and 2, the whole screen can be selected and moved or copied to a different file. But because of the program's limited internal buffer space, it may not be possible to move the entire drawing screen when working in the higher modes. One way to get around this is to select the Grid On menu option, then select and move large blocks of the drawing screen.

However, should you need to move the entire drawing to a different area of the page, you can do it easily by using the Edit menu options rather than the Select icon.

Text Options

Labeling your drawing is simple. By choosing the Text icon (T), you have available all the Text menu options (see Figure 3). Once you select the options you want, you press button 1 of your pointing device and then enter the text from the keyboard.

If you want more complex fonts, you can use the FONT.ART file from the Drawing Assistant art library, which includes a set of vertically oriented letters and numbers. Or you can create your own font libraries.

The pull-down menus also allow you to do other things, such as inverting a drawing. For example, if you have a black-on-white drawing, you can invert it so that it appears white-on-black. Or you can "select" a portion of the screen and invert it. You can create fascinating, strange effects with the invert option.

You also can flip a selected area either horizontally or vertically. However, the flip does not change the screen orientation of the selected area. Selecting the vertical flip turns the selected area upside down. Selecting the horizontal flip turns the area backwards. However, there is no way to flip a shape (including a group of letters) from a horizontal to a vertical position.

Saving Your Drawing

When you finish a drawing and wish to save it for later use with Drawing Assistant, you save it with an .ART file extension. Drawing Assistant will even recall Graphing Assistant files that were saved with option 3 of the Graphing Assistant main menu. Before you actually bring up Graphing Assistant graphs into Drawing Assistant, you should read Appendix B of the Drawing Assistant manual, which tells how to ensure that the graphs will appear as if they were printed using Writing Assistant. This includes saving the Drawing Assistant files with a .PIC extension so that Writing Assistant will accept them.

Saving a drawing in an .ART file is no problem. However, after you have brought up and edited a .PIC (BSAVE) file with Drawing Assistant, you may not be able to save the entire picture back to a .PIC file. The reason is that Drawing Assistant runs at 640 X 200 or 640 X 350 pel resolution, while .PIC files are saved to run at 320 X 200 pel resolution. Rather than stripping pixels from the completed picture, Drawing Assistant places a limit on how much of the drawing can be saved to a .PIC file. The amount of the drawing that can be included in the .PIC file depends on the drawing mode you selected when you use Drawing Assistant. The higher the mode, the smaller the portion of the screen you can save. The Show Page menu option shows how much of the drawing will be included if you save the drawing to a .PIC file.

During the setup procedure, you must select a pointing device. The program allows a keyboard, mouse, or joystick interface. However, unless you have read the reference manual, you would not know the joystick is available as a user interface to the program. On page 2-15 are instructions for loading the device driver JOYSTICK.COM, which is included on the program diskette. Also, there are no instructions for modifying the startup batch file G.BAT to include loading JOYSTICK.COM as part of the startup process. Normally the device driver must be loaded each time you load the program. However, if you know how to use batch files, you can easily add it yourself. JOYSTICK.COM uses two buttons of the pointing device, and the button indicators at the bottom left of the drawing screen show which button is active.

Drawing Assistant also has printer drivers that support 12 listed printers. The drivers may be used for other printers that are compatible with one of the listed printers.

When you select the PRINT function (and you use the IBM Graphics Printer), you are given the option of either a draft copy or a final copy. The PRINT function prints the entire drawing area as you have positioned it on a "page." A full-page drawing occupies an area approximately 7 inches wide and 9.25

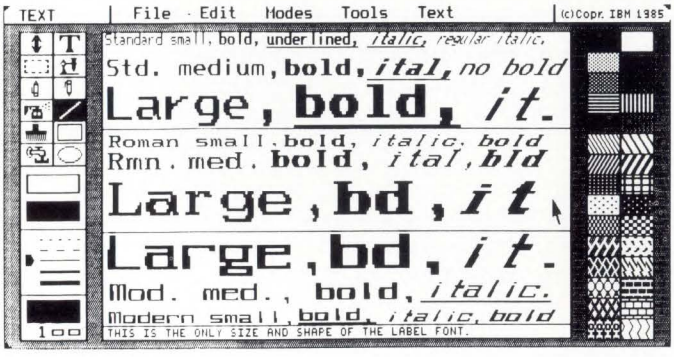


Figure 3. Text Option Screen.

inches high. If you have saved your drawing as a .PIC file and include it as part of a Writing Assistant printout, the picture prints out 3.5 inches high and 4.5 inches wide, occupying 18 lines of the page. There is no provision for printing either .ART or .PIC files sideways.

Conclusion

I have used other drawing programs and each one has its own character, style, and techniques. But I prefer Drawing Assistant, not only for its price, but because it has the added benefit of being compatible with the other Assistant Series software.

Pascal Programming

David Chess
IBM Corporation

(Editor's note: This article consists of excerpts from Programming in IBM PC DOS Pascal, *by David M. Chess, published by Prentice Hall. Reprinted with the permission of Prentice Hall.)*

This book is a description of, and a learning guide for, the advanced features offered by Pascal under the IBM Personal Computer Disk Operating System (DOS). It does not apply to the UCSD P-System Pascal (also sold by IBM). Versions 1.0 and 2.0 of PC Pascal are covered; differences, where they exist, are noted in the text.

The reader of this book should either know Pascal (or some comparable block-structured language, like PL/1), or have an introductory work at hand (the Bibliography gives several suggestions). A working knowledge of DOS and the PC is also recommended. The book is intended primarily for PC users looking for a good, powerful language, and for Pascal users new to the PC looking for ways to get to the power of the machine from Pascal.

The Pascal language was designed by Niklaus Wirth in the late 1960s as a simple, easy-to-understand language for teaching computer science. Since then, Pascal has been implemented on vast numbers of computers, from 8-bit micros to large powerful facilities for input-output, character and string manipulation and systems programming, and it has become one of the most popular general-purpose programming languages. The International Standards Organization, which establishes standard definitions for common languages, has drafted a document defining a set of functions that are essential to the language. Most current Pascal implementations, including IBM PC Pascal, start with this basic set, and extend it in several directions.

This book briefly describes the essentials of the Pascal language, with emphasis on the extensions PC Pascal provides. It also goes into detail about interfacing Pascal programs to the rest of the PC environment; the handling of disk files, access to the PC's displays, the keyboard, and various DOS and BIOS functions. Use of system utilities such as the library manager is not covered; these are described in the system manuals. The linker is described in only enough detail to illustrate a "fast path" through Pascal compilation.

* * *

DOS, BIOS, and Pascal

When a Pascal program runs on any modern computer, it is not running by itself. Other programs are in the machine at the same time, keeping track of the time of day, accepting input from the keyboard and holding it until the program asks for it, carrying out requests from the program to write data onto the screen, and generally making the program's (and the programmer's) task easier. When the program completes, the machine does not come to a halt; there is another program in the machine ready to accept control, and ask the user "what's next, boss?" These other programs are called, among other things, the "operating system," the "I/O system," and the "background."

The PC's Disk Operating System, usually called DOS, is the program that controls all the operations of the PC. You run a Pascal program by telling DOS the name of the program you want to run. DOS determines where in memory to load the program, reads it in from a disk or diskette, makes any necessary adjustments to allow the program to run where it has been loaded, and passes control to it. When the program needs to communicate with the user though the keyboard or the display screen, it can call a routine in DOS to do it. When the program ends, it returns control to DOS, which displays its prompt to indicate to the user that it is ready for the next task.

Most of the operation of DOS is not visible to the Pascal programmer. Whenever a Pascal program uses

the standard output routine WRITE, for instance, to display data on the screen, Pascal calls DOS automatically; the programmer needn't worry about the details. The same applies to the function READ; the programmer may use it to get data from the keyboard or keyboard buffers, single or double sided diskettes, or file allocation. Because Pascal knows to call DOS, and DOS keeps track of these things, the Pascal programmer can make use of the PC's hardware without knowing anything about the hardware-specific details.

Even DOS is not on its own in the machine. Underlying DOS is the I/O system, called the BIOS (for "Basic Input/Output System"). BIOS handles the details of input and output; when DOS needs to read data from a certain place on a diskette, it calls BIOS. BIOS determines just what commands to send to the diskette to accomplish the reading, deals with the timing and other hardware requirements of the device, and eventually returns the data to DOS. In similar ways, DOS calls BIOS to write data to the display, to read data from the keyboard, and to interface with the rest of the environment. When you press a key on the keyboard, it is BIOS that gets control, stores the data that you enter away in memory, and then returns control of the machine to whatever was running when you interrupted things by pressing a key.

Specific calls to DOS and BIOS will be mentioned later in the book. As we will see, at times it is useful to be able to call DOS or BIOS directly, or even to circumvent them entirely, to make a program faster or more powerful. The fact that, for instance, every character output to the display in a **write** statement causes a call to DOS and multiple calls to BIOS, means that, for applications where speed is vital, it is good to know faster paths. In general, however, it is simplest to write standard Pascal statements, let Pascal call DOS, and let DOS call BIOS, in the usual way.

* * *

Strings and Lstrings

A major use of the super array type is in the predefined types **String** and **Lstrings**. These types are used to do manipulation of character strings, and are PC Pascal extensions, not present in standard Pascal. Their definitions are

```
type String = super packed
       array[1..*] of char;
     Lstring = super packed
       array[0..*] of char;
```

The word "packed" in the above really has no significance, and may be ignored in this case.

Variables of these types, and types based on them, may be declared in the usual way, as in

```
type SocSecNo = String(9);
     Name = LString(20);
var ClientName: LString(50);
```

Strings and lstrings are useful because certain PC Pascal internal routines know about them, and handle them specifically. For instance, it is possible to use READ to read in an entire string or lstring at once, rather than reading a character at a time. Strings and lstrings are also handled specially in comparisons, and in some of the other Pascal functions described in this book.

Lstrings are different from strings only in that they have a zero-indexed element. This element is used to

keep track of the "current length" of the lstring, which may be less than the actual upper bound. For instance, if the user types "FRED" and hits return in response to

```
writeln('Input client name:');
readln(ClientName);
```

where ClientName is declared as above, the zero element of ClientName will be set to the value four, to reflect the length of the string the user entered. In this respect, **lstrings** are "variable length" character strings, whereas **strings** may be thought of as "fixed length." The zero element of an lstring variable may be accessed either with the ORD function, or by using the special suffix ".L" on the variable name, as in

```
readln(ClientName);
writeln('Length of name was ',
   ORD(ClientName[0]));
   (* or *)
writeln('Length of name was ',
   ClientName.L);
```

Notice the use of the ORD operator to convert the zero-element of ClientName (the element is of type **char**) into an **integer** for output.

The length information for an lstring variable is set correctly by the READ procedures, by the Pascal string-handling functions described in Chapter 5, and by the assignment process if the entire variable has a new value assigned. It is not automatically set if you assign a value to some element of the lstring, however; in these cases the length should be set explicitly. For instance:

```
var MadeUpName: LString(50);
...
MadeUpName := 'X';
(* Length is now 1. *)
for I := 1 to 30 do
   MadeUpName [I] := 'A';
(* Length is still 1.  Fix it. *)
MadeUpName[0] :=CHR(30);
```

* * *

Screen Handling

The display screen is the PC's voice. It is its major output device (the minor ones are the printer and the speaker), and how effectively a program uses it will have a major impact on how effective the program looks to the user. A program with beautiful and efficient internals but poor display routines will often seem inferior to one with sloppy internals but elegant displays.

This is not simply because people are easily fooled; it is a fact that poor use of the display can make a program hard to use and can defeat the purpose of every computer program: to make its users more productive.

Some functions typically involved in screen display are

- Clearing the screen or selected parts of it,
- Moving the "cursor" so that the next character displayed appears in a specific place on the screen,
- Selecting whether a character will be displayed in high-intensity, reverse video, etc.
- Selecting the active colors on a color display,
- Drawing non-character shapes, like line, boxes, graphs, and complex drawings.

The PC's keyboard is a powerful and flexible device.

Display Techniques and Trade-offs

There are four methods of writing text on a display. Two of these also can be used to write graphics (points, line, graphs) on the color display; the other two are for characters only. The end effect of all of these methods is just to change the contents of a location in the PC's memory that is "mapped" onto the desired place on the screen. This is what "memory–mapped I/O" means: every character or point displayed on the screen reflects a certain piece of information stored in a certain place in memory.

Which of the four methods a program uses to control the display will determine how long it takes to display the information, how portable the program will be to other environments, and how much modification the program will require to work with other display devices or under a different operating system.

Keyboard I/O

If the display is the PC's voice, the keyboard is its ear. Alternate input devices, like mice, joysticks, and track balls, have a role to play in games and some more practical application, but the large majority of user input to a computer is though its keyboard.

The PC's keyboard is a powerful and flexible device. Counting the Control, Shift, Alternate-Shift, and function keys, there are well over 150 possible keys and key combinations and four "modes" (Insert, and three Lock modes) available to a program. If the possibilities are over-used, the user may be frustrated. Striking a balance in keyboard layout and use is, as usual, a set of trade-offs.

* * *

Top-Down Design

This section discusses the highest level of program design—the way the various routines are put together to construct a working program. In a small program, the construction is easy, and the order in which the few pieces are designed and put together is not very important. In a large program, however, it will be; a well-planned design can make even a large programming project relatively easy.

There are several advantages to top-down design methods.

I will introduce my idea of the correct design procedure here; it may differ in some details from other accounts of "structured" or "top-down" design, but the important points will be the same. The guiding principle is

Keep the job small and clear.

This means that, at any point during program design and coding, the immediate task facing the programmer should be small enough to be kept straight, and well-defined enough not to be ambiguous. To keep the jobs in a large programming project small, we will obviously need to do them a little at a time.

The first step in writing a program is determining what it should do. This involves problems that are beyond the scope of this book; if you are writing a program to do a job that someone else needs done, the hardest part of the project may be in finding out what the job really is. This takes careful thought and a good deal of patience. It may also require presenting the person with a finished program, only to discover that your ideas of the job to be done were not quite the same, and some changes will have to be made. I will restrict myself here to discussing the implementation details; given a good description of the job to be done, what is the best way to write a program to do it?

Trade-Offs

There are several advantages to top-down design methods. First, it helps make the code easy to write in the first place and therefore cuts down on the number of errors. It is easier to write bug-free code when the task you are coding is simple. Second, it makes the code easier to read. Anyone reading the code can read at whatever level is appropriate for immediate needs. If the question is only a very general "what does it do?", the answer can be found simply by reading the main program and skipping the routines. If the question is "how does the program sort the data?", the reader can find the routine in charge of sorting and reading the main program and skipping the routines. If the question is "how does the program sort the data?", the reader can find the routine in charge of sorting and examine the details of the algorithm. As well as being easier to read, this kind of program is easier to modify. When a change must be made, it will generally be simple to locate the routine or routines to be modified, and since each routine has a well-defined role in the program, the programmer making the changes can easily check that they will have no undesirable side effects.

One disadvantage to top-down design is that the programs produced are not always as fast as they might be. This is because there are generally a large number of calls to routines, and such calls take time. When speed is important, however, the solution is not to abandon top-down style, but rather to do a top-down design with speed in mind, and then to locate and improve the "inner loops" of the program. This means finding the parts of the program where most of the time is being spent and recoding them (in faster Pascal, or even in assembler) for speed. While top-down code may sometimes be slower before it is improved like this, there is no guarantee that code designed more haphazardly will be any faster, and it is always harder to improve.

Learning Assembly Language

Paul Sherr
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Why Assemble?

Assembly language for the PC is well worth learning. Improvements gained by using assembly language are simply spectacular. The advantages fall into three categories: speed, size, and versatility. For example, I cut the time for a sort routine by changing from a BASIC GOSUB to an assembly language call. The elapsed time changed from thirty minutes to under fifteen seconds! Also, emulating the DOS MORE utility using IBM Pascal or Modula-2 takes about a 10KB program. In assembly language, it takes only 384 bytes.

There are many advantages to knowing assembly language. When you know assembly language, you know the PC. You learn what's inside, how it works, and all there is to know about what makes it tick. High-level algorithms will make more sense, and you will have better ideas about how to make DOS and files work for you. Debugging becomes much easier, and you can optimize code with confidence.

Using assembly language, you can extend programs and languages, and add features such as graphics. Functions not originally implemented, such as encryption, and the creation or removal of copy protection can be added with just a bit of code.

Why Not Assemble?

If assembly language is so good, why isn't everything written in it? First, assembly language is more difficult to write. A good part of assembly language's power comes from writing every routine from the ground up, so it requires more knowledge of the PC and DOS, and takes more effort. Assembly language works at a more primitive level. It's like driving a race car with a five-speed manual transmission and dozens of gauges, rather than driving a luxury car with automatic transmission and power everything. Usually, it takes five to ten times as long to write an assembly language routine as it does to write it in a high-level language.

Second, assembly language is unforgiving. You do not get nice error messages; the machine locks up, or loops, or does something equally irritating.

Last, the potential gains may not be attainable. Execution speed may be bound by the speed of disk I/O, or screen update speed, or user speed. An old adage says, "Programs spend 95 percent of their time executing five percent of the code." This can turn into a good reason for using assembly language: Write your program in a high-level language, debug your algorithms, monitor where the program spends its time, and then use a few short assembly language routines to optimize the program. The results can be dramatic.

Improvements gained by using assembly language are simply spectacular.

Before Starting

I would not advise using assembly language until I was fairly proficient in a high-level language. A programmer needs to feel comfortable with the PC in general, have some background in problem solving by programming, and know how to organize and design programs. Without this type of background, I suspect that the additional complexity of assembly language will be overwhelming. You will start better by learning a structured, modular language such as C, Pascal, or Modula-2. The PC assembly language has the best support for modern structured techniques that I have found in an assembly language.

The Best Way to Learn

If you can scan the IBM technical reference manual and then disassemble and rewrite program code to optimize it, you may not benefit from my suggestions. However, if you're like me, when you program you want detailed tutorial material and samples of code that work on the PC. Then I'd like to suggest some things that may make

learning assembly language a bit easier and a lot more productive.

When learning new techniques, I like a good tutorial with plenty of examples; then I try the program, try variables, and maybe write a small example for myself to be sure that I understand. If this sounds good to you, follow me. Assembly language, by the way, is fun. The coding is very interesting, and there is a tremendous sense of achievement in obtaining the kind of performance you get when you use it.

Looks at Books

(Editor's note: Mention of the following books does not constitute their endorsement by IBM.)

A good place to start is the *Assembly Language Primer for the IBM PC & XT* by Robert Lafore. Like all of the other books in the Waite Group's Primer series, this primer features logical organization, exhaustive detail, and very clear, short example programs that do not take long to enter. As you can tell, I am a great believer in a learn-by-doing approach, and then building on experience. The Waite group is a master of this method. You type in a short program, see how it works, and then learn the new concepts. Should you forget it, you can return to the summary section where the concept is presented in a box in contrasted color.

Lafore's programs are clear and clever, and they illustrate his points very well. The book covers Debug, the assembler, DOS, sound, graphics, file handling, and interfacing to high-level languages. If you work through the book (it is 500 pages), you will gain an excellent grasp of assembly language fundamentals.

Lafore's strength, his clear dissection of fundamentals, has another side—he really does not teach how to write full-fledged programs in assembly language. (Nor should he; first walk, then run.) So when you finish the *Primer*, a good source for further study is the *Assembly Language Safari* by John Socha.

If you work through the book, you will gain an excellent grasp of assembly language fundamentals.

Socha's approach to assembly language is different from Lafore's—he sets out to teach assembly language programming as well as covering assembly language coding. I really like his approach. He devotes the book to building a fairly substantial program, a Norton-Utility-like disk sector editor. His approach is very "real world." He stresses modularity, top-down design, building a module so that it works, and then enhancing it or modifying it to include more features or to work with another module.

If I have not made the distinction between Lafore and Socha clear, first read the *Primer* to learn what to write, then read the *Safari* to learn how to write it. Going on the *Safari* means writing a routine, testing it, writing a second routine that adds another function, testing it, and then testing both in combination. Socha is super in his practical and friendly advice about design methodology and programming techniques. By the way, the routines in both books are not just play code — they are very useful for incorporating into other programs.

Neither book is quite comprehensive, so after the *Safari*, I recommend *Assembly Language Programming for the IBM Personal Computer* by David Bradley to move into advanced topics.

Bradley does an excellent job on advanced features of the assembly language such as records, macros, the 8087, and on programming background programs or using hardware features. His examples are neither as detailed nor as practical as Socha's or Lafore's, nor were they intended to be; he presumes more experience on the part of his reader than does Socha or Lafore. Bradley was one of the original designers of the IBM PC, and his authority shows in his book. He is abundantly clear, but not elementary.

Once you start programming in assembly language, you are going to need a reference to DOS and PC features. The IBM *DOS Technical Reference Manual* is the best reference for the PC. The manual is exhaustive and contains much unique and proprietary information.

Peter Norton's *Programmer's Guide to the IBM PC* covers much (but not nearly all) of the same ground, and also contains very useful experience and advice. It is really excellent; practical, readable, and a bargain to boot. Remember that it is a reference book rather than a tutorial. Norton also mentions a number of bugs in DOS and the assembler as well as some errors in IBM's documentation. His book also is very good for non-assembly language programmers who program in languages that permit DOS calls and

interrupts, such as C and Turbo-Pascal.

I also want to recommend a companion book to Lafore, *Bluebook of Assembly Routines for the IBM PC & XT* by Christopher Morgan. The Bluebook is a collection of handy gadgets, written in assembly language and designed to be linked into a high-level language program or included in an assembly language program. They range from playing a bugle call or drawing a box and filling it with color, to a set of routines that handle a circular buffer. They are ready to use, if that is your interest, but they also repay study handsomely. Morgan documents them briefly, but quite thoroughly.

The *Serious Assembler* by Charles Grayne and Dian Girard is also worth having. It is not as good a tutorial as most of the other books mentioned, but it contains a number of well-written, clever programs that are thoroughly explained. The programs include a keyboard redefinition routine (into Hebrew!), a routine for using two monitors simultaneously, and a routine for displaying and using hidden files, all interesting stuff that I have not seen elsewhere.

If you consider other books, watch for these things: I do not find books treating the 8086 in the abstract very useful, and they often use Intel rather than IBM instructions. Also, look for books that refer to IBM PC applications.

Other Tips

There are some loose ends I need to cover for beginners. If you plan to work in assembly language, you really should have an assembler. The assembler is a program that translates assembly language code (what the programmer writes) to machine language, which is what your PC actually speaks. All programs ultimately end up in machine language. Interpreters like BASIC translate each line just before it is executed. Compiled languages like Pascal translate the whole program before any of it can be executed. Then why isn't assembly language a compiled language? A single assembly language instruction is translated into a single machine operation. In contrast, some high-level instructions, like drawing a circle or finding a square root, can take pages of assembly language code.

You can use Debug, which comes with DOS, to assemble programs, but it is just too limited for serious work. I suggest you get the IBM or Microsoft Macro Assembler. Although Microsoft wrote both, the assemblers are packaged differently. IBM's includes an interesting structured assembly language preprocessor, which allows you to write structured pseudocode that it then translates into assembly language code. IBM also includes about twice as much documentation.

Microsoft includes a MAKE utility, which keeps track of what code belongs to which program, and automatically includes the proper code and reassembles whichever is necessary. There are some public domain MAKEs available on bulletin board systems. Microsoft also included a symbolic debugger, which I have not seen, but it should be extremely useful.

You also will need a text editor. EDLIN (like DEBUG) comes with DOS, but with the number of excellent and inexpensive editors available, I would not use EDLIN.

The other programs you need all come with DOS: DEBUG, LINK, and EXE2BIN. With the resources and programs mentioned above, I think you'll be pleasantly surprised at how much you can gain from the time you devote to learning assembly language.

IBM Graphics with BASICA Pseudo Hidden Line Removal

Vance Jaqua
Rocketdyne Microcomputer Users Group

Treating hidden lines—those lines representing the back surfaces of a figure being described—is one of the most challenging tasks when drawing three-dimensional graphics. True hidden-line removal logic is somewhat beyond the scope of IBM BASICA graphic programs. However, I will describe some interesting techniques that are often called pseudo hidden-line removal. While these techniques do not use true hidden-line removal logic in the strictest sense, they are useful for some very effective graphics.

Why Remove Hidden Lines?

The IBM medium resolution graphics mode provides a four-color palette. The color codes are 0, 1, 2, or 3, with code 0 (zero) being the absence of color, or more precisely, the background color in the IBM system. One may wonder why a programming language would include a command for drawing a line or circle that you cannot see. Yet such a command can be very useful because it lets you blot out sections of the screen that you had previously drawn with one of the other colors.

The "rotating" color rays that are part of the medium resolution graphics explained in this article demonstrate how redrawing a line in the zero color will "erase" a visible line by replacing its color with the background color. By running the program in Figure 1, you can see how the zero color provides a wiping effect as it successively obliterates the color of each visible line.

In line 320, the loop steps in reverse order from 3 through zero, setting the line color code to this value each time (LCLR=3 TO 0 STEP -1). Each time the program runs through the final loop, a zero- color line is drawn over each succeeding line. Drawing a zero color line across any existing graphic presentation will produce a blank any place that it intersects a previously drawn line. You can produce some apparently three-dimensional surfaces when using this techinque to repeatedly wipe out offending areas of old lines.

```
100 REM sample of med res graphics
150 PI=3.1417
200 SCREEN 1,0,0,0
210 CLS
300 FOR BCLR=0 TO 15
310 FOR PCLR=0 TO 1
320 FOR LCLR=3 TO 0 STEP (-1)
400 COLOR BCLR, PCLR
500 FOR L= 0.1 TO 2*PI STEP PI/30
510 X=90*COS(L)
520 X=X+150
530 Y=90*SIN(L)
540 Y=Y+100
600 LINE (150,100)-(X,Y),LCLR
690 NEXT
700 NEXT LCLR
710 NEXT PCLR
720 NEXT BCLR
990 END
```

Figure 1. Rotating Rays.

The program in Figure 2 draws the lines very slowly, since each curved line across the screen is the result of 200 loops, each requiring a fair amount of computation. The command at line 3500 draws a zero color line up from the base of the screen, which "erases" any portion of a previously drawn line that it intersects. The command at line 3600 lights a single pixel at the top of the "invisible" lines we have just drawn. The result should be a seemingly three-dimensional presentation of a cosine function.

```
1000 REM solid cosine function surface
2000 SCREEN 1
2100 CLS
2500 FOR LIN=1 TO 40
3000 FOR PIX=0 TO 200
3100 X=3*LIN+PIX
3200 YOF=40+2*LIN
3300 Y=YOF+3*LIN*COS(PIX/30)
3500 LINE (X,199)-(X,Y),0
3600 LINE (X,Y)-(X,Y),2
4000 NEXT PIX
4100 NEXT LIN
```

Figure 2. Three-Dimensional Cosine.

Figure 3 lists another relatively short program that illustrates a similar use of the background color line. The routine, which I call the cornucopia, uses partial, progressive erasing of previously colored lines. The result is a dramatic representation of a hollow, tubular object.

```
1000 REM cornucopia
2000 SCREEN 1
2100 CLS
3000 FOR D=1 TO 50
3200 RAD=D
3300 X0=20+4*D
3400 Y0=20+2*D+D*.6*SIN(D/5)
3500 LINE (X0,Y0)-(X0,(Y0+RAD)),0
4000 FOR R=0 TO 6.3 STEP 6.28/20
4100 X=X0+RAD*SIN(R)
4200 Y=Y0+RAD*COS(R)
4300 LINE-(X,Y),2
4400 LINE (X0,Y0)-(X,Y),0
5000 NEXT R
5100 NEXT D
6000 IF INKEY$="" THEN 6000
```

Figure 3. Three-Dimensional Cornucopia.

Interesting Effects

The program also uses trigonometry functions to achieve its interesting effects. The technique is to draw segmented, circular lines at graduated spaces across the screen. As each segment of each circle is drawn, a radial line of zero color is drawn to one end of the segment (line 4400). This radial line erases any previously colored point of the circle wherever it intersects the circle. If enough erasing lines intersect the circle line, they will erase a complete section of it. The partial erasure leaves an effect much like a shaded, open end of a tube.

A more complex program using the same erasure technique is listed in Figure 4. This program draws an interesting, seemingly three-dimensional representation of a jet plane. The plane is generated using the same technique of segmented circles, with a zero color radial line at each segment. The basic circle is distorted by some conditional statements (IF tests) at various points to represent the canopy, the wings, and tail surfaces. If you run it on a color monitor, you will note the appropriate red flame in the exhaust plume. This program allows apparent views from different view angles in the X, Y and Z axis.

Editor's note: The program in Figure 4 can be downloaded from the IBM Electronic Bulletin Board System. The name of the file is JET.BAS, and it can be found in the <F>iles section of the EBBS. To access the EBBS, call (305)-998-EBBS.

This program draws an interesting, seemingly three-dimensional representation of a jet plane.

A Challenge

It would be interesting and challenging to create a program that provides true hidden-line removal. You could use the same color zero approach shown in these examples, but applied using a rather tortuous logic. Assuming that you had a data file containing X,Y, and Z values for each end of a series of lines to create a "wire figure" of a three-dimensional object, you could sort these lines according to which ones had an average "Z depth" greater than the next. You then draw the lines with the greater "depth" first, and each succeeding line closer to the screen surface. As each line was drawn, a shorter, dark line would be drawn on each side of it. This dark line would "cut" any subsequent line that it intersected. This effect by itself would provide some clue of the lines that should be hidden. A few judicious PAINT commands using color zero would complete the blackout of the offending lines. Although I haven't written such a program yet, it should work, and it should prove an interesting challenge.

```
1000 REM ROT3D2 FOR PLANE IN ANY PLANE
1010 PRINT"X IS POSITIVE TO RIGHT"
1020 PRINT"Y IS POSITIVE UP
1030 PRINT"Z IS POSITIVE GOING INT SCREEN"
1040 PRINT
1050 PRINT"ANGLES ARE POSITIVE CLOCKWISE"
1060 PRINT"LOOKING AT POS END OF AXIS"
1070 PRINT
1080 PRINT"IMAGE IS SIDE VIEW AT 0,0,0"
1090 PRINT"INPUT ROTATE ANGLES ABOUT X,
     Y, AND Z AXIS"
1100 INPUT AX,AY,AZ
1110 SCREEN 1
1120 KEY OFF
1130 COLOR 0,0
1140 CLS
1150 PRINT"ROTATED ABOUT X ";AX;" Y  ";AY;"
     Z ";AZ
1160 XCL=100
1170 YCL=100
1180 SNX=SIN(AX*3.1416/180)
1190 CSX=COS(AX*3.1416/180)
1200 SNY=SIN(AY*3.1416/180)
1210 CSY=COS(AY*3.1416/180)
1220 SNZ=SIN(AZ*3.1416/180)
1230 CSZ=COS(AZ*3.1416/180)
1240 REM
1250 XC=-100
1260 FOR N=0 TO 70
1270 XC=XC+4
1280 IF N>45 THEN R=.2*(70-N)*(1+SIN(N/2))
1290 IF N>25 THEN R=R-.6: GOTO 1310
1300 R=16*SIN(3*N*.02)
1310 REM
1320 FOR ROTC=-1 TO 20
1330 M=1
1340 IF ROTC<0 THEN M=0
1350 ROT=ROTC*6.283001/20
1360 REM CANOPY
1370 NC=SIN((N-10)*6.28/20)
1380 IF N<10 THEN 1440
1390 IF N>20 THEN 1440
1400 IF ROTC=19 THEN M=1+.5*NC
1410 IF ROTC=20 THEN M=1+.8*NC
1420 IF ROTC=0 THEN M=1+.8*NC
1430 IF ROTC=1 THEN M=1+.5*NC
1440 REM
1450 REM
1460 NM=SIN((N-15)*6.28/20)
1470 IF N<15 THEN 1510
1480 IF N>25 THEN 1510
1490 IF ROTC=5 THEN M=1+7*NM
1500 IF ROTC=15 THEN M=1+7*NM
1510 REM
1520 IF N<40 THEN 1580
1530 IF N>45 THEN 1580
1540 NT=SIN((N-40)*6.28/10)
1550 IF ROTC=5 THEN M=1+7*NT
1560 IF ROTC=15 THEN M=1+7*NT
1570 IF ROTC=0 THEN M=1+5*NT
1580 REM
1590 YC=R*M*COS(ROT)
1600 ZC=R*M*SIN(ROT)
1610 REM
1620 YP=YC*CSX-ZC*SNX
1630 ZP=ZC*CSX+YC*SNX
1640 XP=XC*CSY+ZP*SNY
1650 ZP=ZP*CSY-XC*SNY
1660 XP=XP*CSZ-YP*SNZ
1670 YP=YP*CSZ+XP*SNZ
1680 X=XCL+XP
1690 Y=YCL-YP
1700 IF ROT<.06 THEN 1750
1710 CL=1
1720 IF N>45 THEN CL=2
1730 LINE(XCN,YCN)-(XO,YO),0
1740 LINE(XO,YO)-(X,Y),CL
1750 REM
1760 XO=X
1770 YO=Y
1780 IF ROTC<0 THEN XCN=X
1790 IF ROTC<0 THEN YCN=Y
1800 NEXT
1810 NEXT
```

Figure 4. Program to represent a three dimensional jet plane.

The Three R's Enter the Computer Age

Lowell Blackham
IBM Corporation

If you graduated from high school several years ago, chances are you missed the technical changes that have been recently occuring in the educational field. Computers have entered the classroom and left repercussions that will be felt for decades. As computers become more pervasive, and more quality educational software becomes available, it is vital to recognize the potential of computers in improving education.

As parents and teachers turn to computers to fulfill educational needs, it is important to evaluate and select sound educational products. This article explores the expanding influence of computers in education and develops criteria for selecting educational software.

History of Computers in Education

In the 1960s, computer enthusiasts began to study the possibility of computer assistance in education. However, due to the costs of the cumbersome equipment and the difficulty of use, few schools showed interest. It wasn't until the advent of microcomputers in the early 1980s that widespread computerized instruction began to be seriously considered. Educators began to realize the importance of computers and the need to prepare students for a place in a computerized society. Also, because of increased availability of low-cost hardware and high-quality educational software, school boards began to look seriously at computer assistance in education.

Aside from the necessity of teaching about computers, many problems that educators and students face can be remedied by using computers. The computer does not take the place of the teacher; rather, it complements important phases of the educational process. By properly integrating computers with quality software into the curriculum, the educational process can be greatly enhanced.

Potential for Students

All students can benefit from computerized instruction. Quality programs keep elementary students' attention as they learn the material. In the process, the students become computer-literate. Using computer-aided instruction, students review, practice, and learn new topics, using methods sometimes superior to traditional methods.

The computer can give the student assistance and immediate feedback, which teachers cannot always do. Interest is maintained through various games, formats, and programs. Students learn to feel at ease in front of a console as they improve their academic skills and understanding.

Computers also can be a strong factor in special education. Slower students benefit from the self-paced format and lack of peer pressure. Retarded and handicapped children enjoy programs designed specifically for their needs. Gifted students can move ahead at their own pace.

Middle-school and high-school students enjoy the computer's ability to simulate programs, manipulate variables, and process words. The ability to edit, use an on-line thesaurus, and check spelling ensures a better final product.

Computers can help prepare high school students for the ACT and SAT tests. Research shows that studying for these tests improves scores. Computer primers may give students an advantage while taking these tests. A primer program tells which topics will be covered and how they are presented. Some programs even identify which topics the student needs to study, and offer specific instruction in these areas.

Potential for Teachers

By using computers, instructors can decrease their workload and improve the education they offer. Worksheets that teachers develop and correct are eliminated when students practice on computers. Sometimes, ineffective textbook exercises can be replaced with computer-administered quizzes that teach conceptually rather than mechanically. Teachers gain time to spend on individuals and preparation.

Time-saving capabilities also can be implemented. Teachers can

use their time better by using computers to file, automate records, streamline grading, and plan agendas. They can make up tests on a computer, and quickly calculate grading curves and class standings. They can make up papers easier using computers and get better reproduction quality. And they can save old tests, assignments, and teaching techniques on disk to serve as bases for developing new material.

Computers have entered the classroom and left repercussions that will be felt for decades.

Educational Software in the Home

Many parents supplement a student's education at home. This can be for a variety of reasons, as each student's needs are distinct. Some parents want to keep their children ahead of the class; others just want to keep them abreast. Occasionally, students are extremely talented or interested in a subject that is covered minimally in the classroom. They use the home supplement to help them reach their potential.

What's in the Future?

Computers in education will become more common and important as their capabilities are tapped. The importance of computer literacy will increase as students use computers more to their benefit.

Consider the possibilities: A 24-hour connection into a data bank for information; encyclopedias on disk or microfilm with easy-access references and directories. Are your encyclopedia disks outdated? Upgrade them. As computers enter the classroom and educational software improves, education will improve.

What Makes Educational Software Good?

Quality software is the catalyst of computer-aided education. The best intentions and the most powerful computers still need quality software. Good educational software shares many of the same characteristics of other instructional materials: accurate materials, appeal, lack of bias, appropriateness, and good organization.

Finding Quality Educational Software

When you select educational software for either home or school, the ideal thing is to preview the program. Visit a software store and ask to preview the program or see a demonstration diskette. If you are unable to preview the program, try the following:

- Read the reviews. Some publications evaluate only educational software. Try to find a reviewer involved with the age group of your students. Although subjective, a review gives you a better idea whether a program will fulfill your needs.
- Look for evidence of field testing in the reviews. Educational software experts agree that no software should be on the market until it has been tested. If it has been tested, see if you can contact the schools where the testing was done, and ask their opinions.
- Check the reputation of the developer. Also ask about money-back guarantees or credits if you are dissatisfied with the product.

Reviewing Educational Software

The only person who knows if the software fits your needs is you. When you preview software personally, either before or after the purchase, consider the following:

Quality software is engaging and has "staying power," the ability to be used over and over without a large drop in interest. It challenges the student to learn, and provides rewards. Good software shares some characteristics with pinball machines; both are hard enough that "winning" is an accomplishment, but easy enough that it is attainable. Quality teaching theory is necessary. Students cannot be expected to do something beyond their abilities, but they should be challenged.

Programs that cover textbook topics should be organized to allow for flexibility between publications. Feedback should be immediate and specific—positive reinforcement for a correct answer, and helpful (not punitive) response for a wrong answer. Several important aspects of quality software are content, usability, aesthetics, and documentation.

Content

Content consists of material and its presentation. Before even looking at a program, consider the educational value of the topic. Is the topic worth spending money on? Decide if the content is worth the price. Is the content in logical sequence? Are the objectives clearly stated and worthwhile? How are they accomplished?

Content should be free of stereotypes, social concerns, software bugs, and grammatical spelling errors.

Usability

Usability is the primary influence on students. The software should teach the topic rather than computer programming and cryptic navigation. If students cannot control the program and must concentrate on the computer rather than the topic, the purpose has been defeated. Programs should load easily and be consistent in input pattern. Key assignment should be logical. Keystrokes should be kept to a minimum and allow a self-paced format. If too much or too little information is given, one student is frustrated and another is bored.

Students should be aware of where they are in the program, and what still needs to be completed. Key inputs should be shown on the screen to facilitate navigation. Students familiar with the program should be able to skip instructions and exercises they know, while other students should be able to go back if they have questions. Instructions should be clearly written and at the appropriate level for the reader. Relevant help screens should be available.

Aesthetics

Programs need to be personalized and use appealing color. Quality graphics need to be instructional and interesting, but not distracting. What purpose does a cute dancing bear on the screen serve? Sound should be user-controlled and not distracting.

The screen design should emphasize the important concepts, yet remain uncluttered. A text-filled screen is unappealing, and neutralizes the software's interactive capabilities. The design should be consistent throughout the series of programs.

Documentation

Quality documentation should be available. Instructions should include techniques to use the software, different approaches, and advice and suggestions. Parents or teachers should receive a supplement to the material given to the students.

Conclusion

Computers in education are here to stay. They can improve the education students receive while complementing teachers' instruction and reducing their workload. Quality educational software is the catalyst in this process. It is important to learn about an educational product before you buy it. As the quality of software and your ability to discriminate between educational products improve, you will find products to fit your needs. Computers improve the quality of education and ease of learning and allow students to reach their highest potential.

(Editor's note: IBM is dedicated to providing a wide variety of educational software, including the recent announcement of 13 new educational software packages. Please refer to the New Products section of this issue.)

Right-Justifying Text

Greg Klipstein
IBM Corporation

One feature that many word processors or editors don't have is the capability to right-justify a document. IBM PCs are frequently used to compose and print articles. Many people like the right column to be lined up smoothly, or right-justified, like the left column. This is not difficult to do with simple text files. The difficult part is to know where it makes sense to right-justify and where not to, especially when the file contains more than just text.

Figure 1 shows a simple program that takes an ASCII text file as input, right-justifies it by inserting extra blanks, and writes it to another file that you can send to your printer. The program asks for the input file name, the left and right margins that your editor used to create it, and the name you want for the output file. You then choose whether you want to see the input, output, both or none while it is being processed.

To keep the program listing short, little more than the minimum information to perform the task is included here. You can easily enhance it with more extensive documentation, prompts to the user, and error processing. For a more complete program, you can download the files JUSTIFY.ASC, .EXE and .DOC from the IBM PC User Group Support Electronic Bulletin Board System, accessible by calling (305)-998-EBBS.

The JUSTIFY.EXE program was compiled with the /O option of the BASIC Compiler, which does not require any licensing. The speed at which a file will process is significantly different between compiled and interpreted BASIC. As an example, for a 50-line file of text with margins of 10 and 45, the interpreter took 21 seconds with no input or output displayed. The compiled program took 6 seconds. Showing both input and output during processing took 33 and 16 seconds respectively.

```
100 INPUT "Enter the INPUT file name (e.g. news.in):";INFILE$
110 INPUT "Enter the OUTPUT file name (e.g. news.out):";OUTFILE$
120 INPUT "Enter the intended margin settings:";LMARGIN,RMARGIN
130 INPUT "Enter i to display input, o to display output, b to display both
    (just hit enter for no display)";ANS$
140 IF ANS$="i" OR ANS$="b" OR ANS$="I" OR ANS$="B" THEN PRINT "The input is:";
150 OPEN INFILE$ FOR INPUT AS #1
160 OPEN OUTFILE$ FOR OUTPUT AS #2
170 LINE INPUT #1, A$
180 WHILE NOT EOF(1)
190 LINE INPUT #1, B$  'get next line too
200 IF ANS$="i" OR ANS$="b" OR ANS$="I" OR ANS$="B" THEN PRINT A$ 'display line
210 IF LEN(A$) > RMARGIN THEN NOCHG=1: GOTO 240  'current line is longer than
    right margin...maybe some control code imbedded and forced longer..no chg
220 IF LEN(A$) = 0 THEN NOCHG=1: GOTO 240  'current line is blank line; leave it
230 IF LEN(A$) < RMARGIN-10 AND ASC(RIGHT$(A$,1)) < 65 THEN NOCHG=1  'current
    line is short and ends with punctuation or control code
240 IF NOCHG=1 THEN NOCHG=0: NNEW$=A$: GOTO 400
250 '*************************************************************************
260 '       Expand current line with blanks to right justify
270 '*************************************************************************
280 X=LEN(A$)
290 FILL=RMARGIN-X: IF FILL=0 THEN NNEW$=A$: GOTO 400
300 STARTCOL=LMARGIN+10
310 FOR I=1 TO FILL
320 N=0
330 IF MID$(A$,STARTCOL+N,1) <> " " AND STARTCOL+N < RMARGIN THEN N=N+1:GOTO 330
340 IF STARTCOL+N = RMARGIN THEN STARTCOL = LMARGIN+1: N=0: GOTO 330
350 ' need to check for no more blanks then go back to beginning of string
360 NNEW$=LEFT$(A$,STARTCOL+N)+RIGHT$(A$,X-(STARTCOL+N)+I)
370 A$=NNEW$
380 STARTCOL=STARTCOL+N+2
390 NEXT I
400 PRINT #2,NNEW$: A$=B$
420 WEND
430 PRINT #2,B$
440 IF ANS$="i" OR ANS$="b" OR ANS$="I" OR ANS$="B" THEN PRINT B$ 'display line
445 IF ANS$="" OR ANS$="o" OR ANS$="O" THEN Q=Q+1: LOCATE 24,1: PRINT Q;
    'just to see that something is being processed, print line number
450 '*************************************************************************
460 '       Close file and put new file to display if wanted
470 '*************************************************************************
480 CLOSE
490 IF ANS$="o" OR ANS$="b" OR ANS$="O" OR ANS$="B" THEN OPEN OUTFILE$ FOR
    INPUT AS #1: PRINT "This is the output file:": PRINT: GOTO 510
500 GOTO 550
510 WHILE NOT EOF(1)
520 LINE INPUT #1,A$
530 PRINT A$
540 WEND
550 CLOSE: PRINT "Finished."
560 PRINT "The output file is named: ";OUTFILE$: END
```

Figure 1. Sample Program to Right-Justify Text.

Glossary for Bulletin Board Users

Ted Hanss
Washtenaw IBM PC User Society

ARC
A set of related files that have been compressed into one file and given a name like FILENAME.ARC. Also a program to perform the compression and uncompression.

ASCII
American Standard Code for Information Interchange. The standard code that uses 7 of the 8 bits in a byte to represent characters.

Asynchronous Transmission
The sending of data where the time lapse between characters varies. Start and stop bits are necessary to signal the start and end of characters so that each character is recognized.

Auto Answer
A feature that allows the modem to answer incoming phone calls without user intervention (the phone line goes directly from the wall to the computer).

Auto Dial
A feature whereby you can dial a phone number from your computer without using a telephone; the dialing tones are generated by the modem that is attached to the phone line.

Baud Rate
The speed of data transmission. Roughly equivalent to the number of bits per second being transmitted over a communications line. Modems generally operate at 300, 1200, or 2400 baud. 1200 baud would refer to 1200 bits per second being transmitted over a phone line by a modem, roughly 20-25 words per second.

Carrier
A continuous frequency signal created by the modem that carries a data signal between communicating computers over phone lines. A "no carrier" message means no connection.

Chat
An on-line conversation with the SYSOP.

COM Port, Serial Port
A connector on the outside of the computer into which you plug the cable from the modem. Part of the Async adapter.

Conference
An electronic conversation where you can leave messages and (with some systems) "talk" with your keyboard to another computer user.

Connect
A message verifying that you have established connection with another computer.

Dedicated Line
A phone line to be used only with the computer. The phone line does not go through a switchboard or a multi-line phone and there are no extensions to the line.

Default Setting
Any setting assumed by the computer or modem to be true unless changed by the user.

Download
Receive a file from another computer via a modem.

Echo
The appearance of characters (from your computer) on your screen. Full Duplex means that the characters are remotely echoed from the receiving computer; Half Duplex means that the characters are entered directly from your keyboard.

Freeware/Shareware
Programs that may be evaluated at no charge but which require payment to the author if kept and used.

Full Duplex
Information is traveling to and from two separate systems at the same time (similar to talking on a telephone).

Half Duplex
Information travels in only one direction at a time between two systems. Transmission is alternated to allow two-way data flow. (An example of half duplex communications is a CB radio.)

Library
(1) The collection of software available to user group members ***or*** (2) A type of file containing smaller files of related data that must be separated to run.

Library Utility
A program that separates library files into their component files so they can be read or run.

Logging Off
The communications exchange sequence necessary to finish a communications session with an electronic bulletin board. Abbreviated as LOG OFF on some systems.

Logging On
The opening sequence of communications necessary to begin a session on an electronic bulletin board. Abbreviated as LOG ON on some systems.

Mail
The electronic messages you send to another computer, usually over some sort of bulletin board. Mail can be personal (read only by the designated recipient) or public (open for all to read). Mail can also be referred to as Messages.

Menu
A selection of options for operating the computer.

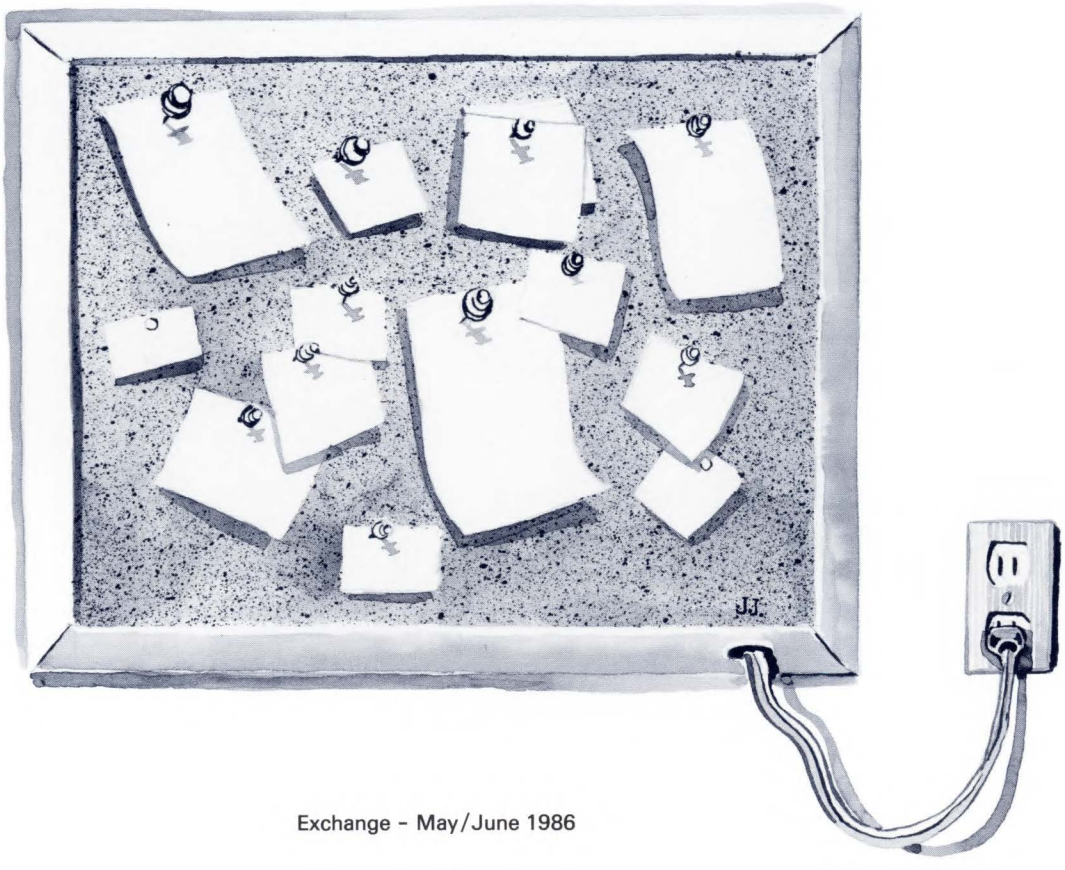
Messages
See Mail.

Modem
(MOdulator/DEModulator). A device used to transfer data via telephone lines. The modem transforms binary signals from the computer into analog signals suitable for transmission over phone lines. In return, it receives signals over phone lines and demodulates them into binary signals that your computer understands.

On-Line
The state of being connected to a remote computer. You can access on-line files while connected to a bulletin board system.

Paging
The remote ringing of the SYSOP's computer speaker to indicate your need to "speak" with him or her through the terminals.

Parity Checking
A parity bit is the eighth bit of a character with a value set to either 0 or 1; it makes the total number of 1's in the character even or odd, depending on whether "even parity" or "odd parity" is used. Both computers must use the same type of parity checking, or both must omit parity checks.



Password
The secret word that you use to gain access to a bulletin board and to some BBS functions.

Protocols
The rules that standards committees set forth in standards documents, and programmers and hardware manufacturers agree to follow, so that there can be compatibility between different sources of hardware and software.

Public Domain Software
Programs that may be obtained and used without charge.

RBBS-PC
Remote Bulletin Board System; a particular BBS software package.

RS-232 or RS-232C
The standard computer hardware interface used for computer asynchronous communications connections.

Serial Communications
The transmission of data one bit at a time over a single electronic path line. Modems are serial communications devices, as opposed to parallel transmission, which uses parallel electronic paths to send characters. Data sent to most printers is in parallel form.

Special Interest Group (SIG)
A group within a user group that has a particular interest, such as telecomputing, spreadsheets, or the PC*jr*.

Squeeze
To reduce a file in size. This allows more data to fit in less space, an important factor on bulletin boards. Squeezing is done by special programs.

Start/Stop Bits
In serial, asynchronous transmission, start/stop bits indicate the beginning and end of each 7- or 8-bit data character.

Synchronous Transmission
Data communications where the data bits in characters are sent at standard, fixed intervals. No stop and start bits are needed.

SYSOP
Bulletin Board SYStem OPerator, the person who runs and maintains a bulletin board.

Terminal Mode
When a microcomputer acts not as a separate processor but as a keyboard and screen attached to a remote computer. This is done by a program called a terminal emulator.

Tone/Pulse Signal
Types of dialing signals required by telephone lines. Modem commands must match "touch tone" or "pulse" (rotary dial) requirements of the phone line.

Unsqueeze
To transform a squeezed library file back to regular size so it can be used.

Upload
To send a file to another computer via a modem.

User Group
An organization of microcomputer users with similar interests.

Videotex
A facility for delivering information stored in a computer to a user at a display terminal. The facility is the total of the hardware and software which allows the interactive exchange of the data between the data storage device and the end user. Videotex presentation protocols include North American Presentation Level Protocol Syntax (NAPLPS), ASCII, Prestel and Color ASCII.

XMODEM
A protocol for transferring blocks of data via modem with a high degree of accuracy.

XON/XOFF
Protocol for controlling the flow of data. If you dial into a timesharing system in which many users simultaneously use the same computer and if the system is about to overflow, it will send an XOFF character to your computer. The XON character will be sent to you when the system is ready to receive again.

IBM Electronic Bulletin Board System

Steven Mahlum
IBM PC User Group Support

(Editor's note: This is an updated version of an article that was printed in the August 1985 issue of **Exchange**.*)*

To assist you in acquiring timely information about the IBM Personal Computer and IBM PC products, IBM's PC User Group Support Department offers not only the *Exchange* newsletter but also an Electronic Bulletin Board Sqstem. Through these two media, PC users from user groups around the country can exchange technical ideas, insights, problems and solutions. We invite you to participate.

The Electronic Bulletin Board System is located in Boca Raton, Florida and consists of several IBM Personal Computer XTs connected to a Personal Computer AT using the IBM PC Network. Each PC XT system has a 1200-baud modem to receive your calls. The bulletin board system database is contained on the Personal Computer AT and is available to multiple users over the PC Network. A specially written program coordinates all functions of the bulletin board system.

The bulletin board system database contains a wealth of information about the IBM Personal Computer family, including announcement material, hints and tips, users' comments, and other valuable information. The information section of the database is divided into many topic areas. An index of all topic areas helps you locate specific information you may want.

Another section of the bulletin board system database contains files that you may download and use on your PC system.

The Electronic Bulletin Board System is now available to everyone. It can be accessed using most communications programs (such as IBM's Personal Communications Manager, PC-TALK, QMODEM, PC-DIAL, etc.) and is available at all times.

To use the PC User Group Support bulletin board system:

1. Set your program with the following parameters:

   - 300 or 1200 baud
   - 7 data bits, even parity, 1 stop bit
     or
     8 data bits, no parity, one stop bit (for binary data transmission)
   - Host echo (full duplex) can be changed to local echo (half duplex) for a noisy line

2. Dial 305-998-EBBS (305-998-3227)

3. Enter your name as prompted.

You will be asked if you want to change the spelling of your name. By answering <N>o, you will be permitted a session to read information and download files.

Once your session has begun, you will be guided through a series of command menus. Each command in a menu may be selected by pressing one of the keys shown in brackets. (Do not press Enter after you press letters shown in brackets.)

From the main menu, you may choose the <I>nfo section or the <F>iles section. The <I>nfo section contains nearly 50 topics, each with files that discuss pertinent information about that topic. For example, after pressing "I", you will be asked to enter a topic. If you are interested in information about the IBM PC Convertible, you would enter CONVRTBL. The CONVRTBL topic contains several information files which you may browse through, selecting those you wish to read.

The <F>iles section contains program files available for you to download. There are several PC Storyboard presentations you may download and run. To use these, download UNPACK.HOW and ST.EXE.

All menus include on-line help (pressing the H key displays explanations of the functions available in a menu). You can terminate the help text by pressing Ctrl-C.

Through your participation, *Exchange* and the Electronic Bulletin Board System will continue to provide you, the user community, with timely and interesting information about the IBM Personal Computer family.

Hardware

IBM PC Convertible

The IBM PC Convertible is a laptop portable personal computer with multiple power options (battery or alternating current) and multiple display options (liquid crystal or cathode ray). The System Unit contains a microprocessor, memory, LCD display, two 3.5-inch diskette drives, keyboard, and an optional modem. The system can be carried in one hand and operated in many places and environments.

The IBM PC Convertible is available in two models -- Model 002, which comes with application software, and Model 022, which does not. Both models include:

- A CMOS 80C88 microprocessor
- Two 32KB CMOS read-only memory chips containing a power-on self-test, basic input/output system (BIOS) support, and a BASIC language interpreter
- 256KB of memory in the form of two 128KB CMOS random access memory (RAM) cards
- Two 3.5-inch 720KB diskette drives
- A detachable 80-column by 25-line liquid crystal display (LCD) that supports 640 x 200 high-resolution graphics and 320 x 200 medium-resolution graphics
- An LCD controller
- A 16KB RAM display buffer
- An LCD font contained in 8KB of RAM
- A 78-key keyboard
- An AC adapter
- A battery pack

Besides providing IBM PC-compatible interfaces, the new ROM BIOS supports the 720KB diskette drive, 78-key keyboard, battery saving modes, a program suspend/resume feature (requiring well-behaved programs), power-on self-test, and self-configuration. The ROM BIOS provides the same features as in earlier PC versions.

The IBM PC Convertible is 14.5 inches deep, 12.5 inches wide, and 2.75 inches high, and weighs 12.17 pounds with the battery pack. The rechargeable nickel-cadmium battery pack fits into the system unit and plugs into the power supply card.

IBM Personal Computer Disk Operating Systems (DOS) versions earlier than 3.20 will not work properly on the IBM PC Convertible, and will not support the new hardware features at their fully rated capacity. DOS 3.20 may be purchased separately.

Each IBM PC Convertible includes a *Guide to Operations* manual and a *Start-Up* diskette. The *Guide to Operations* shows new users the operation and capabilities of the IBM PC Convertible, including software and problem determination procedures, printer and modem control codes and system messages.

The *Start-Up* diskette has system software, diagnostics, and an online familiarization program, *Exploring the IBM PC Convertible*. This program uses graphics, animation and simulated screens to explain how to use the system.

In addition, the Model 002 *Start-Up* diskette includes a Software Setup program to create a System/Applications diskette. This diskette holds the Application Selector program, SystemApps, and Tools. Application Selector provides a menu for selecting the other programs. SystemApps includes several personal productivity programs -- Notewriter, Phonelist, Schedule, and Calculator. Tools is a series of menu-driven programs for maintaining files and diskettes. DOS 3.20 functions also can be included in this menu. You may optionally merge DOS 3.20 (purchased separately) onto the *Start-Up* diskette.

The *Technical Reference* and *Hardware Maintenance and Service* manuals are sold separately. The *Technical Reference* manual is intended for designers, programmers and engineers who need a detailed understanding of the technical operation of the IBM PC Convertible. Volume one of the *Technical Reference* details the hardware design, system interfaces, and basic input/output system (BIOS). Volume two contains a listing of the BIOS.

The *Hardware Maintenance and Service* manual provides trained service personnel with instructions and information for locating failing parts and making repairs. The manual includes error code charts, a parts catalog, and an *Advanced Diagnostics* diskette.

PC Convertible Optional Features

The IBM PC Convertible has two internal options that fit inside the System Unit:

- A 128KB Memory Card
- An Asynchronous Internal Modem

Three feature modules attach to the back of the System Unit or to each other in sequence:

- PC Convertible Printer
- CRT Display Adapter
- Serial/Parallel Adapter

Two options attach to the CRT Display Adapter:

- PC Convertible Monochrome Display
- PC Convertible Color Display

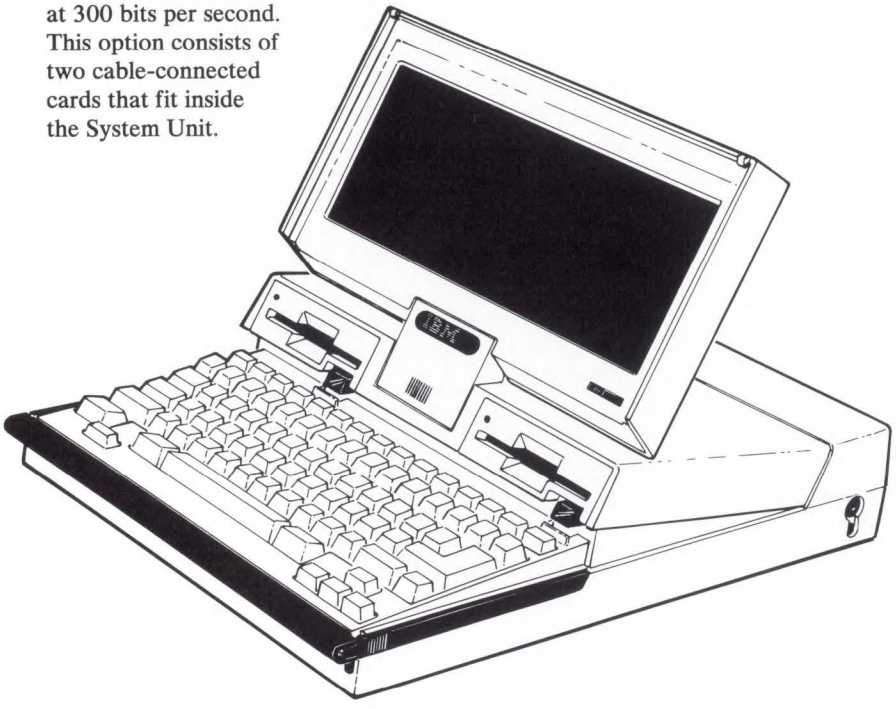
The PC Convertible also has other options:

- Battery Charger
- Automobile Power Adapter
- Printer Cable
- Standard Accessory Carrying Case
- Compact Accessory Carrying Case

Details about the optional features follow.

IBM PC Convertible
128KB Memory Card
The IBM PC Convertible 128KB Memory Card, which fits inside the System Unit, lets you expand the memory in your IBM PC Convertible to a maximum of 512KB. Each card contains 128KB of CMOS random-access memory. With one 128KB Memory Card, the PC Convertible has 384KB of memory; with two cards it has 512KB of memory.

IBM PC Convertible
Internal Modem
The IBM PC Convertible Internal Modem allows asynchronous communications over existing telephone lines with other modems and computers using Bell 212A-compatible protocol at 1200 bits per second, or Bell 103A-compatible protocol at 300 bits per second. This option consists of two cable-connected cards that fit inside the System Unit.



IBM PC Convertible
Printer
The IBM PC Convertible Printer is a feature module designed to attach directly to the back of the IBM PC Convertible, or indirectly through an optional cable. No other feature module can be attached between the Printer and the System Unit.

Controlled by a microprocessor, the IBM PC Convertible Printer is capable of burst speeds up to 40 characters per second. The printer has a high-resolution, 24-element, non-impact print head designed for low power consumption (all power is supplied by the System Unit). The printer supports the standard ASCII 96-character upper- and lower-case character sets and all-points-addressable graphics. The printer can produce output at near-letter quality using a thermal transfer ribbon on smooth paper or draft quality on regular paper. It also supports ribbonless printing on thermal transfer paper.

IBM PC Convertible
Printer Cable
The IBM PC Convertible Printer Cable connects your IBM PC Convertible Printer to the System Unit while letting you detach the printer from the System Unit. The cable is 22 inches long with custom 72-pin connectors at both ends.

IBM PC Convertible
CRT Display Adapter
The IBM PC Convertible CRT Display Adapter is a feature module that attaches either directly to the back of the System Unit or through the other feature modules. The CRT Display Adapter lets you connect a separate display to the system. The CRT Display Adapter supports the IBM PC Convertible Monochrome Display (not the IBM Monochrome Display), and the IBM PC Convertible Color Display. The IBM PC*jr* Color Display, IBM Color Display, or a standard television set also may be connected through optional cable connectors.

IBM PC Convertible
Monochrome Display
The IBM PC Convertible Monochrome Display is a 9-inch (measured diagonally) composite video display that attaches to the IBM PC Convertible CRT Display Adapter. The display provides a character box of 8 by 8 picture elements (pels); supports text modes of 80 columns by 25 rows, and 40 columns by 25 rows; and supports graphics modes of 640 pels by 200 pels, and 320 pels by 200 pels. The display includes an AC power cord, display stand, and signal cable.

IBM PC Convertible
Color Display
The IBM PC Convertible Color Display is a 13-inch (measured diagonally) color display that attaches to the IBM PC Convertible CRT Display Adapter. It supports medium-resolution graphics (300 x 200 lines), 40 x 25 text mode, and 80 x 25 text mode. The display includes a built-in speaker, power cord, display stand, and signal cable.

IBM PC Convertible
Serial/Parallel Adapter
The IBM PC Convertible Serial/Parallel Adapter is a feature module that attaches directly to the back of the System Unit or through the other feature modules. It provides

an RS232-C asynchronous communications interface compatible with the IBM Personal Computer Asynchronous Communications Adapter, and a parallel printer interface compatible with the IBM Personal Computer Parallel Printer Adapter.

IBM PC Convertible Battery Charger
The IBM PC Convertible Battery Charger is a 110-volt option used to trickle-charge the battery pack inside the System Unit. It does not provide enough power to operate the computer while the battery pack is charging; however, you can operate the computer by using the AC Adapter that comes with the PC Convertible.

IBM PC Convertible Automobile Power Adapter
The IBM PC Convertible Automobile Power Adapter is designed to power the System Unit while simultaneously charging the battery pack. The adapter attaches to the System Unit and plugs into the cigarette lighter outlet of a vehicle with a 12-volt, negative-ground electrical system.

IBM PC Convertible Standard Accessory Carrying Case
The IBM PC Convertible Standard Accessory Carrying Case resembles an attache case of soft, ribbed material. The case is designed to hold the PC Convertible and most of its accessories (diskettes, paper, and *Guide to Operations*, but not CRT displays). The IBM PC Convertible and the printer can be operated while in the case.

IBM PC Convertible Compact Accessory Carrying Case
The IBM PC Convertible Compact Accessory Carrying Case holds the IBM PC Convertible, printer, diskettes, and paper. The foam-padded case includes a shoulder strap for converting the case to a backpack.

IBM Personal Computer 3.5-Inch External Diskette Drive

The IBM Personal Computer 3.5-Inch External Diskette Drive is a double-sided diskette drive that stores up to 720KB of programs and information. It attaches to your IBM Personal Computer, providing additional storage, and lets you transfer information to the IBM PC Convertible.

The 3.5-Inch External Diskette Drive drive comes in two models, 001 and 002. Model 001 includes a 36-inch signal/power cable that attaches to the external plug of the diskette drive adapter in the IBM Personal Computer, IBM Personal Computer XT, and IBM Portable Personal Computer. Model 002 attaches to the IBM Personal Computer AT. It comes with a 36-inch signal/power cable and external diskette drive adapter which must be installed in either slot 7 or 8 of the Personal Computer AT System Unit. Both models come with a customer-installable internal power split cable to take power from the personal computer.

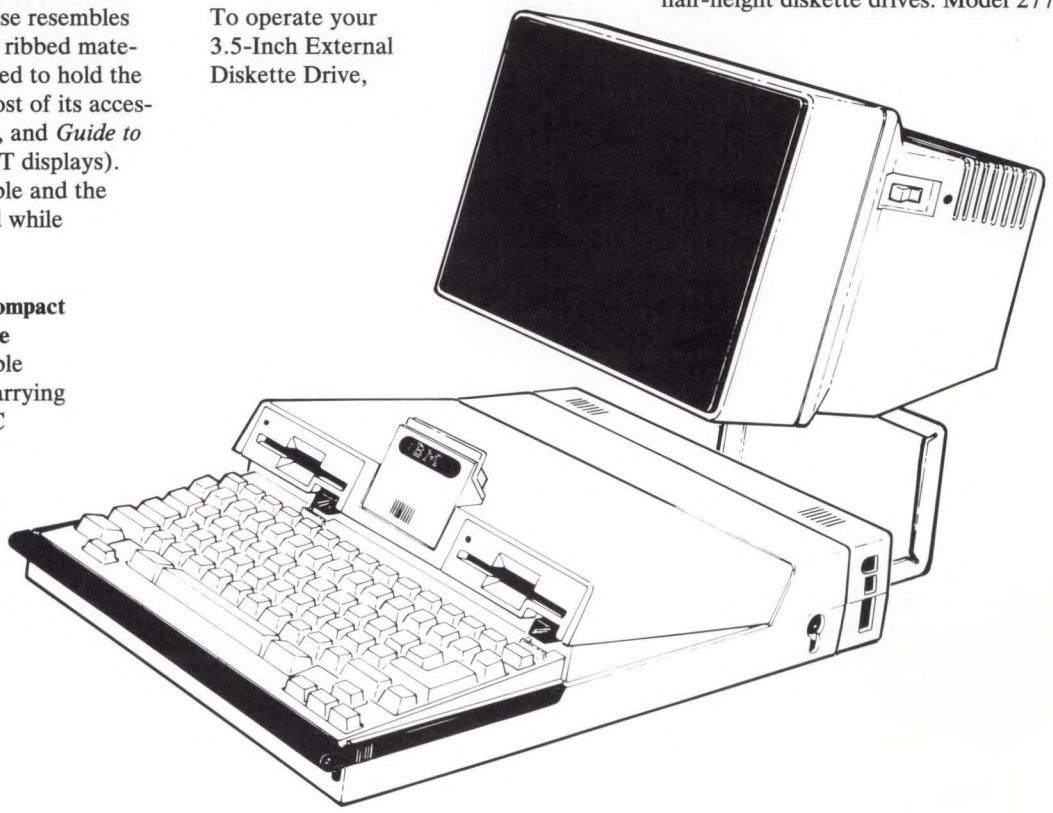
To operate your 3.5-Inch External Diskette Drive, you must have DOS 3.20 on a 5.25-inch diskette that is used in an existing 5.25-inch drive.

IBM Personal Computer XT Models 088, 089, 267, 268, 277, and 278

Six new versions of the IBM Personal Computer XT -- Models 088, 089, 267, 268, 277 and 278 -- provide greater memory and disk/diskette storage capacity. All new models feature eight expansion slots, half-height diskette drives, and up to 640KB of memory on the system board. Three of the models come with an Enhanced Personal Computer XT Keyboard. All models accept an optional 8087 processor.

Models 267 and 268 include 256KB of memory and one 5.25-inch 360KB half-height diskette drive. Model 267 comes with the regular Personal Computer Keyboard; model 268 has the Enhanced Personal Computer Keyboard.

Models 277 and 278 include 256KB of memory and two 5.25-inch 360KB half-height diskette drives. Model 277



comes with the regular Personal Computer Keyboard; model 278 comes with the Enhanced Personal Computer Keyboard.

Models 088 and 089 include 512KB of memory, one 5.25-inch 360KB half-height diskette drive, one 20MB full-height fixed disk drive, and an asynchronous communications adapter. Model 088 comes with the regular Personal Computer Keyboard; model 089 comes with the Enhanced Personal Computer Keyboard.

The Enhanced Personal Computer XT Keyboard has 101 keys that have been rearranged for easier use and commonality with other IBM products. The enhanced keyboard has four sections -- a typing section with enlarged Tab, Enter, Backspace and Shift keys; a numeric keypad with its own Division and Enter keys; cursor and screen controls as dedicated keys; and 12 function keys including dedicated PrtSc, Scroll Lock, and Pause/Break keys. The enhanced keyboard comes with a nine-foot connecting cord.

Optional Features

256KB Memory Module Kit
The 256KB Memory Module Kit expands the Personal Computer XT Models 267, 268, 277 and 278 to 512KB of memory. The kit is installed on the system board.

128KB Memory Module Kit
The 128KB Memory Module Kit expands all new models of the Personal Computer XT to 640KB of memory. The kit is installed on the system board. Models 267, 268, 277 and 278 require the 256KB Memory Module Kit as a prerequisite.

5.25-Inch 360KB Half-Height Diskette Drive
A second 5.25-inch 360KB half-height diskette drive is available for IBM Personal Computer XT Models 088, 089, 267 and 268. The second 5.25-inch diskette drive is installed below the existing 5.25-inch diskette drive and attaches to the diskette drive adapter. You can have up to two Diskette Drives of any type.

3.5-Inch 720KB Diskette Drive
The IBM Personal Computer XT 3.5-Inch 720KB Diskette Drive is an internally mounted 3.5-inch half-height diskette drive that holds 720KB of data. Available on Personal Computer XT Models 088, 089, 267 and 268, the 3.5-inch drive is installed below the existing 5.25-inch diskette drive, and attaches to the existing diskette drive adapter. You are limited to one 3.5-inch diskette drive.

5.25-Inch 20MB Fixed Disk Drive
The IBM Personal Computer XT 5.25-Inch 20MB Fixed Disk Drive is available for IBM Personal Computer XT Models 267, 268, 277 and 278. Installed next to the diskette drives, this full-height disk drive requires a 20MB Fixed Disk Adapter.

IBM Personal Computer AT Models 319 and 339

The IBM Personal Computer AT Models 319 and 339 offer increased performance. Both models use the 80286 processor operating at 8Mhz (versus 6Mhz for other AT models). They also have six 16-bit feature slots, two eight-bit feature slots, 512KB of memory on the system board, a security keylock, and a 192-watt power supply. Model 339 offers an Enhanced Personal Computer AT Keyboard. In addition, both models include a 30MB Fixed Disk Drive and a Serial/Parallel Adapter.

The Enhanced Personal Computer AT Keyboard has all the features of the Enhanced Personal Computer XT Keyboard plus indicator lights for Caps Lock, Num Lock, and Scroll Lock on/off conditions.

The IBM Personal Computer AT family now supports up to 10MB of memory (see the following announcements). DOS uses the extended memory as virtual disks. The XENIX operating system uses the memory directly.

Optional Features

128KB/640KB Memory Expansion Option
The 128KB/640KB Memory Expansion Option comes with 128KB of memory to expand the memory of the Personal Computer AT to 640KB. You can add one 512KB Memory Module Kit (described below) to the card and use the additional 512KB as extended memory.

512KB/2MB Memory Expansion Option
The 512KB/2MB Memory Expansion Option comes with 512KB of memory to expand the memory of the Personal Computer AT to 1MB. You can add up to three 512KB Memory Module Kits (described below) to the card to increase its memory to 2MB.

512KB Memory Module Kit
The 512KB Memory Module Kit consists of 512KB of memory that can be installed on either the 128KB/640KB Memory Expansion Option or the 512KB/2MB Memory Expansion Option.

IBM Personal Computer Advanced 3278/79 Emulation Adapter Card

The IBM Personal Computer Advanced 3278/79 Emulation Adapter Card is a half-length adapter card that supports all the functions of the original full-length IBM PC 3278/79 Emulation Adapter. When used with the IBM Personal Computer Monochrome Display, the 3278/79 Emulation Adapter emulates an IBM 3278 Display Station Model 2. When used with a color display, the adapter emulates an IBM 3279 Display Station Model 2A or S2A. The adapter supports file transfer to and from the host computer, and allows an emulation session and a DOS session to be active concurrently.

In addition to coaxial cabling, the Advanced 3278/79 Emulation Adapter can attach to a host through

the IBM cabling system, or through telephone twisted pair wires.

The IBM Personal Computer Advanced 3278/79 Emulation Adapter Card installs in any full- or half-length slot of an IBM Personal Computer, IBM Personal Computer XT, or IBM Personal Computer AT. It requires an IBM Monochrome Display or color display. In addition, the Advanced 3278/79 Emulation Adapter requires one of the following software products:

- IBM PC 3278/79 Emulation Control Program Version 2
- IBM PC 3270 Emulation Program, Entry Level
- IBM PC 3270 Emulation Program Version 2.00
- PROFS PC Connection
- PC/VM Bond Release 2
- IBM Personal Decision Series Host Attach Product
- PROFS PC Support Program
- CIEDS/Design Capture PC-AT

System memory and DOS requirements vary for each software product. A 3270-PC file transfer program must be running on the host computer for file transfer.

IBM Proprinter XL

The Proprinter XL is a high-speed, wide-carriage, desktop, impact printer. Its features include an operator panel that lets you choose many print modes without the need for programming skills; support for proportional spacing, software-selectable margins and printing of double-high characters; ribbon life of approximately three million characters; power-assisted paper loading for continuous forms; 4K standard print buffer; and "quiet" mode, a user-controlled feature that mutes the sound level while printing.

The IBM Proprinter XL extends the versatility of the original IBM Proprinter to those users requiring the capability of printing on wide forms. It offers all Proprinter features plus the following:

- Operator-panel-controlled features:
  - Near-letter quality
  - 12 characters per inch printing
  - Condensed printing
  - Emphasized printing
  - Double-high printing
  - Double-wide printing
  - Proportional spacing
  - Quiet Mode
  - Audible alarm on/off
- Standard 4K buffer
- Increased character set size for downloadable fonts
- Power-assisted paper loading
- Optional 8K Print Buffer (the Proprinter 5K buffer functions as an 8K print buffer in the Proprinter XL)

The Proprinter XL attaches to IBM Personal Computers via the standard parallel interface or optional asynchronous serial interface and an appropriate printer attachment cable.

IBM Token-Ring Network PC Adapter II

The IBM Token-Ring Network PC Adapter II provides bridging of IBM Token-Ring Network rings. This PC Adapter II furnishes attachment for IBM Industrial Computers, and is an alternative for attachment of IBM Personal Computers to the IBM Token-Ring Network.

Two IBM Token-Ring Network PC Adapter IIs operate with the IBM Token-Ring Network Bridge program to support bridging IBM Token-Ring Network rings. This increases the allowable number of attaching devices that communicate on an IBM Token-Ring Network within the establishment. The bridging of multiple rings provides the appearance of one logical ring with transparency to higher-level protocols.

The IBM Token-Ring Network PC Adapter II provides an alternative attachment for the IBM Personal Computer to the IBM Token-Ring Network and provides all of the function of the IBM Token-Ring Network PC Adapter with the addition of 8KB of random access memory (RAM).

The PC Adapter II can be used in devices attached to the ring which require additional RAM for increasing message segment size and/or increasing the number of link stations supported by the adapter. For example, the IBM Token-Ring Network PC Adapter II in a server may improve performance when multiple workstations require simultaneous access to the server.

For attachment of the IBM Personal Computer or IBM Industrial Computer to the network, the IBM Token-Ring Network PC Adapter II requires:

- One full-sized expansion slot in one of the following system units:
  - IBM Personal Computer
  - IBM *Portable* Personal Computer
  - IBM Personal Computer XT
  - IBM Personal Computer AT
  - IBM 5531 Industrial Computer
  - IBM 7531 Industrial Computer
  - IBM 7532 Industrial Computer

  (Note: The adapter is not supported for use in the IBM Personal Computer System Expansion Unit.)
- One Diskette drive
- IBM Token-Ring Network PC Adapter Cable or Type 3 Media Filter

For attaching the IBM Personal Computer or IBM Industrial Computer to the network, the IBM Token-Ring Network PC Adapter II requires:

- IBM Personal Computer Disk Operating System (DOS) Release 3.20

- IBM Token-Ring Network Bridge Program (Optional)

Two application program interfaces are provided with the IBM Token-Ring Network PC Adapter II:

- An IEEE 802.2 data link control programming interface
- An IEEE 802.5 direct physical control programming interface

In addition to the DOS memory requirements, the adapter requires 7 KB of memory for the adapter handler program.

In addition, two high-level programming interfaces are available:

- Advanced Program-to-Program Communications for the IBM Personal Computer (APPC/PC), which provides an SNA APPC (LU 6.2) application programming interface to the network.
- The IBM Token-Ring Network Basic Input/Output System (NETBIOS) program, which provides a NETBIOS application programming interface.

Examples of programs that utilize this interface are the IBM PC 3270 Emulation Program Versions 2.00 and 3.00 and the IBM PC Local Area Network Program Version 1.10.

Software

IBM Personal Computer DOS Version 3.20

IBM Personal Computer Disk Operating System (DOS) Version 3.20 provides all the features and functions of prior versions of DOS, plus support for the 3.5-inch 720KB diskette drive. Two new commands (XCOPY and REPLACE) have been added for disk and diskette management. Some existing commands have been improved.

The BASIC language interpreter version 3.20, included with DOS 3.20, supports the IBM PC Network and the high-resolution modes of the IBM Personal Computer Enhanced Graphics Adapter. The CIRCLE statement supports the aspect ratio of the IBM PC Convertible's built-in LCD display.

DOS 3.20 comes with a *User's Guide*, *Reference Manual*, and *Quick Reference Card*. The *BASIC Reference Manual* is available separately.

DOS 3.20 is available on both 5.25-inch diskettes and 3.5-inch diskettes. DOS 3.20 operates on the IBM PC*jr* with 128KB of memory, IBM PC Convertible with 128KB of memory, IBM Personal Computer with 96KB of memory (128KB of memory with Fixed Disk), IBM Personal Computer XT with 128KB of memory, IBM Portable Personal Computer with 256KB of memory, and IBM Personal Computer AT with 256KB of memory. DOS 3.20 requires either a 360KB diskette drive, a 720KB diskette drive, or a 1.2MB diskette drive.

BASIC Language Reference Manual Version 3.20

The *BASIC Language Reference Manual Version 3.20* documents the new features of the BASIC Language Interpreter included with DOS 3.20. The BASIC Interpreter is enhanced to support the Enhanced Graphics Adapter, the IBM PC Network, the IBM Token-Ring Network, and DOS Extended Error facilities. The manual describes these features.

IBM Application Software Available for the IBM PC Convertible

The following IBM Personal Computer software products are available on 3.5-inch diskettes for use with the IBM PC Convertible:

- Macro Assembler
- BASIC Compiler
- C Compiler
- DisplayWrite 3
- Personal Decision Series
  - Data Edition
  - Reports+ Edition
  - Words Edition
  - Plans Edition
  - Plans+ Edition
  - Graphs Edition

IBM Personal Computer XENIX Version 2.00

The IBM Personal Computer XENIX Version 2.00 is a set of products designed to support a multi-user, multi-tasking environment on the IBM Personal Computer AT. There are four new XENIX products:

- IBM Personal Computer XENIX Operating System Version 2.00
- IBM Personal Computer XENIX Text Formatting System Version 2.00
- IBM Personal Computer XENIX Software Development System Version 2.00
- IBM Personal Computer XENIX Operating System Extensions Version 2.00

Each of these products is derived from UNIX System V Release 1 and offers enhancements over its Version 1.00 counterpart. XENIX Version 2.00 lets you partition the fixed disk for other operating systems. IBM Personal Computer XENIX requires a minimum of three disk partitions.

IBM Personal Computer XENIX Operating System Version 2.00

The IBM Personal Computer XENIX Operating System Version 2.00 has many functional enhancements over the XENIX Operating System Version 1.00, yet retains binary compatibility with with programs developed under Version 1.00. Like Version 1.00, the IBM Personal Computer XENIX Operating System Version 2.00 provides:

- Dynamic memory management and protection through the 80286 processor
- Hierarchical file system
- Three command interfaces (Bourne, C, and Visual)
- Three text editors (vi, ed, and sed)
- File sharing and access control
- 80287 Math Co-Processor support
- Berkley extensions (csh, ex, file, finger, head, lc, more, termcap, tset, and vi)

The IBM Personal Computer XENIX Operating System Version 2.00 introduces new utilities, including:

- Installable device driver support
- LPR, a System V print spooler that supports multiple printers
- NEWS, a news broadcasting facility
- AT, a batch subsystem controlled by the AT command
- GETTY, a System V method for terminal description and initialization
- PG, a System V file perusal filter

The XENIX Operating System Version 2.00 features an enhanced 80287 floating point library, auto start in event of power failure, enhanced display and keyboard support, support for the 30MB fixed disk and other AT supported disk devices, and improved support for shared interrupts.

IBM Personal Computer XENIX Text Formatting System Version 2.00

The IBM Personal Computer XENIX Text Formatting System Version 2.00 offers enhancements over Version 1.00. In addition to supporting files developed with Version 1.00, Version 2.00 contains text processing capabilities that make it easy to produce technical reports, memoranda, formal papers, and documentation.

The high function of the Personal computer XENIX Text Formatting System makes it more applicable to the technical professional rather than the casual user. Output can be directed to computers with simple printers, or to typesetters. The Text Formatting System offers:

- A mathematical preprocessor to convert formulas to typesetter instructions
- A standardized manuscript layout package
- A powerful line printer formatter
- A table preprocessor to convert tables into detailed formatting instructions
- Automated column width calculations
- Left- and right-justified columns, or centered or decimal-aligned columns
- A powerful formatter that generates output for typesetters

IBM Personal Computer XENIX Software Development System Version 2.00

The IBM Personal Computer XENIX Software Development System Version 2.00 includes a new C compiler that supports arrays larger than 64KB. A new Assembler includes macro support and several new library routines and system calls. Both C and Assembler can generate code that runs in either a XENIX or a DOS (version 2.00 or later) environment.

In addition to having software development tools such as language translators, the Software Development System has interactive debugging and source code management tools. These tools include a Source Code Control System to maintain an audit trail of file revisions, the names of people who made the changes, and file version numbers. Any document or source code can be recreated as it existed at any point in time. Any document or code is stored in such a way that recurring text is not duplicated.

The MAKE command automates the creation and tracking of dependent files. There are other commands and programs for comparison, pattern matching, calculations, sorting, and more.

IBM Personal Computer XENIX Operating System Extensions Version 2.00

The IBM Personal Computer XENIX Operating System Extensions Version 2.00 provides additional end-user functions that are consistent with other IBM UNIX derivative products. The XENIX Operating System Extensions Version 2.00 provide:

- A function-key-driven user interface
- A full screen editor with windowing
- A command for remote UNIX system connection
- An intra- and inter-system mail facility
- An inter-system communication facility
- Print and job queuing
- Unix System V Operating System accounting functions
- Migration aids for moving files from PC/IX to IBM Personal Computer XENIX

IBM Personal Computer XENIX Version 2.00 Requirements

The IBM Personal Computer XENIX version 2.00 Text Formatting System, Software Development System, and Operating System Extensions (herein referred to as component systems) each require the IBM Personal Computer XENIX Operating System Version 2.00, an IBM Personal Computer AT with 512KB of memory, a high-capacity 1.2MB diskette drive, a

fixed disk drive, and an IBM display and adapter. A Serial/Parallel Adapter, cable, and ASCII terminal are required to run any one of the XENIX component systems as a multi-user system.

IBM PC XENIX Version 1.00 Upgrades to Version 2.00

Licensed owners of version 1.00 of either the IBM Personal Computer XENIX Operating System or any one of the component systems can upgrade to version 2.00 of the same system at reduced cost. In addition, licensed owners of IBM Personal Computer Interactive Executive (PC/IX) Version 1.00 or 1.10 can upgrade to the XENIX Operating System Version 2.00 or to any one of the XENIX Version 2.00 component systems at reduced cost.

To obtain the upgrade, you must complete the Product Upgrade Order form (available from Authorized IBM Personal Computer Dealers) and include payment and proof of purchase (the front cover page of the XENIX Operating System Version 1.00 manual or the XENIX Version 1.00 component system manual or the PC/IX Version 1.00 or 1.10 manual). Upgrade orders must be postmarked no later than November 30, 1986. IBM customers may contact their IBM branch office for an alternate upgrade method.

TopView Version 1.10

TopView 1.10 lets IBM Personal Computer users concurrently load and execute multiple text and graphics applications chosen from menus. The applications run inside windows, and users can cut and paste information between applications that have filter tables, as well as perform many DOS services. TopView users select which window is active as other applications run in the background.

In addition to offering all the features of TopView 1.00, TopView 1.10 lets you:

- Swap programs to disk or RAM disk when the combined DOS, TopView and application memory requirements exceed the installed addressable system memory
- Run batch files
- Automatically load a predefined set of programs under TopView
- Start a set of programs grouped under one name from the TopView menu
- Run the DOS command processor, COMMAND.COM, as an application program
- Co-existence with later versions of other IBM System extensions (eg., Local Area Network, 3270 Emulation, Graphics Development Toolkit)
- Use enhanced printer support for parallel, serial, and network printers
- Use up to 20 file handles per program
- Use DOS 3.10 functions
- Use I/O redirection, piping and filters

In TopView 1.10, the DOS Services function includes support for many DOS commands and groups the most frequently used DOS commands in a separate menu.

Other enhancements make it easier to add multiple programs, change program information, use printers and set up TopView.

TopView 1.10 requires an IBM Personal Computer, IBM Personal Computer XT, IBM Portable Personal Computer, or IBM Personal Computer AT with 320KB of memory; DOS 2.10 or later (3.10 or later for the Personal Computer AT); and either two double-sided diskette drives, or one double-sided diskette drive plus one fixed disk drive. Because the amount of memory required varies according to the size and number of applications, 512KB to 640KB of memory is recommended. In addition, a fixed disk is also recommended.

TopView 1.10 supports the IBM Monochrome Display, IBM Color Display, IBM Enhanced Graphics Display configured for Enhanced Color (in Normal Color mode), and the IBM Professional Graphics Display in emulator mode. A customer-supplied mouse is optional. Supported mouse devices are:

- Microsoft Mouse for IBM Personal Computers (parallel interface)
- Microsoft Mouse for IBM Personal Computers (serial interface)
- PC Mouse by Mouse Systems, Inc. (serial interface)
- Visi On Mouse by VisiCorp Inc. (serial interface)

TopView Programmer's ToolKit Version 1.10

TopView Programmer's ToolKit 1.10 is designed to help programmers write applications for the TopView environment. The Programmer's ToolKit documents how to write filters to let applications use the mouse movements and cut-and-paste features of TopView. The TopView Programmer's ToolKit also includes a window design aid, panel library utilities and language interfaces to TopView, as well as guidelines for writing applications that make the best use of TopView.

In addition, the ToolKit lets the programmer:

- Determine if the pointing device is the keyboard or mouse, and control the keyboard mode
- Start a program from within another program
- Post tasks from second-level interrupt handlers or other tasks
- Determine mouse button press and button release
- Set escape on all keys
- Scroll both attributes and text
- Reorder application windows

The requirements for TopView Programmer's ToolKit 1.10 are the same as for TopView 1.10.

IBM Graphics Development Toolkit Version 1.10

The IBM Graphics Development Toolkit Version 1.10 lets graphic application programers write to a Virtual Device Interface (VDI) for device-independent graphics. Programmers write to a Normalized Device Coordinate System (NDC) of 32,767 points by 32,767 points, or to real device coordinates. This makes applications independent of devices, languages, or operating systems.

The Graphics Development Toolkit provides language bindings and graphics primitives to improve programmer productivity. Language bindings are available for:

- IBM Macro Assembler
- IBM FORTRAN Compiler 2.00 (GDT Version 1.00 functions)
- IBM Professional FORTRAN Compiler Version 1.00
- IBM BASIC Compiler Version 2.00
- IBM Pascal Compiler Version 2.00
- IBM C Compiler Version 1.00
- Lattice C Compiler Version 2.12

The Virtual Device Interface takes Normalized Device Coordinates from the application program, and maps them into device specific commands through device drivers. The Graphics Development Toolkit includes device drivers for:

- IBM Color/Graphics Adapter
  - High-resolution 640 x 200 line, 2-color graphics
  - Medium-resolution 320 x 200 line, 4-color graphics
- IBM Enhanced Graphics Adapter
  - Monochrome Display
  - Enhanced Color Display 640 x 350 lines, 16-color graphics
  - Color/Graphics Display high-resolution, 16-color graphics
  - Color/Graphics Display medium-resolution, 16-color graphics
- IBM PC*jr* Color Display (Version 1.00 functions only)
  - High-resolution 640 x 200 line, 4-color graphics
  - Medium-resolution 320 x 200 line, 16-color graphics
  - Low-resolution 160 x 200 line, 4-color graphics
- IBM Graphics Printer
- IBM Proprinter
- IBM Color Printer
- IBM PC Compact Printer (Version 1.00 functions only)
- IBM 7371/7372 Plotters
- IBM Game Adapter with Joystick
- Mouse Devices
  - Microsoft Mouse (parallel or serial)
  - PC Mouse (serial)
  - Visi On Mouse (serial)
  - TopView Logical Mouse
- IBM Virtual Device Metafile (Version 1.00 functions only)

The IBM Graphics Development Toolkit Version 1.10 includes all the function of version 1.00, plus:

- Improved performance (between 1.25 and 5 times on some device drivers)
- Additional support for raster graphics
- Elliptical primitives
- Clipping functions
- Input and cursor control functions
- Language binding for IBM C language
- Mouse Driver Support
- Compatibility with TopView version 1.10
- 40 new VDI functions
- Enhancements to some Version 1.00 functions

The IBM Graphics Development Toolkit Version 1.10 runs on the IBM Personal Computer, IBM Personal Computer XT, IBM Personal Computer AT, IBM Portable Personal Computer, and IBM PC*jr*. It requires 128KB of memory (256KB recommended), a double-sided diskette drive, a display and adapter, and DOS 2.10 or later. The Personal Computer AT requires DOS 3.00 or later.

IBM PC Local Area Network Program Version 1.10

The IBM PC Local Area Network Program Version 1.10 replaces the IBM PC Network Program and provides more functions for both the IBM PC Network and the IBM Token-Ring Network. The Local Area Network Version 1.10 is compatible with TopView Version 1.10 (messenger configuration), the IBM PC 3270 Emulation Program, Entry Level (messenger configuration), and the IBM PC 3270 Emulation Program Version 2.00 (server configuration).

New message capabilities include:

- Saving, retrieving, and sending the same message
- Editing and forwarding a retrieved message
- Skipping already viewed messages in the message log

Configured as a redirector, the PC Local Area Network Program can run under TopView Version 1.10. This lets you run the IBM PC LAN Program's Message Manager as a TopView application.

When run with the IBM PC 3270 Emulation Program Version 2.00, the PC Local Area Network Program supports any combination of network configuration plus emulation configuration. You can redirect host files or print jobs to network servers. The host also can initiate print jobs to servers. Selected personal computers can act as gateways, providing 3270 host access to other personal computers on the network.

The IBM PC Local Area Network Program Version 1.10 requires an IBM Personal Computer, IBM Personal Computer XT, IBM Portable Personal Computer, IBM Personal Computer AT, IBM Personal Computer AT/370, IBM 3270 PC AT/G, or IBM 3270 PC AT/GX; an IBM Monochrome Display, IBM Color Display, or IBM Enhanced Color Display and adapter; one IBM PC Network Adapter or IBM Token-Ring

Network Adapter for each network station; and either DOS 3.10 or later for the IBM PC Network, or DOS 3.20 for the IBM Token-Ring Network. The IBM 3270 PC AT/G and IBM 3270 PC AT/GX require the IBM Graphics Control Program (GCP) Version 3.20. If used to support the IBM Token-Ring Network, the IBM Token-Ring NETBIOS Program and IBM Token-Ring Network Adapter Handler program are required.

The network configurations and their requirements are:

Redirector 28KB of memory and one double-sided diskette drive

Receiver 99KB of memory and one double-sided diskette drive

Messenger 156KB of memory and one double-sided diskette drive

TopView Message Manager 126KB of memory and one double-sided diskette drive

Server 220KB of memory, one double-sided diskette drive, and one fixed disk

Other program combinations will require additional memory.

IBM PC Network Program Upgrade

Licensed users of the IBM PC Network Program can upgrade to the IBM PC Local Area Network Program Version 1.10. You must complete the Product Upgrade Order form (available from Authorized IBM Personal Computer Dealers), and include payment and proof of license (the inside front cover page of the IBM PC Network Program User's Guide). Upgrade orders must be postmarked no later than September 30, 1986. IBM customers may contact their IBM branch office for an alternate upgrade method.

IBM PC 3270 Emulation Program, Entry Level

The IBM PC 3270 Emulation Program, Entry Level lets your personal computer emulate an IBM 3278 or 3279 display station in Control Unit Terminal (CUT) mode. The program supports host color selection and host file transfer. While in communication with a host computer, you can also suspend and resume a DOS session. This new program is compatible with TopView 1.10 and the IBM PC Local Area Network Program Version 1.10.

This new program supports the enhanced IBM Personal Computer XT and AT keyboards, and supports key remapping for the 3270 session. The 3270 Emulation Program, Entry Level provides up to a 40 percent increase in file transfer speed over the IBM Personal Computer 3278/79 Emulation Control Program. 3276 file transfer also is supported.

The IBM PC 3270 Emulation Program, Entry Level requires an IBM Personal Computer or IBM Personal Computer XT with 128KB of memory and DOS 2.10 or later, or an IBM Personal Computer AT with 256KB of memory and DOS 3.10 or later; an IBM 3278/79 Emulation Adapter or IBM Advanced 3278/79 Emulation Adapter; one double-sided diskette drive; and an IBM Personal Computer Monochrome Display or IBM Personal Computer Color Display and adapter. For file transfer, host processors require either the 3270 Host Program for VM/SP or the 3270 Host Program for MVS/TSO.

IBM PC 3278/79 Emulation Control Program Versions 1.00, 2.00 Upgrade

Licensed users of the IBM PC 3278/79 Emulation Control Program Version 1.00 or 2.00 can upgrade to the IBM PC 3270 Emulation Program, Entry Level. Ask your IBM Marketing Representative for the Product Upgrade Order form, which must be completed and postmarked no later than October 15, 1986. You must include payment and proof of license (the original cover page of the user's guide).

IBM PC 3270 Emulation Program Version 2.00

The IBM PC 3270 Emulation Program Version 2.00 provides enhanced 3270 emulation for the IBM Personal Computer in a stand-alone environment, or in the IBM PC Network or IBM Token-Ring Network environments. The 3270 Emulation Program allows you to suspend a well-behaved application under DOS, hot-key into 3270 emulation, and then resume the DOS application. The IBM PC 3270 Emulation Program Version 2.00 supports SDLC telecommunications connection to a host computer, or Distributed Function Terminal (DFT) connection to a host computer by coaxial cable through a 3274 control unit (SNA or non-SNA) to emulate the following devices:

- IBM 3274 Model 51C Control Unit
- IBM 3278 Model 2 Display Station
- IBM 3279 Model S2A Display Station
- IBM 3287 Model 1 Printer

The 3270 Emulation Program Version 2.00 has a Presentation Space Application Interface that accepts routines written in assembly language. This lets you automate keystrokes or data transfer. The 3270 Emulation Program includes office support for the PS/PC, PROFS/PC, and PDS/Host products. It is compatible with the IBM Local Area Network Program Version 1.10 and TopView Version 1.10.

The IBM PC 3270 Emulation Program Version 2.00 runs in four configurations:

- **Stand-alone Station**, where a Personal Computer is connected to the host and operating a 3270 emulation session.

- **Gateway**, where a network and host-connected personal computer provides host access to other personal computers on the network.
- **Network User Station**, where a Personal Computer is connected to the IBM PC Network or IBM Token-Ring Network, and operating a 3270 emulation session through a gateway Personal Computer.
- **Gateway and Network Station**, where a personal computer is directly connected to a host, operating a 3270 emulation session, and providing host access to other network-connected personal computers.

In a network environment, a gateway personal computer can support up to twenty-eight 3270 emulation sessions if connected by SDLC, or up to five 3270 emulation sessions if connected through a 3274 Control Unit. Each Personal Computer on the network must have the IBM PC 3270 Emulation Program to run as a Network User Station. The four emulation configurations are compatible with any of the four network configurations (server, receiver, messenger, and redirector).

When combined with the network redirector configuration, the IBM PC 3270 Emulation Program Version 2.00 permits file transfer between the host and a file server. The host operator can initiate a print job on a network print server as well.

The IBM PC 3270 Emulation Program Version 2.00 requires an IBM Personal Computer, IBM Personal Computer XT, IBM Personal Computer AT, or IBM Portable Personal Computer; a double-sided diskette drive; an IBM Monochrome Display, IBM Color Display, or IBM Enhanced Color Display; and a printer (if 3287 emulation is required). Memory requirements vary by configuration.

For host connection, the Emulation Program requires the 3278/79 Emulation Adapter, Advanced 3278/79 Emulation Adapter, or SDLC Communications Adapter. For network support, the IBM PC 3270 Emulation Program requires IBM PC Network Adapter or IBM Token Ring Network Adapter, and the IBM Local Area Network Program Version 1.10. The 3270 Emulation Program also requires DOS 2.10 or later. The Personal Computer AT and IBM PC Network require DOS 3.10. The IBM Token-Ring Network requires DOS 3.20. A 3270-PC file transfer program must be running on the host computer for file transfer.

IBM Token-Ring Network Bridge Program

The IBM Token-Ring Network Bridge Program is a licensed program for the IBM Personal Computer AT and IBM Industrial Computer AT that supports message directing between IBM Token-Ring Network rings. Operating in conjunction with two IBM Token-Ring Network PC Adapter IIs, it interconnects IBM Token-Ring Network rings to increase the number of attaching devices that can directly communicate within an establishment. The IBM Token-Ring Network Bridge Program includes:

- Transparent to higher-level protocols
- Increased design flexibility in IBM Token-Ring Networks
- Parallel path for performance and availability
- Ring diagnostic and problem determination

The IBM Token-Ring Network Bridge Program operates with two IBM Token-Ring Network PC Adapter IIs to perform bridging functions between IBM Token-Ring Network rings. Bridging of multiple rings provides the appearance of one logical ring that is transparent to higher level protocols.

Communication across the IBM Token-Ring Network Bridge Program is transparent to applications written to the IEEE 802.2 Standard logical link control interface and using source routing (i.e., the station sending the message determines the routing path). The IBM Token-Ring Network NETBIOS Program and the Advanced Program-to-Program Communications for the IBM Personal Computer meet these specifications. Communication across the bridge will be transparent to IBM Personal Computer application programs using these high-level programming interfaces.

The bridge program allows an establishment to have more than 260 attaching devices on the IBM Token-Ring Network using IBM Cabling System data grade media and more than 72 attaching devices on a IBM Token-Ring Network using the IBM Cabling System Type 3 Media Specification.

Bridges permit flexibility in designing IBM Token-Ring Networks. Token-rings may be connected by bridges in series, parallel, or hierarchically. Additional factors to consider when determining appropriate ring size and bridge configurations are affinity groups, establishment topology, ring traffic load, and ring availability requirements.

The program monitors error conditions and, on request, gives the location and time of occurrence for the last errors for each of the two attaching rings at the bridge display. The bridge can be preconfigured by the user for automatic restart after a power disturbance or after some adapter error conditions.

The IBM Token-Ring Network Bridge Program is available separately and as part of the IBM Token-Ring Network Bridge Installation Kit that supports connecting IBM Token-Ring Network rings.

The IBM Token-Ring Bridge Program requires:

- A dedicated IBM Personal Computer AT, IBM 7531 Industrial Computer, or IBM 7532 Industrial Computer
- Two full-sized expansion slots
- Two IBM Token-Ring Network PC Adapter IIs (included in the installation kit)

- 256KB of Memory
- 1.2MB diskette drive
- IBM Monochrome Display or IBM Color Display and adapter
- IBM Keyboard
- Two IBM Token-Ring Network PC Adapter Cables (data grade media) or Two Type 3 Media Filters (Type 3 media specification)
- IBM Personal Computer DOS Version 3.20 is required.

IBM Personal Telephone Manager Program

The IBM Personal Telephone Manager Program for the IBM Personal Computer Voice Communications Option runs in the foreground or background and provides support for the IBM Personal Computer Voice Communications Option. These products combine to connect the telephone to an IBM Personal Computer for creating and maintaining telephone directories and reminders, audible call progress, redial lists, and facilitating one-key dialing. They also provide the ability to detect a host or IBM Personal Computer screen for speed dialing.

The IBM Personal Telephone Manager Program provides software support for the IBM Personal Computer Voice Communications Option, allowing the IBM Personal Computer to perform certain standard and advanced telephone functions. The program also contains screens that prompt the user to perform advanced telephone directory and reminder functions in conjunction with the IBM Personal Computer Voice Communications Option. Online tutorials are available to provide guidance.

The IBM Personal Telephone Manager Program for the IBM Personal Computer Voice Communication Option is compatible with the IBM Personal Computer Local Area Network Program Version 1.10. Note: This product cannot co-reside with the Server configuration of the IBM Personal Computer Local Area Network Program.

IBM Token-Ring Network Manager

The IBM Token-Ring Network Manager, a licensed program for the IBM Personal Computer, assists the user in problem determination and error recovery for the IBM Token-Ring Network. The IBM Token-Ring Network Manager:

- Continuously monitors the ring for hard and soft failures, identifies probable cause and source about failures, and notifies the operator of failures requiring immediate attention (with a highlighted indicator on the master display and an audible alarm).
- Supports up to 260 attaching stations on a single ring.
- Provides easy-to-use menus and operator commands to display status and test station connectivity.
- Logs soft and hard network error and status information to disk (diskette) for subsequent retrieval by date and time and/or station address.
- Assists in trouble isolation by logically deleting a station from the network (as requested by the operator).
- Controls access to program functions by use of a password, preventing unauthorized use of the network management functions and program.

The IBM Token-Ring Network Manager records failures associated with the network cabling system, access units, and attaching station network adapters. It also records hard errors when a permanent error causes the loss of a network resource. The IBM Token-Ring Network Manager records soft errors when the error threshold for transient, recoverable errors is exceeded (which can indicate an impending loss of a network resource). This facilitates problem determination and recovery.

Other network events, such as stations joining and withdrawing from the network, are optionally recorded in the log. Events logged during a specified time period and/or associated with a specified adapter (station) can be displayed and/or printed.

Operator control functions are provided. Connectivity problems can be investigated by displaying all online stations or requesting a path test between two stations. Intensive recording mode (which causes all soft-error incidents to be recorded) and continuous network traffic generation are operator-controlled functions useful in isolating transient failures.

Operator interaction with the program is accomplished through a series of program function menus. Function keys simplify operator interaction. Operator interaction is also simplified through the use of symbolic names for network stations (adapters). Station names are assigned by the operator and stored in a file.

The IBM Token-Ring Manager requires IBM Personal Computer DOS Version 3.20, 512KB of memory, and an IBM Token-Ring Network PC Adapter. It runs on any dedicated IBM Personal Computer, IBM Personal Computer XT, IBM Personal Computer AT, or IBM Portable Personal Computer.

The personal computer needs two double-sided or high-capacity diskette drives, or one fixed disk (10MB or 20MB) drive and one double-sided or high-capacity diskette drive. An IBM Monochrome or IBM Color Display also is required. The IBM Graphics Printer or IBM Proprinter are optional.

IBM Token-Ring Network/IBM PC Network Interconnect Program

The IBM Token-Ring Network/IBM PC Network Interconnect Program permits the exchange of information between IBM Personal Computers attached to two IBM PC Networks. It can also be used to connect an IBM Token-Ring Network and IBM PC Network. The configuration phase of the program identifies devices on each network that will be known to the other network. The operational phase receives and forwards messages from one network to the other, and includes operator functions to check device status and monitor activities.

Network application programs to be linked must use network basic input/output (NETBIOS) communication protocols. An IBM Personal Computer LAN Program Version 1.10 user can access programs or data on a server from one network to the other using the Token-Ring Network/IBM PC Network Interconnect Program.

Hardware Requirements

The program requires a dedicated IBM Personal Computer XT or AT, 256K of memory, one 360K diskette drive, and a monochrome or color display. Two IBM PC Network Adapters also are required. When an IBM Token-Ring Network and an IBM PC Network are connected, an IBM Token-Ring Network Adapter and an IBM PC Network Adapter are required.

Software Requirements

IBM Personal Computer DOS 3.20 is required. Network application programs linked by the interconnect program must use NETBIOS communication protocols. If the program is used to link an IBM PC Network to an IBM Token-Ring Network, the IBM Token-Ring NETBIOS program is needed.

Application programs that use the NETBIOS interface and operate on the IBM PC Network should operate across the two networks. Programs that have been successfully tested include:

- IBM Personal Computer 3270 Emulation Program Version 2.00
- IBM Asynchronous Communications Server Program
- IBM Personal Computer Local Area Network Program Version 1.10*

  * The message-forwarding function is not supported. For those networks requiring multiple versions of DOS and/or Personal Computer LAN Program to exist on a single server, the IBM PC System Extensions Planning and Installation Guide documents a method for accommodating this environment.

IBM ISPF/PC II (EZ-VU II Development Facility)

The IBM ISPF/PC II (EZ-VU II Development Facility) is an enhanced version of the IBM EZ-VU Development Facility that lets you design attractive interactive panels for your applications with less coding effort. ISPF/PC II (EZ-VU II Development Facility) supports:

- Pop-up panels
- Selectable fields
- Thirty-two emphasis levels
- An "undo" function
- An on-line, interactive tutorial
- Multiple active panel displays
- Picture editing
- Language interface modules for the C language
- Improved usability and help panels
- Panel conversion to host ISPF panels
- Improved overall performance

When combined with the IBM ISPF/PC II (EZ-VU II Runtime Facility) and the IBM ISPF/PDF PC Editor (EZ-VU Editor), the IBM ISPF/PC II (EZ-VU II Development Facility) lets you write host-based applications on the IBM Personal Computer and upload them to a host for further processing.

IBM ISPF/PC II (EZ-VU II Development Facility) requires an IBM Personal Computer, IBM Personal Computer XT, IBM Portable Personal Computer, or IBM Personal Computer AT with 256KB of memory; an IBM Monochrome Display, IBM Color Display, or IBM Enhanced Graphics Display plus adapter; two 5.25-inch double-sided diskette drives, or one 5.25-inch double-sided diskette drive plus one fixed disk drive; DOS 2.00 or later; and the IBM ISPF/PC II (EZ-VU II Runtime Facility).

IBM ISPF/PC II (EZ-VU II Runtime Facility)

The IBM ISPF/PC II (EZ-VU II Runtime Facility) is an enhanced version of the EZ-VU Runtime Facility, a productivity aid designed to reduce the effort of creating interactive applications. Through screens created by programmers, it provides a conversational interface between a user and an application.

This product extends the host ISPF dialog manager to the IBM Personal Computer. It provides application program selection, full-screen panel display, input validation, field translation, and message display. This new version allows program developers to define up to 40 function keys, display multiple panels, call panels from panel libraries, and use programs written in C, Pascal, and assembly language.

IBM ISPF/PC II (EZ-VU II Runtime Facility) requires an IBM Personal Computer, IBM Personal Computer XT, IBM Portable Personal Computer, or IBM Personal Computer AT with at least 128KB of memory; an IBM Monochrome Display, IBM Color Display, or IBM Enhanced Graphics Display; a 5.25-inch double-sided diskette drive; and DOS 2.00 or later.

IBM ISPF/PDF PC Editor (EZ-VU Editor)

The IBM ISPF/PDF PC Editor (EZ-VU Editor) is a personal computer-based version of the host-based Interactive System Production Facility/Program Development Facility (ISPF/PDF). It lets you create, copy, and modify source data on a personal computer, then transfer the data back to a host computer for further processing.

The ISPF/PDF PC Editor supports line commands typed over line numbers, and primary commands. Either group of commands can be assigned to any of the 40 function keys supported by the IBM Personal Computer.

An optional tutorial diskette teaches the features of the ISPF/PDF PC Editor, and provides additional information for error messages.

The IBM ISPF/PDF PC Editor (EZ-VU Editor) requires an IBM Personal Computer, IBM Personal Computer XT, IBM Portable Personal Computer, IBM Personal Computer AT, or IBM PC*jr* with 256KB of memory; an IBM Monochrome Display, IBM Color Display, or IBM Enhanced Graphics Display; and a 5.25-inch double-sided diskette drive. It also requires DOS 2.00 or later, and the IBM ISPF/PC II EZ-VU Runtime Facility.

Education Programs Announced

Physics Discovery Series

The Physics Discovery Series helps beginning physics students understand the nature of investigation and the processes at work in the physical environment. The focus is on conceptual learning. Students manipulate variables in simulations, collect and graph data, develop formulas, and apply concepts for a better understanding of the scientific method.

The three new Physics Discovery Series programs cover wave interference, electric fields, and models of light. Interactive sequences encourage experimentation and problem solving. Randomized quizzing tests the skills of the student.

Like the first four programs in the Physics Discovery Series, various utilities are available, such as on-line glossary and calculator, page up and page down, print screen capabilities, and tutorials. The course easily integrates into the common curriculum. An advanced excursion is available for students who want to be challenged.

The Physics Discovery Series requires 128K of memory, and runs on the PC*jr*, Personal Computer, Personal Computer XT, Portable Personal Computer, and Personal Computer AT. A double-sided diskette drive and monitor are required.

Biology Series

These additions to the Biology Series offer four major topics for the high school student:

- Human Life Processes: Development and Differentiation
- Pollination and Fertilization: Seed, Fruits, and Embryos
- Taxonomy: Classification and Organization
- The Environment II: Cycles and Interactions

Animations illustrate major concepts and processes, stimulating reasoning and cognitive thinking. Experiments allow the student to make observations, interpret these observations, and predict outcomes. Graphics improve retention and keep interest level high as they illustrate major concepts and processes.

Each program is divided into several instructional lessons, followed by a testing section, all self-paced. Interactive sequences encourage active student participation.

All Biology Series programs require 128KB of memory and run on the PC*jr*, Personal Computer, Personal Computer XT, Portable Personal Computer, and Personal Computer AT. A double-sided diskette drive and color monitor also are required.

Scientific Reasoning Series

The Scientific Reasoning Series, designed by scientists, helps students in grades 5-12 develop problem-solving techniques. Natural language responses and interactive dialogue teach hypothesis development and scientific reasoning. The programs can be used in both formal and informal learning situations.

The two topics developed are 1) measurement and distance, and 2) reflection. The programs show how to approach a problem from a scientific standpoint. Experiments encourage theory development and evaluation as they are illustrated by the programs and performed in class. Students are encouraged to manipulate the variables and conceptualize before solving mathematical problems. An advanced section is available to students who care to explore further.

The Scientific Reasoning Series is self-starting; DOS is not required. The programs need 128K of memory and run on the PC*jr*, Personal Computer, Personal Computer XT, Portable Personal Computer, and Personal Computer AT. A double-sided diskette drive and graphics display are also necessary. Telephone support is available for 90 days following purchase.

Landslides

IBM Personal Computer Landslides helps students learn about major earth processes with emphasis on landslides—how they occur, their place in the environment, and their effect on people. The product also covers the different effects of weathering on rocks and materials. The program then quizzes the knowledge of the student.

The two tutorials included are 1) Natural earth processes related to landslides, and 2) How the processes affect human activity.

Landslides requires 128KB of memory and DOS 2.10 or higher, and runs on the PC*jr*, Personal Computer, Personal Computer XT, Portable Personal Computer, and Personal Computer AT. A color monitor is required; a printer is optional.

Basic Skills Software

IBM announces several products in the basic skills areas that have been developed in conjunction with WICAT Systems, Inc. The programs span from kindergarten to 8th grade. All programs are similar in instruction and format; once students learn to use one program, they have learned to use all of them, and can follow these programs through 9 grades.

All programs in basic skills begin with the same tutorial about basic key function (escape, return, cursor, etc.). Any special keys are explained and also shown on the keyboard guides that come with each program. All student instruction is self-contained. Further instructions to parents or teachers are given in a guide supplied in the software package.

The programs follow a self-paced menu format. Students sign on initially. When they quit (end), a 'bookmark' remembers them. When they sign on again, it returns them to the next activity from where they left off. Or, the teacher or parent can make assignments to take the student automatically to a section. The programs keep record of the activities of the student. If a printer is attached, scores are printed out complete with name, date, and expended time.

These programs have extensive on-screen helps and follow a self-paced menu format. The lessons are pedagogically sound and were planned to mesh easily into the classroom curriculum. Students' interest is held through fast-paced design and immediate feedback.

The programs do not require DOS or BASIC to start up or run. However, if run with DOS, the programs require at least 256KB of memory. The programs run on the PC*jr*, Personal Computer, Personal Computer XT, Portable Personal Computer, and the Personal Computer AT. A double-sided diskette drive is necessary. Although a monochrome monitor works, a color monitor is suggested in order to receive the full value of the extensive graphics. A printer is optional for all programs. A speech attachment is optional for the Spelling Series.

The basic skills software is divided into several series. Details follow.

Vocabulary Series

The Vocabulary Series supplements the vocabulary curriculum for grades 3-8. Three programs teach over 300 new words, word parts, and unfamiliar words by part and context. The following activities challenge the student and maintain interest:

Make-A-Word teaches roots, prefixes, and suffixes, and how to use them to form words and find meanings.

As the Words Turn presents new words through stories in a logical format and common theme.

Testing 1-2-3 is a multiple choice test that evaluates mastery of the new vocabulary, and then reviews the missed words.

What's My Word is a crossword puzzle game that makes reinforcement enjoyable.

Review Test tests retention and encourages mastery of the new words before going on to the next unit.

Reading for Meaning Series

The Reading for Meaning Series covers the reading curriculum of grades 1-8. These programs enhance students' interpretive and inference skills, develop better contextual analysis, and improve prediction and key word identification.

Read a Story (Grades 1-2) asks students to answer questions about what is happening in a simple story and predict what they expect to happen.

Digging for Meaning (Grades 1-2) develops contextual analysis skills as students help a futuristic archeological professor study papers about present-day topics that have key words smudged out.

Word Meaning (Grades 1-2) drills new vocabulary and uses the new words in sentences to help the student learn meaning through context.

Getting the Picture (Grades 1-2) zeroes in on one of four possible pictures through key word and phrase identification.

Reading More Than the Words (Grades 3-8) teaches inference as the students combine what they know and read, and learn to support conclusions.

Reading to Get the Picture (Grades 3-8) teaches keyword and phrase identification. It is essentially the same as **Getting the Picture** but is designed for higher levels.

Reading for Information Series

The Reading for Information Series teaches students techniques for evaluating graphs and graph-related materials. Older students also learn to discriminate among opinions, claims, and evidence while evaluating arguments.

Reading Graphs and Charts (Grades 3-8) discusses graphs and textual correlation to graphs. The student prac-

tices interpreting different graphs and maps, and uses this information to answer questions.

Reading Arguments (Grades 5-8) explains the differences between opinions, claims and evidence. The student then gets experience evaluating varied arguments. The student can return to the definitions or receive assistance.

Spelling Series

The Spelling Series teaches spelling skills and correct usage to students in grades 1-6. Recall is improved through the optional speech attachment which allows students to see and hear the words they learn. The content is formatted to coincide closely with grammar texts.

Pre-test and **Post-test** compare the knowledge of the student before and after the exercises. The various exercises and games use extensive graphics to improve retention.

Math Concepts Series

The Math Concepts Series presents supplemental instruction and practice for the math curriculum of grades K-8. Problem-solving strategies as well as traditional computation and geometric concepts, are covered. The programs follow standard teaching progression to coincide with textbooks.

Covered concepts include: estimation, addition, subtraction, multiplication, division, relationships of equivalence and size, spatial relationships, problem solving, and graphs. Close attention is paid to keeping the practices engaging and interesting through graphics and format.

Math Practice Series

The Math Practice Series drills students' knowledge of mathematical concepts in grades 1-8 and complements the Math Concepts Series. Whole numbers, decimals, and fractional computations are covered. On-screen helps and hints are included in the lessons to allow flow and cohesiveness.

Touch Typing for Beginners

Touch Typing for Beginners introduces students in grades 3-8 to touch typing, with emphasis on correct finger placement. The program recognizes the correct keyboard (whether PC*jr* or any other IBM Personal Computer), and displays it for demonstration purposes. The program utilizes an interesting array of exercises and games, with emphasis on typing real language rather than nonsense syllables. Students can customize the exercises to their level of speed and mastery, allowing the program to be used for higher levels.

Parts of Speech Series

The Parts of Speech Series (Grades 3-8) enhances basic language skills by explaining what parts of speech are, how they interact, the various sentence structures, and how to use confusing words and rules properly.

Whatzit: Study introduces the parts of speech gradually and graphically.

Whatzit: Practice teaches identification of parts of speech and how to fit them into sentences. Animated characters then act out sentences.

Whatzit: Self-Test quizzes and reinforces by giving exercises to identify parts of speech.

Fixit teaches how to understand confusing rules and specific usage problems.

IBM Business Adviser

The IBM Business Adviser is an easy-to-use business accounting system built around a seamless architecture concept. No rigid boundaries exist between different applications -- information is shared across every facet of business. Because IBM Business Adviser acts as one application, the system automatically posts all transactions to their appropriate accounts, which then reflect the most current information. A multi-layered menu system allows you to move easily from one task to another as three on-line support functions respond to questions as they arise. Personalized design is allowed.

The IBM Business Adviser is flexible to meet growing needs. The General Accounting Edition operates alone, or acts as a cornerstone. Information is shared regardless of how many editions have been installed. Eight editions comprise the IBM Business Adviser:

1. The General Accounting Edition

The General Accounting Edition blends four basic accounting functions to help automate the receivables, payables, general ledger, and payroll portions of your business. It also provides (on demand) printed reports, checks, and financial and customer statements. Flexible financial calendars allow you to split the year into 53 financial periods. Customized financial statements and spreadsheets from general data are available. The General Accounting Edition prints reports that compare budgets to past activity. Automatic account prompts can be assigned for frequent accounts used.

This edition stands alone, but also is a requirement for installing all other series applications except the Information Management Edition. When other IBM Business Adviser accounting applications are added, entries from the new additions are automatically posted throughout other installed editions. Books remain constantly current. Support functions are extended to new editions.

The remaining seven editions are extensions of the General Accounting Edition's capabilities.

2. The Accounts Payable Edition

The Accounts Payable Edition uses the accrual method to tighten control of outgoing business funds. Therefore, both income and expenses are recorded as they occur, whether or not funds change hands. Amounts are automatically posted, and can be preset to save time entering credit for vendors. Reports help to project busi-

ness cash requirements and take advantage of discounts. This edition prints vendor checks on demand, with voucher number, vendor, available discount, or due date.

3. The Accounts Receivable Edition

The Accounts Receivable Edition offers comprehensive customer and accounting information to help manage outstanding receivables. Flexible options for structuring data entry, analysis, billing and reporting tasks are available. Accounts Receivable ages invoices, provides policy formats, and gives the option to handle accounts as either balance-forward or open-item. It also prints complete customer statements.

4. The Payroll Edition

The Payroll Edition automates most repetitive payroll tasks. It offers fully automated payroll calculating, check writing, IRA processing, W-2 printing, and report generating. Payroll Edition also keeps period-to-date totals and on-line employee information. Various payroll methods are available -- paychecks can be cut on a weekly, biweekly, semimonthly, or monthly schedule. Tips can be tracked and reported. Current tax tables will be sent to you at no charge when you register this product. IBM Application Service-Payroll Tax Table Service is available afterwards as a fee-based service.

5. The Inventory Control Edition

The Inventory Control Edition offers on-line up-to-date information about your inventory investment. It streamlines the way you stock and order inventory items. It also tracks inventory costs and profits for as many as 99 warehouses. Inventory transactions and adjustments are automatically updated. Reports show activity, floor plans, aging, and exception, and allow you to make sound projections and reduce carrying costs.

6. The Order Entry Edition

The Order Entry Edition provides a flexible method for processing customer orders and monitoring sales orders from initial estimate to final invoice. Order Entry generates sales analysis reports by region, date, customer, or salesperson. It also automatically posts balances to the General Accounting Edition's general ledger, and provides on-line monitoring of customer status. These features help integrate sales orders and invoicing practices company-wide.

7. The Network Extension Edition

The Network Extension Edition allows a remote Personal Computer user to access IBM Business Adviser programs and data stored on a central "server" Personal Computer. One Network Extension Edition is required for each remote computer, and up to eight concurrent users can access through the IBM PC Network or Token-Ring Network. All computers have complete access to features available to a single user (on-line Help, windows, selector, layered menus, etc). Each user can work on a different set of information, or all can work on the same information concurrently.

8. The Information Management Edition

The Information Management Edition functions independently or adds powerful data base capabilities to other IBM Business Adviser applications. As a stand-alone data base manager, this edition lets you design reports and handle information easily. Coupled with other editions, otherwise unavailable methods of collecting, manipulating, and reporting information are provided. With the Information Management Edition, you can customize predefined screens or design new data fields and place them within existing screens.

Reports can be designed using information from IBM Business Adviser's accounting files or documents created by other software products. Using the program's file import and export facility, you can even produce reports combining data from both. Both the IBM Personal Decision Series (ASCII format files) and planning or spreadsheet products utilizing the DIF format are compatible.

IBM Accounting Assistant

The IBM Accounting Assistant is an accounting system designed to fulfill the needs of small- to medium-sized companies. It consists of six distinct, yet compatible accounting applications, allowing you to expand within the system to fit your changing needs. All Accounting Assistant editions use the same menu format. They are available on 5-1/4 and 3-1/2 inch diskettes, and can be installed on a fixed disk. An IBM Personal Computer with 256K of memory is required.

The General Accounting Edition includes four bookkeeping functions: a complete general ledger and three integrated subledgers (Accounts Payable, Accounts Receivable, and Payroll). It also includes a general journal and five specialized journals that provide record-keeping and record-generating functions across a wide spectrum of business activity.

IBM Accounting Assistant's Accounts Payable, Accounts Receivable and Billing, and Payroll Editions continue where General Accounting leaves off, but also operate independently. The General Accounting Edition can interface with the Inventory Control and Job Cost Editions, or can be licensed and operated individually.

Accounts Payable Edition

The Accounts Payable Edition offers recording, calculating, and reporting functions, providing greater management control of payables. It allows you to choose between the cash and accrual methods of accounting, and can be customized to meet company needs. In-depth reports offer information about company obligations and current cash position. Accounts Payable draws data from several general ledger and vendor accounts,

and automatically prints checks from as many as ten different checking accounts. Aging automatically schedules invoice payments to optimize meeting vendor credit terms. After initialization, checks can be printed automatically each time recurring payments are due.

Accounts Receivable and Billing Edition

The Accounts Receivable and Billing Edition monitors and automates your billing process. All data entry, editing, posting, and printing tasks are executed from three simple menus. The design allows tailoring to your style of business. Journals detail transactions; ledgers show date, amount, and description of each charge. Reports can include all accounts, selected accounts, or only past-due accounts.

Payroll Edition

The Payroll Edition covers a wide range of payroll processing and reporting activities. It calculates pay, prints checks, distributes expenses to general ledger accounts, and updates pay and tax records. Payroll can be processed on a weekly, biweekly, semimonthly, or monthly format. Tax tables are included. IBM Application Service--Payroll Tax Table Service is available for a subscription fee.

Inventory Control and Purchasing Edition

The Inventory Control and Purchasing Edition maintains accurate information about the status and movement of stock, and automates repetitive merchandising and warehousing procedures. Using the FIFO, LIFO, or average cost methods of inventory costing, up to ten departments can be simultaneously controlled. Items can be sorted in 14 different ways and analyzed by item number, category, or department. This allows you to spot overstock situations, analyze sales trends, and respond rapidly to your customers' needs.

Job Cost Edition

The Job Cost Edition offers a simple way to project costs for bidding purposes, then tracks the labor, materials, and other costs as the job progresses. Customized accounting tools provide profit analysis for each phase. On-demand job status reports show costs and completion percentages for each element. Journals detail receipts, purchases, inventory transfers, and labor costs.

Services

IBM Extended Support Offering

IBM announces improved terms and conditions for the IBM Extended Support offering for the following licensed programs:

- IBM Business Management Series
- IBM Personal Decision Series
- IBM Business Adviser
- IBM Accounting Assistant Series

Current subscribers may elect the new terms and conditions immediately or upon renewal. The new terms and conditions as well as the IBM Extended Support Agreement will apply to all new or renewal subscriptions. The subscription period is 12 months.

Highlights of New Terms and Conditions

For subscribers to IBM Extended Support:

- In addition to Program Service and the IBM Extended Support *Response* Journal, a subscription to IBM Extended Support now includes toll-free telephone assistance and the ability to receive program updates as part of the annual subscription charge.
- Existing subscribers may easily convert to the new terms and conditions.
- Combined IBM Extended Support, which provides support for the Business Management Series and the Personal Decision Series for a single charge, will no longer be offered; however, current subscribers can continue to receive support under their existing agreements.
- The number of subscriber-designated callers has been revised.

Description

Included in the annual IBM Extended Support base subscription are the following:

- Program Service: If you encounter a problem that you believe is caused by an error in the unmodified portion of the program or if the program does not conform to its program specifications, you may document the problem in writing (or other manner specified by IBM) and request a correction from IBM. The request must not contain any confidential data of the subscriber or a third party.
- Extended Support *Response* Journal: A support publication for the licensed programs, for which you have an IBM Extended Support base subscription, will be mailed periodically during the subscription period. This periodical features operational tips, coding tips and techniques, answers to questions frequently asked about the supported programs, program update availability, and, if appropriate, new announcement information. A subscriber may request additional subscriptions to the IBM Extended Support *Response* Journal for an annual fee.
- Telephone Assistance: The Program Support Center will provide information about known problems, and assist the subscriber with technical questions and solutions related to specific activities involving the supported programs. Telephone assistance is

provided on a "call-back" basis. The subscriber must designate an authorized representative for telephone assistance. An alternate representative also may be designated. The IBM Program Support Center can be reached through a toll-free number.

- Program Updates: Subscribers will be provided, upon request and at no additional charge, one copy of an applicable program update required to bring their edition to the current level. Program updates contain all currently available changes to a licensed program.

For an additional charge, the following also is available to subscribers of IBM Extended Support:

- Additional Program Updates: IBM Extended Support subscribers, for a distribution charge, may request additional copies of updates. Subscribers are authorized to apply the updates to all of the subscriber's licensed programs.

- Administration of Current Subscriptions: Current subscribers to IBM Extended Support may elect the new terms and conditions now or may continue to receive service under their existing agreements until they expire.

  Prior to the expiration of your subscription period, you will be sent a copy of the new IBM Extended Support Agreement and a Subscription Confirmation, for renewal under the terms and conditions of the current IBM Extended Support Offering and its agreement.

- Combined IBM Extended Support: Combined IBM Extended Support, which provides support for the Business Management Series and the Personal Decision Series for a single charge, will no longer be offered; however, current subscribers can continue receive support under their existing IBM Extended Support Agreement.

- Revision of Number of Telephone Designees: Only the authorized representative for telephone assistance and one alternate representative may access the IBM Program Support Center via the toll-free telephone number for each subscription.

Ordering Information

New subscriptions to IBM Extended Support may be initiated, either by completing and mailing to IBM the IBM Extended Support Subscription Application included with each licensed program, or by calling IBM toll-free at 1-800-IBM-2266. New subscribers will be mailed a copy of the IBM Extended Support Agreement and a written confirmation of the products covered, including effective dates, prices, and payment method. The subscription may be cancelled without charge by notifying IBM within one month following the date of confirmation. Coverage may be modified at any time during the subscription period by notifying IBM.

Renewal

Prior to expiration of the contract period, you will be sent a renewal confirmation. The subscription can be modified, cancelled, or automatically renewed for a 12-month period.

Prices

IBM Extended Support prices can be obtained by calling IBM toll-free at 1-800-IBM-2266.

Single-Incident Service

For licensed users of the IBM Business Management Series, IBM Personal Decision Series, IBM Business Adviser, and IBM Accounting Assistant Series who do not choose to subscribe to IBM Extended Support, the following fee support is available:

Licensed users of these program products may now obtain support from IBM on an individual problem basis. If licensed users have a question or a problem with a supported program, for a single-incident service fee, the user can receive the following applicable service depending upon the related incident:

- Toll-free telephone assistance
- Current issue of the IBM Extended Support *Response* Journal
- Program Service
- Program Update

Single-Incident Service users requiring additional copies of program updates may request additional copies for an additional charge.

For all licensed users of the IBM Accounting Assistant Series Payroll Edition or the IBM Business Adviser Payroll Edition, the following is available:

- IBM Application Services Subscription - Payroll Tax Table Service

  The IBM Payroll Tax Table Service is available from IBM for an annual charge. Because the tax tables for the Payroll Editions are not automatically updated when taxing jurisdictions change their schedules, a tax table service is required to provide tax table changes in machine-readable form.

  The service, offered by IBM, allows licensed users of the IBM Accounting Assistant Series Payroll Edition or the IBM Business Adviser Payroll Edition to keep their machine-readable tax table schedules current for federal, state, and selected municipalities. A subscription to this IBM application service is a pay-in-advance offering and is transacted by the IBM Program Support Center directly with the customer.

IBM Extended Support Introduction

To help introduce IBM Extended Support to new users, IBM is offering, at no additional charge, 90 consecutive days of telephone assistance to new users of any edition within a series. Assistance begins the day you

license and register the *first* edition in a series.

In addition, upon IBM's receipt of your *first* registration within a series, IBM also will send you the most recent issue of the IBM Extended Support *Response* Journal for the series.

For more information, contact the IBM Program Support Center at 1-800-IBM-2266.

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"XCOPY selectively copies groups of files, and can copy subdirectories.(page 10)

"If you work through the book, you will gain an excellent grasp of assembly language fundamentals.(page 20)

"This program draws an interesting, seemingly three-dimensional representation of a jet plane.(page 23)

"Computers have entered the classroom and left repercussions that will be felt for decades.(page 26)

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