

Personal Systems

IBM's MAGAZINE FOR TECHNICAL COORDINATORS

NOVEMBER/DECEMBER 1994

SANTA is
IN

Bring your Wish List!

**PEN
COMPUTING:
Today and
Tomorrow**

**OS/2 for PowerPC:
Opening the Future!**

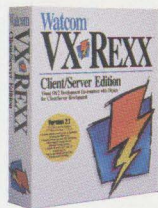
Mobile Computing

DeScribe 5.0 for OS/2

BULK RATE
U.S. POSTAGE
PAID
PERMIT 1808
DALLAS, TEXAS

IBM®

Fast Visual Application Development for OS/2 and DB2



If you're looking for fast and easy application development for OS/2, then take a look at the award-winning Watcom VX•REXX visual development environment. VX•REXX lets you build applications to exploit the graphical user interface, multi-threading, and multi-processing power of OS/2. VX•REXX Client/Server Edition gives you the added power to access DB2 or other database systems, manipulate the

data, and chart the results at lightning speed.

"We like VX•REXX. Using it for development feels like driving a Porsche: it's fast, it's compact, everything's in the right place, and it makes us look good, too."

Peter Coffee, PC WEEK

Designed to Meet Your Needs.

Watcom VX•REXX combines a project management facility, visual designer and an interactive debugger to deliver a highly productive visual development environment. The Client/Server Edition includes additional powerful objects so you can rapidly create rich GUI database applications. You can create OS/2 client applications which connect to DB2/2 or DB2/6000. Use IBM's DRDA support on OS/2 to access DB2 for MVS, DB2/400 for AS/400, and DB2/VSE and VM (SQL/DS) for VM and VSE. Also supported are Watcom SQL and ODBC-enabled databases¹.

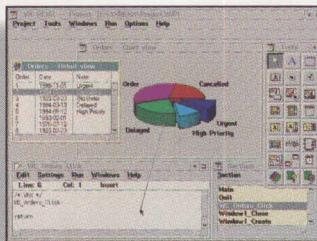
"Overall, this edition of VX•REXX for OS/2 is an outstanding visual client/server development platform." *Nicholas Petreley, InfoWorld*

- Over 2 dozen objects, including CUA'91 containers, notebooks, pop-up menus and more
- Integration and control of existing applications through DDE, keystokes or REXX API's
- Easy to learn event-driven programming model with complete on-line documentation
- Support for professional multi-threaded, multi-windowed and drag-and-drop enabled applications
- Code reusability through section and file sharing
- Graphically create CUA'91 Presentation Manager objects, quickly customize their properties, and easily attach REXX procedures
- Package your application as an EXE or PM macro for royalty-free distribution

Point. Click. And Presto!

To create an application you draw user interface objects, customize their properties using standard OS/2 notebooks, and define their event code using powerful drag-and-drop programming. To add database access just draw a query object, visually design a SQL query, press OK and presto— your window is automatically populated with objects that are bound to your query to display, update and search your data.

"Drag-and-drop nirvana." *Nicholas Petreley, InfoWorld*



Give Your Data a Whole New Image.

Energize your applications by displaying your data in a 3D chart. The Client/Server Edition gives you more than a dozen chart types to choose from, along with over 150 display options. You also get complete support for run-time events so you can bring new drama to your data by making your chart interactive.

"VX•REXX is a must buy." *Jacques Surveyer, ComputerWorld*

Standard or Client/Server Edition— Which one is for you?

To start creating powerful OS/2 GUI applications right away, order your copy of Watcom VX•REXX Standard Edition for just... **\$99***

Or, to start creating rich client/server database applications, order Watcom VX•REXX Client/Server Edition for just..... **\$299***



1-800-265-4555

Watcom

A Powersoft Company

Watcom International 415 Phillip Street, Waterloo, Ontario, Canada N2L 3X2 Tel. (519) 886-3700 Fax (519) 747-4971 *Prices and specifications are subject to change without notice. Price does not include freight and taxes where applicable. Prices quoted in US dollars.
¹ ODBC drivers are available from INTERSOLV, Inc. Watcom, the Lightning Device, and VX•REXX are trademarks of Watcom International Corporation. Other trademarks are properties of their respective owners. ©Copyright 1994 Watcom International Corporation.

Please circle #1 on reader service card.

**Power to run OS/2® and Windows™
with Reply's new 32-bit PowerBoard™
complete system upgrade**

Save your PS/2

Nobody could have guessed that the IBM PS/2 you bought a few years ago would turn out to be a dinosaur. But with new power-hungry Windows applications users want more processing power—now.

Meanwhile you're faced with computer hardware that hasn't been fully depreciated and an investment in expensive Micro Channel networking cards that aren't compatible with new PCs.

**Reply has the solution!
A complete, affordable motherboard upgrade**

Our upgrades are a cost-effective, complete solution. Starting at only \$495, you can bring a ponderous PS/2 up to speed. We provide a **total motherboard replacement**. In addition to the powerful 486 microprocessor, you get accelerated local-bus video, increased memory capacity and the latest in affordable hard disk technology—all the components it takes to run OS/2 and Windows.

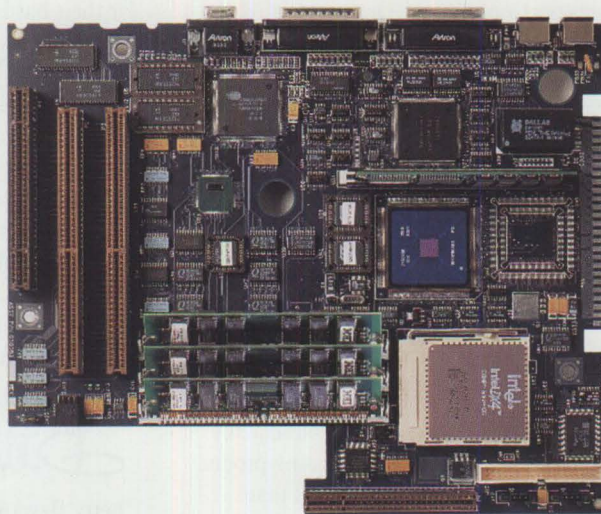
And you can still use your Micro Channel cards.

With Reply's TurboProcessor and PowerBoard upgrades, your sluggish PS/2s evolve into fast cutting-edge productivity tools, and your equipment budget stays in check. Upgrades are available for Models 25, 30, 50, 50Z, 55SX, 60, 65, 70 and 80.

from extinction

New Reply PowerBoards

Intel 486 processor
32-bit data path
Memory capacity to 64MB
64-bit local-bus SVGA video
with GUI accelerator
Enhanced IDE and existing
PS/2 hard drive support



"Reply Corp.'s PS/2 Model 60/80 motherboard upgrade replacement kit will breathe new life into those old Model 80s while protecting a company's investment in Micro Channel add-in boards."
—PC Week

CALL
1-800-955-5295

or fax 1-408-956-2793 to find out more about Reply System Upgrades along with our 30-day money-back guarantee and 3-year warranty

All registered trademarks are the property of their respective owners

Please circle #2 on reader service card.

“The Pen is Mightier Than the Sword . . .”



Who can forget the first time John Madden picked up his new toy that fall Sunday afternoon on CBS TV and scribbled all over that freeze-frame of a football play? Well, I don't actually remember *the* first time, but I do remember being “wowed” by it. Not only was I impressed by the technology that allowed him to do that, but I was also impressed that he could remember, and draw, exactly what had happened in the extremely fast action of the play just completed. I can't even remember which team has the ball unless I'm really concentrating!

Well, memory isn't the theme of this issue of *Personal Systems*—but pen technology is. That televised play-diagramming may be the first time most of us were exposed to this new technology. The O. J. Simpson trial is probably the most recent, and most highly publicized, use demonstrating just how far and how versatile the use of pen technology has come in the last few years.

Just before the trial started, I read an article in the *USA Today* describing the “high-tech courtroom.” A detailed diagram of the video-wired courtroom proclaimed “viewers will see the cutting edge of computer technology being used in big court cases across the country.” This liberal use of pen-enabled applications included:

- A witness monitor where the witness could draw or write with an electronic pen.
- A podium monitor where attorneys could annotate documents and evidence.
- Judge, jury, attorney, and spectator monitors where everyone in the courtroom could view these “drawings” as the witness or attorney was drawing them.

Of course, these are examples of the really visible uses for pen technology. Less visible—but equally as valuable in cutting costs and increasing productivity—are the thousands of applications that

touch our everyday lives. How about the delivery person who delivers a package to your house? You “sign” on a computer “tablet,” or the delivery person annotates on the tablet when and where your package was left. Or the insurance adjuster who checks out the tornado damage to your neighbor's house and, because the data is entered right on-site, your neighbor gets a check the next day?

This issue takes you from the beginning of pen technology through today and then takes a look at what's coming in the future. We've brought together some of the people most involved in the development of these products, both inside and outside of IBM, and asked them to tell you where the technology is and where it's going. We're even letting you in on a well-kept secret: our illustrator, Bill Carr, uses pen technology to create his masterpieces!

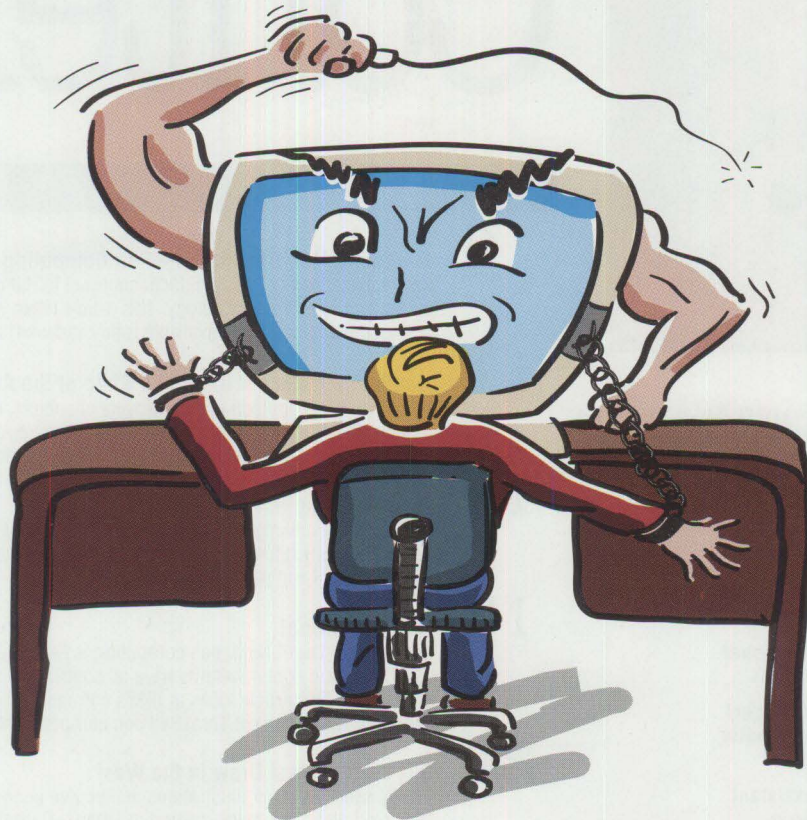
One name you won't see on any of the articles, but who has played a key role in making this issue happen, is Rene Gracia. You'll recognize Rene—he's written for us in the past and helped many of you with technical problems. Our thanks to Rene in Dallas and Steve DelGrosso in Boca Raton, Florida for their hard work on this issue.

The New OS/2

The latest and greatest release of OS/2 is here! We hope you'll find your copy under your Christmas tree. Look for the January/February issue of *Personal Systems*, where we'll have a comprehensive article about this exciting new version of OS/2! We're also going to have some great articles on multimedia and other current technical “stuff.” Until then, enjoy our pen issue, enjoy the holiday season, and get ready for a great 1995!

Betty Hawkins, Editor

OS/2 Programming Shouldn't Have to Hurt.



Introducing VisPro/C and VisPro/C++, easy-to-use tools for IBM C Set and C Set ++ that aren't hard on your wallet.

Other tools allow you to build robust, 32-bit OS/2 applications, but they also require more of your time and money. VisPro/C and VisPro/C++™ give you complete drag and drop visual programming, with all of the bells and whistles -- without having to reach deep into your pockets.

Bells and Whistles

VisPro/C and VisPro/C++ pack an unbelievable amount of functionality into a box. You get a Workplace Shell-enabled GUI environment that fully supports the IBM C Set compilers and User Interface Class Library. Both products have the most CUA '91 objects from simple buttons to 3-D business

graphics and everything in between. And if that isn't enough, we've included a visual DB2/2 database designer that allows you to create embedded SQL client/server applications or reverse engineer existing DB2/2 databases.

From One World-Class Tool Comes Two More

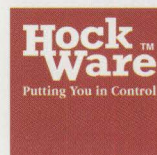
VisPro/C and VisPro/C++ follow in the footsteps of VisPro/REXX, the pioneer visual REXX programming tool. Thousands of customers already rely on VisPro/REXX for powerful OS/2 development. Now we provide the same renowned functionality for the C and C++ languages. At the same easy-on-your-wallet prices.

See it to believe it!

Buy now and take advantage of our no risk, 60-day money back guarantee.

Tool	Price
Gpf 2.0 Single Platform	\$495
Gpf 2.1	\$1,295
Kase: C++	\$1,495
Kase: VIP	\$3,495
VisPro/C or C++	\$399

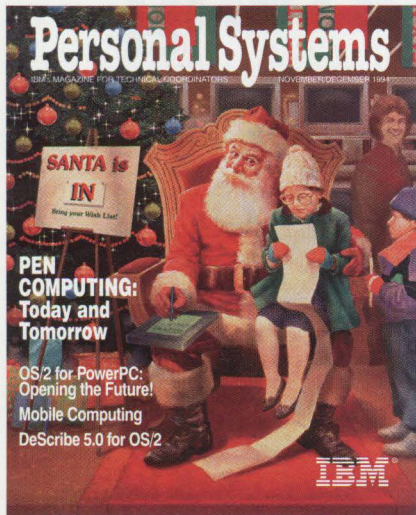
**\$199 until
12/15/94**



HockWare Incorporated
P.O. Box 336
Cary, NC 27512-0336
919-380-0616
919-380-0757 FAX
Go HockWare on CompuServe
hockware@vnet.net on
Internet

HockWare, VisPro/C, VisPro/C++ and VisPro/REXX are trademarks of HockWare Incorporated. All other company, product and brand names are trademarks and/or registered trademarks of their respective holders and are mentioned for reference purposes only. ©1994 HockWare Incorporated. All rights reserved.

Please circle #3 on reader service card.



ABOUT THE COVER

Everyone's using pen products! Dallas artist Bill Carr used an electronic pen product with a digitizer to draw this issue's cover illustrating Saint Nick as he electronically records each child's wish list. Come Christmas Eve, with a twinkle in his eye, Santa will be making his list on his tablet computer and checking it twice with his untethered "pen."

Editor and Publisher
Betty Hawkins

**Business Manager/
Editorial Coordinator**
Donna Su

Editorial Assistant
Lia Wilson

Database Manager
Van Landrum

Subscription Coordinator
Rose McAlister

Production Coordinator
Elisa Davis

**Publication Services,
Typesetting, and Design**
Terry Pinkston/Corporate Graphics
Arlington, Texas

Illustrator
Bill Carr
Dallas, Texas

Printing
Dave Willburn/Motheral Printing
Fort Worth, Texas

Editorial Services
Mike Engelberg/Studio East
Boca Raton, Florida

Manager
Dan Russell



Printed on recycled paper and may be recycled.
Printed in U.S.A.

Contents

FOCUS

6

Evolution, Not Revolution—Pen Computing Comes of Age

New applications for pen products continue to roll out, taking advantage of this natural computing interface technology. This article takes you through the evolution of pen computing, describing what's available today and what's coming.

11

Handwriting Recognition: The State of the Art

Handwriting recognition is a controversial subject. Accuracy rates are debated even though no industry benchmark exists to measure recognition accuracy. This article takes a look at the perception and the reality of handwriting recognition technology.

14

Pen Digitizing Hardware

The basics of making well-informed pen computing product decisions are discussed in this article, which focuses on digitizing hardware: the stylus and writing surface that create the "pencil and paper" metaphor.

17

It's HapPENing!

It is, indeed, hapPENing: pen computing is here. Faster processors, greater storage capacities, and lighter weights have all contributed to the growing acceptance of pen computers. This article looks at IBM's entrance into the pen computer market and describes IBM's current ThinkPad pen computer models.

20

Bill Carr: Fastest Draw in the West

You've seen his cover illustrations and you've puzzled over the meaning of his *Cartrtoons*. Now read about the media behind the man—Dallas artist Bill Carr uses pen technology to "draw." This article takes you through his studio and his technology evolution.

TECHNICAL

34

Super-Fast PenDOS

PenDOS is a pen operating environment that runs on top of existing DOS operating systems, adding pen support and capabilities for existing DOS applications. This article discusses the IBM PenDOS operating environment—its architecture, application development, and comparisons to other pen environments.

40

Pen for OS/2

Pen for OS/2 is IBM's pen environment for the OS/2 operating system. This article includes an overview of the architecture and major subsystem functions, the OS/2 pen input method and its use of OS/2 Presentation Manager, plus the future directions for Pen for OS/2.

43

A Development Environment for Pen-Centric Applications

Power PEN PAL is a pen application development environment developers can use to design and build customized applications to run on pen-based computers. This article outlines the capabilities of Power PEN PAL and tells how it fits in the pen-based computer arena.

LITTLE SOLUTIONS

59

Questions and Answers

This issue includes a variety of pen technology questions and answers.

59

Pen Glossary

This glossary helps you through the new pen computing lingo.



Call us at 1-800-547-1283

IBM Personal Systems Technical Solutions is published bimonthly by End User and Software Solutions Services and Support, International Business Machines Corporation, Roanoke, Texas, U.S.A.

Send address changes to *Personal Systems* Subscription Coordinator, IBM Corporation, Internal Zip 40-B3-04, One East Kirkwood Blvd., Roanoke, TX 76299, fax to (817) 961-7218, or call Rose McAlister at (817) 961-7008. The editor, Betty Hawkins, can be reached at the above mailing address, (817) 961-7525, Internet bhawkins@vnet.ibm.com, or OV/VM HAWKINSB at DALVM41B. The business manager, Donna Su, can be reached at the above mailing address, (817) 961-6268, Internet pstst@vnet.ibm.com, or OV/VM DONNASU at DALVM41B.

Note to IBM personnel: IBM employees in divisions 12, 23, and 72 can subscribe to this publication using OV/VM and the INEWS facility: select hard copy for the PS_SOL category. IBMers in other divisions in the United States can subscribe via SLSS to GBOF-7532. IBMers outside of the United States can subscribe via SLSS to GBOF-6007.

© Copyright 1994 International Business Machines Corporation

BPA International Consumer Publication Membership applied for April, 1994.

Personal Systems Advertising Contacts

Personal Systems accepts paid advertising for applications, products, or services that run on or complement IBM's personal systems hardware and software products. To obtain a media kit and advertising rate information, contact one of the *Personal Systems* advertising sales representatives listed below.

Northeast Office

Peggy Schlatter
422 West Congress
Detroit, MI 48226
Phone (313) 963-8500
Fax (313) 963-0464

Southeast Office

Tom Flynn
290 Jade Cove Drive
Roswell, GA 30075
Phone (404) 993-2451
Fax (404) 993-4423

Central Office

Laura Stevens
422 West Congress
Detroit MI 48226
Phone (810) 661-9283
Fax (810) 661-8746

West Office

Kyle Walkenhorst
5394 Kenwood Drive
Salt Lake City, UT 84107
Phone (801) 262-1786
Fax (801) 262-1886

22

Work Management in the Field

Work management has often been discussed indirectly by discussing its parts—many times without thinking of the whole. Major utility companies are now building the parts and planning for the whole. This article discusses how OS/2 and Pen for OS/2 can assist in building a complete work management system.

26

Communicating Without Wires: IBM's Mobile Communications Module

When portable computers were first introduced, they transformed the way people worked. Now, wireless communications products are revolutionizing portable computing. This article describes the IBM Mobile Communications Module.

28

Tomorrow's Networking Today—from IBM's Personal Systems Competency Center

Assistance is just a phone call away. Read about the application and installation assistance offered by IBM's Personal Systems Competency Center.

29

Customers Speak Out About Consult Line

Just a few months old, IBM's Personal Systems Support Family offerings are already receiving rave reviews. This article describes Consult Line, one of the elements of the Support Family, and its ready acceptance by customers.

31

New DeScribe 5.0—Leader of the Pack

DeScribe 5.0 for OS/2 is here! This article details the features of this full-bodied, 32-bit application and tells how it can enhance your word processing and graphics projects.

50

Writing DOS Installation Programs for Selective Boot Systems

Selective Boot, a feature of IBM PC DOS 6.1 and later versions, lets you conditionally execute sections of the CONFIG.SYS file, thus providing a way to alter your operating environment at boot time. This article explores the IBM Mobile Communications Module installation program's method for handling Selective Boot.

55

OS/2 for PowerPC: Transforming Architecture into Implementation

Implementation is one of the principal translators between an architecture and the reality of a working system. This article describes how the architects of IBM's OS/2 for PowerPC used this philosophy to produce a product that delivers on the promises for the Workplace architecture.

61

Corrective Service Information

Refer to this section for the latest maintenance release levels and other software service information.

Evolution, Not Revolution— Pen Computing Comes of Age

The “nay-sayers” have spoken, and if you believe them, pen computing has no future . . . but new applications continue to roll out, taking advantage of this natural computing interface technology.

The vision is still clear. Throw out your clipboard and replace that spiral-ring notebook with a tablet or a notebook computer. Gather data by simply writing on the screen of your handheld personal computer (PC). Using your pen instead of a keyboard, take handwritten notes that your PC translates into text. Take your information and computing power with you wherever you go!

These concepts have been expressed since the 1970s. Today some call this “mobile computing”; others call it “pen computing.” It is a little bit of both.

Since the time the personal computer industry was born, its growth and popularity has exploded through the 1980s and into the 1990s. Hardware has become more and more capable of providing the computing power needed for complex operations such as recognizing handwriting and speech. And, as they have gotten more powerful, computers have also gotten much smaller.

All these factors led to the first generation of pen computers. These machines, either hybrid laptops or keyboardless tablets, first appeared as production models in the late 1980s. When companies such as GRiD, Linus Technologies, and Momenta introduced their first machines, they were hailed as the next revolution in computing.

Unfortunately these early pen computers were not yet powerful enough to recognize handwriting at acceptable speeds,

since the available microprocessors could not handle the heavy computations required. Handwriting recognition received poor reviews and the initial wave of machines fell far short of expectations. The PC industry pundits declared pen computing dead almost before it was born.

The Second Wave

About the same time Momenta was developing pen computing hardware, GO Corporation, a company founded by Robert Carr and Gerry Kaplan, was working on another pen-based solution. GO Corporation was founded for the sole purpose of developing an object-oriented “pen-centric” operating system and hardware solution. The pen-centric operating system became PenPoint.

PenPoint was designed to work only with pen input. There were no provisions for using a keyboard or mouse. From an operating system standpoint, this was certainly the only way to design the software. From an end user and customer perspective, this became a problem.

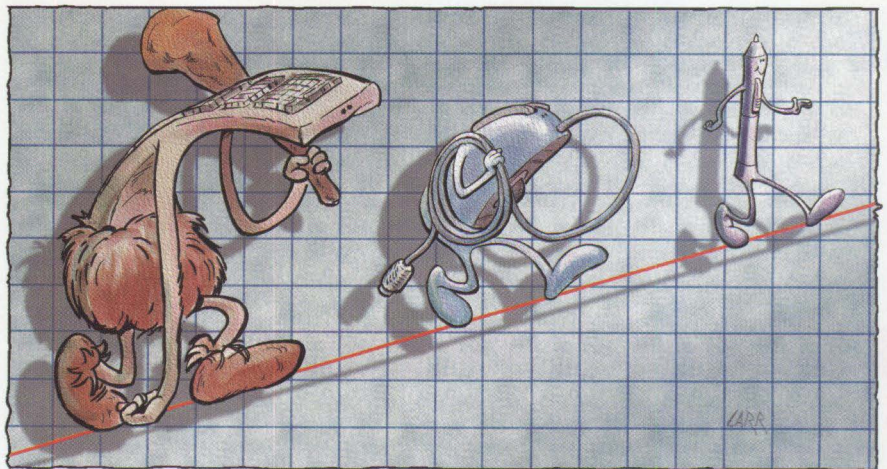
PenPoint development continued, and in 1992, IBM introduced the first ThinkPad

portable computer with the PenPoint operating system preinstalled.

The computer was the model 700T; the “T” stands for tablet. The system did not have a keyboard (although it did have a keyboard expansion port) because the pen was the primary input device. There was no hard disk—only a provision for two flash memory storage cards. PenPoint was installed on one card, and the other 10 MB card stored user programs and data.

Other companies introduced more pen computer models about the same time. GRiD continued to update their handheld model called the GRiDPad. This computer was designed specifically for data-gathering such as survey information collected by utility company field personnel or by road and property survey crews.

Dauphin, MicroSlate, Telepad, and other companies followed with more generalized tablets. GRiD further advanced the available pen computing hardware platforms by introducing the GRiD Convertible. This machine included a keyboard and could be used as a standard notebook computer, or, with the



Getting IBM software support has just gotten simpler.



Before



After

We asked what you wanted in IBM software support, and the first thing we heard was, "Make it easier, quicker, more direct." So now it is.

Now, a single phone number gets you access to the right IBM experts fast, whether it's for simple usage questions or in-depth systems analysis, for almost any IBM system you have.

You can build your own support plan, choosing from the full

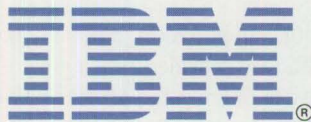
range of IBM Support Family services, and pay only for what you need.

You can get the same level of support across your entire business with just one signature on one contract.

And you said you were serious. So are we. Satisfaction is guaranteed or your money back.

To learn more, call us today. We think

you'll like what you hear from us, because it's what we heard from you.



For more information about IBM software support call:

1 800 799-7765

©1994 IBM Corporation

display screen folded down over the keyboard, it could be used as a pen computer.

Even with all these hardware choices and with more pen operating environments and applications being introduced, it was easy to see that pen computing was "not ready for prime time." What were the expectations and how have pen-enabled hardware and software systems been accepted? The answers to these questions are mixed.

Where is the Pen Market Today?

Part of the problem lies in the question. Many are not convinced there is a "pen market"—that is, an entire market based on pen computers. What there is, however, is a large variety of vertical applications that can greatly benefit from using a pen. The pen is just one method of data input, one that happens to be very convenient and easy to use in certain applications. These applications are not limited to the mobile professional; many desktop applications are also excellent areas for pen applications.

Consider document reviews. Currently, your organization probably passes around stacks of paper, which are "red-lined" by reviewers and collected for comments. If you've automated the process, then the document is available in soft copy, but comments still come in as separate e-mail or marked-up copy.

Now take that same document review process, add a pen to each workstation, and develop an application that allows annotation directly onto the document. This lets document reviewers receive a soft copy of the document, mark it up with a pen at their workstation (just like they used to do with hard copy), then forward the annotated review copy to the owner. You not only have your comments in soft copy for easy distribution, but you have a permanent soft copy method for storing editing comments.

Examine architectural or engineering drawing production. A pen-enabled system is almost a requirement these days. How about adding annotations to a spreadsheet you develop in your favorite spreadsheet program? Wouldn't it be nice to be able to leave little handwritten notes explaining a certain value or calculation

(you may already do this with little yellow sticky pieces of paper)?

All these examples use pen on the desktop, and all the required technology is available today! The easiest and most cost-effective way to implement these desktop applications is with desktop-attached "opaque tablets." These devices usually attach to a serial port on your desktop system and let you use a pen instead of a mouse, giving you the freedom to do accurate freehand sketching, drawing, and handwriting with or without handwriting recognition.

There is no need to limit these applications to the desktop. With today's powerful laptops and notebooks, you can take these same applications on the road. The important point is that pen-enabled computers allow you to exploit the power of pen input when using applications that benefit from the pen.

As powerful as these desktop applications sound, it is the mobile worker who receives the greatest benefits from pen technology. Collecting data in the field or conducting a presentation with a customer are two scenarios where pen computing excels. A pen-enabled system combined with the power of multimedia applications can produce a powerful and convincing presentation at a client's location.

Filling out electronic forms is one of the most popular pen applications. Forms are filled out either by the client or salesperson with the pen device. The information is immediately placed in the form and can be printed locally or sent back to the home office.

Key industries that today are either seriously investigating or already using pen systems are health care, utilities, insurance, transportation, law enforcement, sports, and sales.

Health care providers, especially home health care providers, see a great opportunity to improve the productivity of their field forces and office staff. One scenario has the home health care nurse using a mobile computer to remotely download the day's case load from the main office server. The nurse travels to the case locations, writes patient information directly into an electronic form, annotates test

results with notes, and at the end of the day returns home to upload the day's patient updates.

This scenario yields savings in several areas. First, the nurse does not submit written reports on paper that then have to be keyed into the home office server. Instead, electronic forms capture handwriting input for the application's data collection, thus eliminating an entire step of data processing. Trips to the main office are reduced since a daily stop to pick up and drop off paperwork is no longer needed. Finally, the flexibility of the entire staff is improved since the cases do not need to be assigned until the morning of the nurse's rounds.

Another popular application for mobile technology exists in the utility industry. Utilities have field forces to maintain equipment in the field and to read meters. A pen system greatly enhances both of these tasks.

Utility workers no longer have to fill in paperwork or make freehand sketches on paper while in the field. Now these drawings and data can be directly entered on the pen system for uploading to the main office computer network. This again cuts out the step of translating the handwritten field data to a format usable by the home office system. (See the "Work Management in the Field" article in this issue.)

These and many other similar applications are in major pilot or prototype projects today. Not just large companies, but smaller companies trying to gain a competitive advantage are turning to pen systems. In addition to in-house development, many companies are seeking help from consultant developers who specialize in pen applications.

So the market is here for companies in several industries that are using these pen-enabled applications and for the companies that supply these vertical applications to these industries. 1994 may not be the year pen computing hits the growth rates of the PC revolution, but it should end up with a solid showing of key applications in key industries, which will spur future growth.

What Software Platforms are Available Today?

Although many of the early industry pioneers have left the field, there is still a core group of companies that continue to provide general purpose as well as specialized hardware and software for pen systems. An early leader in the pen operating system area, PenPoint changed direction over the past year and was available only on the EO systems. Recently, EO ceased operations.

With PenPoint no longer a viable solution, there are now four major operating environments for general purpose pen system applications. (This discussion does not consider the personal information managers or personal digital assistants as part of the "general purpose" category.) The four major pen operating environments for which pen applications can be developed are:

- **PenDOS:** PenDOS is IBM's pen operating environment for DOS-based machines. It runs on DOS 5.0 or higher including MS-DOS and IBM PC DOS. PenDOS allows use of pen-enabled applications as well as standard DOS applications that are "mouse-aware." PenDOS is small and fast and provides excellent handwriting recognition capability. (See the "Super-Fast PenDOS" article in this issue.)
- **PenRight:** PenRight is a pen application development and runtime environment that requires DOS as its underlying operating system but does not allow standard DOS applications to run with the pen environment active.
- **Pen for OS/2:** Pen for OS/2 is IBM's pen operating environment for the OS/2 operating system. Pen for OS/2 allows use of the pen for DOS, Windows, and OS/2 pen-unaware applications. Pen for OS/2 also provides a developer's toolkit to allow development of pen-aware applications. (See the "Pen for OS/2" article in this issue.)
- **Windows for Pen Computing:** Windows for Pen Computing is Microsoft's release of Windows 3.1 for pen-enabled systems. Built as an extension to Windows 3.1, it is available as a preload option only on certain pen systems from specific personal computer manufacturers.

Where Do I Go from Here?

To determine if your organization may have a competitive advantage in developing an application for pen systems, give yourself this little test.

- Is my application forms-based and does it run on small mobile hardware devices without a keyboard? If so, a pen device may be the perfect fit.
- Does using a pen make a better solution? If the answer is yes, your application will be able to use freehand drawing, point to checkboxes or lists, annotate documents with freehand writing, and possibly recognize handwriting. If you don't see your application taking advantage of most of these data input methods, there may be no reason to move to a pen solution.
- Can I do a small pilot test of my application? With pen implementations, it is important to keep pilot programs small. A quick pilot application can be developed using one of the many rapid application development tools available for pen applications.
- Is my application mobile? If so, the pen may be the perfect input device for your mobile field force.

As with non-pen applications, you can choose from many hardware and software platforms. You may decide to pilot on more than one hardware platform once you have decided on the software to use. The pen operating environments mentioned in this article all have different strengths and weaknesses. Be sure to examine them closely to apply the one that best suits your application's requirements.

For example, if your deployment will require you to use standard DOS applications as well as your customized application, you should choose either PenDOS or Pen for OS/2 from IBM. Both PenRight and Windows for Pen Computing do not provide pen support for pen-unaware DOS applications. If background communication is important to your application, Pen for OS/2 provides the same preemptive multitasking, 32-bit operating environment as base OS/2. This can be very important to salespeople who want to process an inquiry while writing a second order at the same time.

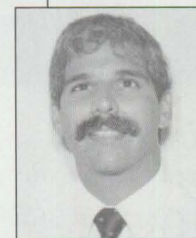
Another important decision is whether or not to develop your own applications. If you decide to do in-house development, many tools available today can help you write pen-aware programs. Several of the DOS-based tools provide a visual programming environment.

A good example of a visual development tool that can be used to develop Pen for OS/2 applications is VX-REXX from Watcom International (Ontario, Canada). A beta version is currently available, which includes Pen objects for OS/2. VX-REXX provides a rapid development environment for OS/2 Presentation Manager applications.

If you choose to outsource development, many companies provide system integration services for pen systems. There are also several companies specializing in developing vertical industry application software for pen computing.

Finally, be prepared for changes during the pilot phase. As your end users get familiar with the pen input metaphor, they will think of ways to make their interaction with the system easier. Tasks that you may have ported over from an existing application will probably have a faster and easier input method with the pen. Rely on the pilot feedback to enhance your application with more pen functions, and eventually your application will be fully pen-aware.

Launch yourself into the next step and pilot that pen solution you've been discussing. You may find that a pen-enabled solution has the "write stuff" for your application.



Steve DelGrosso is a Senior Engineer and a "pen evangelist" with the IBM Natural Computing Technology team in Boca Raton. Steve joined IBM in 1978 after graduating from the University of Miami (BSIE) and has worked in IBM Product Development, Manufacturing, and System Integration. Steve's internet address is s_delgrosso@vnet.ibm.com.

LAN "Intensive Care Utilities" For IBM LAN Server 3.0/4.0

ICU
FOR YOUR LAN



INCLUDES INDUSTRIAL STRENGTH TOOLS TO:

■ *Eliminate flying blind or worrying about corrupted domains*

Export your entire domain or just a part into simple and easy to read text files. These text files can then be imported in part or as a whole.

■ *Fix your domain using artificial intelligence techniques*

Our LAN analyzer goes through your NET.ACC and DCDB files looking for corruption and inconsistencies. Using a rule base, the utility can correct most of the problems encountered. All problems are logged.

■ *Put into place a corporate wide security policy on LAN Server*

Our LAN analyzer will check each and every account against a rule-based profile and alert you to accounts that contain access and application assignments beyond their privilege and memberships. Accounts that are missing assignments are also flagged. Extra or missing assignments can be corrected on-line immediately. Check hundreds of users in a matter of minutes.

■ *Balance your loading*

Reports are produced providing cross reference of alias usages as well as permissions by user and group for better control of your LAN.

■ *Build and update your LAN FAST!*

Rapid add/delete/update of users, groups, aliases, and applications using simple ASCII text files. Templates allow you to define prototype resources or users. Templates allow you to type in only those fields that are unique for users and resources.

ORDER TODAY! And receive your copy of LAN Intensive Care Utilities electronically in minutes.

\$970⁰⁰

SITE LICENSING
AVAILABLE AT
SUBSTANTIAL DISCOUNTS

Use your American Express, VISA, MasterCard or Discover Card.



Free demo disk available or download the demo from our BBS, CompuServe or IBMLink.

Lieberman and Associates Design and Engineering Group

221 N. Robertson Blvd. / Suite C / Beverly Hills, CA 90211

800-829-6263

Phone: (310) 550-8575

IBMMail: USMVHLVH

FAX: (310) 550-1152

CompuServe: 76426,363

BBS: (310) 550-5980

OS2BBS1: LANUTIL

Internet: 76426.363@compuserve.com

Please circle #5 on reader service card.



Handwriting Recognition: The State of the Art

Handwriting recognition is a controversial subject. Accuracy rates are debated even though no industry benchmark exists to measure recognition accuracy. This article takes a look at the perception and the reality of handwriting recognition.

In recent years, computer companies have attempted to attract new users by creating new applications for computers. Now they are turning to improved user interfaces as a key way to stimulate market growth.

The graphical user interface (GUI), which was once considered frivolous and unnecessary, is now widely accepted—even considered essential—by most computer users. Emerging natural input technologies such as handwriting and speech recognition are the newest developments in user interfaces, providing us with the ability to communicate with computers in much the same manner as we communicate with each other.

Still in its infancy, natural input technology improves every year. As the computing power of today's personal computer (PC) processors continues to dwarf the capabilities of early mainframe computers, the key question is not how fast computers can become, but how intelligent.

An important aspect of this new intelligence lies in a computer's ability to interpret handwriting. Although handwriting recognition technology must still overcome hurdles, it has matured to the point of being usable today. When the user has the proper expectations and the correct applications, handwriting recognition technology is very viable.

Before delving into the potential uses of handwriting recognition, let's discuss the different designs and the philosophies behind them. There are two primary

handwriting recognition systems: *user-dependent* and *user-independent*.

User-Dependent System

A user-dependent system focuses on an individual's particular writing style, yielding, in theory, better results by reducing the number of choices when trying to distinguish character variations. A user-dependent system requires training—either deliberate (writing during training sessions) or on the fly (memory applied to error corrections).

*...pen computing has
WYWIWYG (what you
write is what you get).*

A human relies, in a large part, on contextual knowledge to recognize handwriting; the computer lacks this ability. Thus, when it comes to training a handwriting recognition system, most users embark on a journey of discovery and frustration. They discover all the different ways they write as the system continues to fail on the first occurrence of each character variation. Then they become frustrated when they realize, regardless of the hours, days, or weeks of training invested, the system still does a poor job of reading their handwriting.

No matter how much training time is invested, the computer will still not recognize ambiguous scrawl, and thus expectations are never met.

User-Independent System

The user-independent system attempts to establish a generalized understanding of handwriting across the population. It is a more practical system than the user-dependent system, especially in an environment where multiple users share a single computer.

The benefit of a consistent recognition system is very much like the benefit of the standard QWERTY keyboard layout. (*QWERTY* is a term describing the standard keyboard layout and is derived from the sequence of the first six keys in the first row of alphabetic keys.) Although QWERTY may not have been the most efficient or ergonomic keyboard layout, it prevailed on computers because so many people were familiar with it. Keyboards are also consistent. Each keystroke yields the same result every time, and users learn over time to find the correct key.

The same basic usability principles hold true in handwriting recognition. It is better to provide a recognition system that does a consistent, efficient job of recognizing everyone's handwriting. The easiest system to learn is one that is consistent in its interpretations and that gives a response that makes sense to the user (i.e., the recognition result makes sense based on the shape that was written).

WYWIWYG

The most successful of the currently marketed handwriting recognition systems does the best job of literal interpretations of handwriting. Desktop publishing had WYSIWYG (what you see is what you get), and pen computing has WYWIWYG (what you write is what you get). For most developers, WYWIWYG is the state of the art in handwriting recognition.

A telling summary of the challenges of achieving WYWIWYG was summarized on the cover of the August 1994 issue of *Portable Computing* magazine, showing multiple attempts by an Apple Newton to recognize the same sentence with differing results in every case.

Word Lists

New efforts are being made not just to recognize but also to interpret, and in some cases, second guess what people meant to write. Efforts toward this

capability are tied to specific language knowledge, most often in the form of word vocabularies. However attractive, the use of word lists can actually cause more problems than benefits, if not used properly.

Word lists cannot make up for poor character recognition. Early versions of the Newton were heavily criticized for exotic replacement errors that occurred as a result of heavy dependencies on a word list. What users learned is that more often than not, they write proper names and abbreviations, which the computer cannot recognize; thus a heavy use of word lists can often be disastrous. I've found that a system dependent on a word list will convert my name (Dao) to "Duo" nearly every time!

There are other statistical models based on grammar that can be used to improve recognition, including the challenge of cursive handwriting, but these are just beginning to be implemented.

Cursive Writing

Recognizing cursive forms of handwriting has not been a major requirement in pen applications thus far, because the applications have been mostly electronic business forms. Most people accept the requirement to print on forms.

When using pen applications for more creative tasks, such as note taking and composing, cursive recognition is more critical. Many users write in both print and cursive, sometimes mixing these forms in the same word. Cursive handwriting can be a synonym for illegible scrawl—unreadable by humans, much less by computers!

In reality, most cursive handwriting is recognized not so much by shapes as by context—the specific knowledge that is acquired from familiarity with job functions and personal relationships. At present, handwriting recognition systems lack the ability to absorb this type of information; thus they are dependent on legible cursive writing. Viable cursive recognition will be much more dependent on linguistic models and grammar knowledge than are current print recognition systems.

What to Expect

When using a pen-capable computer for

the first time, users not only have to understand the abilities and limitations of handwriting recognition, but they must also adapt to the feel of writing on a new media: a computer screen. This is a very different experience than writing with pen on paper. The combination of slick computer screen surfaces and the digitizers, which sense the pen movements, usually leads to distorted handwriting.

Many pen interfaces are tied to portable computers. Because these computers are often used while users walk around, the computer is held rather than resting on a stable surface. This further contributes to handwriting distortion.

Computer handwriting recognition is not perfect today and will not match the human ability to recognize handwriting for years to come; however, handwriting recognition hardware and software will continue to improve. As processors such as PowerPCs and Pentiums become standard, typical PCs will have enough computer power to do real-time cursive handwriting recognition. When handwriting recognition response time matches keystroke response, it will take a big step toward user acceptance.

The combination of high recognition accuracy, fast response time, and effective error correction models make handwriting recognition viable. Users make errors when typing—these errors are easily corrected in today's electronic word processing solutions. It's even easier with pen technology. The most effective error correction model for handwriting recognition today is the business form, where the user simply rewrites the right character over the mistake. With one action, the user specifies what to enter and where to enter it—no other input method is this efficient.

The challenge handwriting recognition technology has today is managing blame. When a user makes a mistake on a keyboard, the user accepts the blame for striking the wrong key—a "typo." At this point in handwriting recognition acceptance, blame for mistakes such as writing the wrong character is still being placed on the recognition system.

Benefits of Pen Technology

Handwriting recognition is only part of the story. The pen is a powerful pointing

device. When you hold a pen, you use the same skills you mastered when you learned to write. This degree of control allows you to point with the pen more accurately, efficiently, and comfortably than with a mouse or a trackball.

We learned while developing and using graphical user interfaces that pointing can be a very effective way to interact with applications. As a superior pointing device, the pen is a natural extension to the GUI, complementing it better than a mouse or trackball.

Not only is the pen a powerful navigation and selection tool, but through the use of gestures it is also an effective command execution tool. Used properly, gestures enhance your ability to quickly communicate things that need to be done. For example, the same "pigtail" gesture that proofreaders use can now be "drawn" on a word in an electronic word processor to delete that word.

The pen is also the only logical input device for a very powerful data type—ink. Electronic "ink" is the data type that facilitates the capture of important information such as signatures, drawings, and personal notes. Ink data types also allow you to mark up documents during the editing phase as you do with a pen on hard copies of documents. Using networks, you can accomplish the same tasks previously bound to photocopies of drafts.

Pen and Speech Input

As powerful as the pen is, some people are expecting speech input to eventually replace pen input. The notion of speech input is clearly attractive because it leaves your hands free; however, much more intelligence is needed for speech input to meet users' expectations.

The ability to recognize speech is very challenging, especially when different languages, regional accents, and slang are considered. The ability to interpret what is said is also required to reach full potential. For example, the difference between dictation for input and commands for program action must be determined. Current approaches often require single word commands to start or stop modes of input. This becomes awkward for the user over an extended period of time.

Pen technology provides a far superior solution to conveying position information. For example, how do you verbalize the desire to move the cursor between the sixth and seventh words on the 45th line in the document? This is far more natural to do simply by pointing with the pen.

In document processing, it is also far easier to use the pen to write a new word than to use speech input to move the cursor, switch modes to input text, then verbalize the word to insert.

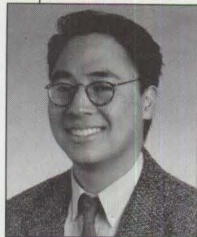
Speech input has much more in common with the keyboard than it does with pen input. Both keyboard and speech allow easy input of linear strings of textual information but are awkward to input position information. Thus the combination of pen and voice is the ultimate solution in a new generation of multimedia interfaces.

The Natural Conclusion

After a few false starts, pen computing is taking off. No different than other high-tech innovations before it—personal computers, graphical user interfaces—handwriting recognition is maturing, becoming increasingly better, and finding applications where it provides the optimum solution.

By proving to the extremely technical computer industry that the rest of us needed more natural interfaces, graphical user interfaces were a critical step in paving the way for acceptance of using a pen to interact with computers. Recognition technology will continue to mature. It will ultimately recognize handwriting as well as we do!

As personal computers continue to become more affordable, this era of developing better user interfaces will eventually set the framework for everyone, not just the technically gifted, to benefit from computers. Ultimately, handwriting recognition and, more generally, pen input will allow a broader cross-section of people to use computers in more settings and in more diverse applications than ever before.



Jeff Dao joined Communication Intelligence Corporation in 1987, working with customers to design pen applications and pen computers. As Assistant Vice President of Marketing and Business Development, Mr. Dao spends most of his time "evangelizing" customers and industry players alike.

Supercharge Your REXX!

GAMMA TECH™

REXX SuperSet/2

Supercharge your REXX with the most complete set of REXX external functions available - GammaTech REXX SuperSet/2.

With over 300 functions from seven DLLs, the GammaTech REXX SuperSet/2 will initiate File and System operations, issue Network commands, execute Video I/O, manipulate Processes and Semaphores, regulate the MacroSpace and perform Math calculations.

Call us today at (405) 947-8080 and you'll see what REXX can do with some extra power!

- Perform EXECIO functions
- Manage LAN Server users by group or domain
- Perform LAN Server permission functions
- Manipulate LAN Server files, sessions and shares
- Interface with NetBIOS, TCP/IP and Communications Manager/2
- Open, close, query and create semaphores
- Start a thread
- Destroy a process or thread
- Copy, move or rename individual or mass files
- Dump variable pools or MacroSpace to a file
- Load, drop or reorganize functions in MacroSpace
- Perform logarithmic and trigonometric calculations
- Query hardware components
- List current system environment variables
- Write character and attribute strings
- Obtain and set cursor type and screen mode

SofTouch Systems, Inc.
Workstation Division

1300 S Meridian, Suite 600, Oklahoma City, OK 73108
(405) 947-8080 • Fax (405) 632-6537

©GammaTech, Inc. 1991-94 All Rights Reserved

Pen Digitizing Hardware

Pen computing is coming, and now would be a good time to nail down some basics that will help you make good decisions for your end users. One area that seems to generate questions is digitizing hardware: the stylus and writing surface that create the "pencil and paper" metaphor.

Devices that emulate pen functions must, like all hardware, make tradeoffs to achieve a price/performance ratio that suits the task. Let's start this discussion by specifying an ideal pen system.

The Ideal Pen System

Our ideal system combines the display with the writing surface. The display has the resolution and brightness of a top quality cathode ray tube (CRT) but is as thin and lightweight as a liquid crystal display (LCD). It can be used flat on the desktop or built into a laptop or tablet computer. The writing surface has resolution high enough to accurately capture complex curves, enough speed to avoid missing any points in a hastily scrawled signature, and the non-skid feel of fine bond paper. Of course, this device is no more expensive than a good CRT and, if used in a portable computer, draws very little power. The pen is untethered (no cord) and requires no battery.

Current Reality

Current pen technology meets some of our criteria but falls short on others. The pen input system can be a sensor built into the display (*integrated pen system*) or one that provides input only and sits on the desk (*opaque tablet*). Both approaches are available with tethered or untethered styluses.

Our ideal system combines the display with the writing surface.

The opaque tablet looks something like a mouse pad, sits flat on the desk, and, using a stylus, allows pen input. Its main disadvantage is that you are looking at your screen but writing on the tablet. It is not nearly as intuitive as an integrated display/writing surface, but it is much less expensive, typically costing \$200 to \$400. The opaque tablet is the device of choice for pen program developers, since it allows them to use their existing development systems with almost no changes. Most opaque tablets just require a serial port for hookup.

The integrated approach is used primarily for portables where a sensor is embedded in the display, but there are some desktop-attached integrated pen/LCD displays on the market.

No matter which input device is used, the interaction of the pen input device, a device driver, and the pen operating system is basically the same. The sensor picks up the user's motion and converts that motion into x-y coordinates. This information is passed to a device driver, which translates the information for the pen operating system.

Each piece of input hardware requires a unique device driver. Specifications for the input hardware are available from the manufacturers and, when used in conjunction with a device driver kit provided by the pen operating system vendor, can be used to create a specific device driver.

Most pen operating systems include device drivers for some of the major digitizer providers. If not already included in the software, a device driver for a pen operating system is usually available directly from the digitizer vendor.

The most common sensor technology is *electromagnetic*, in which the sensor emits a weak electromagnetic field that is disrupted by the presence of the associated stylus. This allows the sensor to locate the stylus and send that information to the device driver. Since the pen's presence is sensed even if it is slightly above the surface of the screen, it is necessary to use a micro-switch in the stylus tip to determine when it is in contact with the screen. Remember, we only want "ink" to flow when the "pen" is touching

YOUR *Single* SOURCE FOR OS/2[®] APPLICATIONS
Choose from a wide selection of the latest 32-bit applications at discounted prices

ORDERS:
1-800-776-8284
FAX: (919) 878-7479
INQUIRIES: (919) 878-9700

Authorized IBM Reseller

OS/2 and IBM are registered trademarks of IBM Corporation.

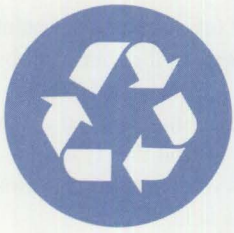


PRODUCTIVITY SOFTWARE
GRAPHICS & CAD
COMMUNICATIONS
NETWORKING
WORD PROCESSING

UTILITIES
BOOKS & VIDEOS
OS/2 T-SHIRTS
BACKUP SOFTWARE
DEVELOPMENT TOOLS

**FULL COLOR
CATALOG
NOW AVAILABLE**

3209 Gresham Lake Road Suite 135 Raleigh, NC 27615



/AIXtra: IBM's Magazine For AIX Professionals

SUBSCRIPTION FORM

Blue & Green

FACT: The IBM RISC System/6000 with AIX platform is the fastest growing advanced UNIX workstation in the industry. The RISC System/6000 was voted best workstation in a 1993 *Byte* magazine reader's survey.

OPINION: While */AIXtra* magazine doesn't recycle information, we do believe strongly in taking care of the environment. */AIXtra* is printed using recycled paper and soy-based inks, and much of the communication between authors, vendors, and production personnel is done electronically, saving both time and energy.

FACT: */AIXtra* magazine's detailed technical articles are written by the experts -- people who design, develop, and support AIX and related products. */AIXtra* covers AIX systems, software, networking, implementation, and much more.

OPINION: Making the world a better place to live in is everyone's responsibility. That everyone includes large corporations like IBM, the mom and pop store down the block, or your next door neighbor. If we all pitch in and recycle more of our waste materials, then we won't have to waste time in the future worrying about where we're going to put all this trash.

A single issue costs \$7.95; you can subscribe now and receive a one-year subscription for only \$50.00 (Canada/Mexico \$75; other countries \$95). Just complete this form and either **fax it to (214) 518-2507** (please include VISA/MasterCard/American Express number and expiration date), or mail your check or money order to: **NCM, P.O. Box 165447, Irving, TX 75016-9939. Checks must be in U.S. dollars drawn on a U.S. bank.**

IMPORTANT: PLEASE COMPLETE ALL INFORMATION REQUESTED.

NAME _____

COMPANY _____

ADDRESS _____

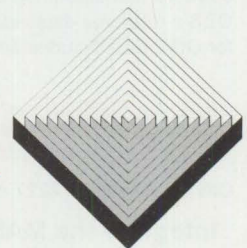
CITY _____ STATE _____ COUNTRY _____ ZIP CODE _____

BUSINESS TELEPHONE _____

CHARGE TO: VISA MC AMEX P.O. # _____

CARD NUMBER _____

EXPIRATION DATE _____



IBM Green As
We Can Be

Please circle #8 on reader service card.

the "paper." If this part of the design is done poorly, the result is missed points, ink "leaks" (unwanted ink as the user lifts the stylus from the surface), or a noticeable sloppiness in the stylus tip.

The electromagnetic sensor is fast (100-200 points/second), has high resolution (256 points/inch or better), and comes in tethered and untethered versions. Although 256 points/inch is considerably higher resolution than the display is capable of showing, it is still worthwhile to capture at the higher rate for recognizing handwriting, verifying signatures, and saving "ink" for displaying later on a higher resolution device such as a laser printer.

An alternative technology is *resistive film* technology, which is bonded either to the display surface (integrated approach) or to a piece of plastic (opaque tablet). This device senses pressure (from any pointed object) as a change in electrical resistance. It contains circuitry that allows it to locate the point of pressure and translate that information into x-y coordinates to

be sent to the device driver. The advantages are lower cost and the ability to "write" with any pointed object (no special stylus is required). The disadvantages are lower speed and resolution and occasional false triggering if the user rests his/her hand on the surface while writing (remember, it responds to pressure).

Shopping Tips

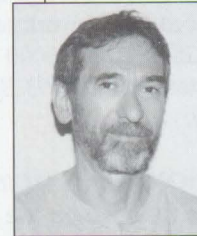
Whether your application needs an integrated display/sensor or an opaque tablet, you will probably prefer an untethered stylus, even though tethered stylus designs are usually less expensive and the pens don't get lost.

Work with your intended user community to ensure that the stylus feels natural to them. This is more important than technical specifications. Make sure that they test the styluses by using them the way they ultimately intend to use them. Determine if the user will be standing or sitting, reaching or not, writing continuously, or frequently picking up and putting down the stylus, etc. There may be a short learning curve (more so for the opaque

tablet), but if the ink skips or loses points during fast writing, the digitizer is probably at fault, and no amount of learning will fix that. On the other hand, if the ink occasionally lags behind the stylus but catches up, that's your computer hardware and/or software's fault.

Conclusion

Until we have the ideal pen input device described earlier, the current available technology can be combined with a pen operating system for a very effective solution.



Gordon Arbeitman is part of IBM's HUMAN-CENTERED Technology group in Boca Raton, Florida. Gordon has been involved in HUMAN-CENTERED input tech-

nology in IBM for over six years and was a key member of the Pen for OS/2 product development team. Gordon has a BS degree in Computer Science from the State University of New York and a master's degree in Industrial Engineering from Rensselaer Polytechnic Institute in Troy, New York.

Has a software problem ever cost you time, money, or aggravation?

QES's Better Software makes your Software Better:

QES/Architect for DOS, OS/2, Windows - complete QA & process management
QES/EZ for OS/2 GUI - Quick & easy capture/replay for OS/2 PM GUI

- * **Manage data:** requirements, specs, validations, tasks, verification, schedules, testing, performance, project, quality, results, etc.
- * **Reposit Data** items with validation & rule data.
- * **Capture / replay** testing & QA functions.
- * **Generate Test Data** via menu picks.
- * **Edit and maintain** all data *Globally*.
- * **Prototype Self** - validating specifications.

**QES Inc. 20 Westbrook St.
E.Hartford, CT 06108-3447**

QES /Architect is a PC-based, menu-driven, system that is easy for **both technicians & end users** to use to test any host-emulated or character-based applications from **DOS, Windows, or OS/2**. It automatically generates WYSIWYG pictures of your own application, discerning fields, data items, and responses by studying captured data. You can manage the entire software manufacturing and acceptance process from a Quality Assurance perspective. With QES's relational database, you can control software projects from beginning to end. QES EZ for OS/2 GUI includes simple management and variables.

No programming ever needed!

QES target environments include 3270, 3X/AS400, VAX, DOS, OS/2, RISC 6000, HP, etc, via any emulation supported by OS/2, DOS, or Windows

Call us at **203 289 2227** or **FAX 203 289 2009** and find out how to:

Integrate the MANAGEMENT and AUTOMATION of your software production process

It's HapPENing!

Pen computing hardware has developed and improved steadily over the past six years. Faster processors, greater storage capacities, and lighter weights have all contributed to the growing acceptance of pen computers. This article looks at IBM's entrance into the pen computer market and describes IBM's current ThinkPad pen computer models.

Certain dates in a person's career are active in memory and visible in scrapbooks; April 16, 1992 was such a date. On that day, IBM participated in GO Corporation's announcement of its PenPoint operating system. In a separate room, IBM was demonstrating the original ThinkPad—the ThinkPad 700T. At the time of the announcement, there were few players in the pen arena. Competition was expected from GRiD, Momena, and TUSK; today, only TUSK continues to pursue its objective of providing a rugged tablet capable of working in any environment.

Since IBM's initial entry, numerous other hardware companies have attempted to get into the pen computing arena. The hardware has been categorized, defined, and redefined in an attempt to capture the right market segment. Operating system and application developers have tested the waters; many found the environment "too cold" to remain. Marketing efforts moved from a vertical focus to horizontal and then back; few companies were able to quantify for customers the real benefits of this new, yet familiar, technology.

The pen market can best be compared to the original personal computer market and seems to be following the same technology adaptation cycle. In the past two years, early adopters and Fortune 500 firms have invested in pilot pen programs. In 1994, through the efforts of "pen evangelists" and articles by key influencers, market acceptance has expanded beyond the Fortune 500 to

small businesses using off-the-shelf pen applications running on more reasonably priced hardware. The consumer market is still on the fringe of adaptation, experiencing pen through handheld organizers and personal digital assistants. Individuals are finding pen systems useful for calendar, e-mail, note taking, and virtually any task formerly done using a "day-timer" paper system.

Pen is, indeed, starting to hapPEN! Let's explore some of the key technologies critical to this market's success.

Key Technologies

As with any computer system, understanding the key underlying technologies is helpful in evaluating which system best suits your needs.

IBM's unique etching process gives a pen-to-screen response that's almost exactly like pen-to-paper.

The processor complex is similar to a notebook computer's. Pen systems must be optimized with power management features such as suspend/resume to maximize battery life. *Suspend/resume* is the ability to power down the computer temporarily without losing the application or the data being processed. Whereas in 1992 most systems were 386-based, today's processors are primarily 486SL or DX2, 25 or 33 MHz.

Applications and data can be stored in two ways. The first method, a rotating hard disk drive (HDD) prevalent in 1992, did not offer the ruggedness and durability required by mobile workers. Leading edge HDD implementations included integrated controllers, power management features, and capacities up to and including 340 MB, but effectiveness in a

mobile environment was still in question. The second method, the PCMCIA (Personal Computer Memory Card International Association) card, is rugged and uses low power. A variety of configurations are available depending on the number and type of slots provided in the system.

The liquid crystal displays (LCDs) are available in three varieties:

- *Transflective*: Used indoors or out. Transflective displays are also capable of turning the backlight off in bright-light conditions.
- *Transmissive*: Primarily used indoors, tends to wash out in bright-light conditions.
- *Reflective*: Primarily used outdoors.

Convertible pen systems offer a display choice between monochrome super twisted Nematic (STN) (ThinkPad 750P), dual scan STN (ThinkPad 360P), or active-matrix color (NEC's Versa). The display is not as important as the digitizer technology, which makes pen computing hapPEN.

The digitizer technology is varied. *Resistive digitizers* are overlaid onto the LCD's surface with the pen tethered via a cable to the unit itself. *The transparent-resistive digitizer* generates interrupts when the pen forces the two conductive layers together. *Electromagnetic digitizers* are embedded beneath the LCD. The electromagnetic digitizers can also be further divided into two types: those that use an active pen with a passive grid versus a passive pen with an active grid. In its most recent products, IBM has chosen to use the electromagnetic digitizer with an untethered, batteryless pen.

Digitizer makers are working to bring pen-based capabilities to desktop PC users as well. Whereas signature-capture devices have been classified as products designed for vertical markets, their capabilities can be migrated to the desktop to send signatures electronically and, perhaps, speed up processing certain

	ThinkPad 710T	ThinkPad 730T
Processor	486SLC, 25 MHz	486SX, 33 MHz (SL Enhanced)
Memory	4 MB expandable to 12 MB	4 MB expandable to 20 MB or 8 MB expandable to 24 MB
Expansion	Three PCMCIA Type II slots	Two PCMCIA Type III slots
Storage	60 MB hard disk	105 MB PCMCIA hard disk
Battery	3.1 to 4.1 hours NiCD	4 to 10 hours NiMH
Weight	4.6 to 5.5 pounds	3.5 to 3.9 pounds
Warranty	One year	Three years
Display	9.5" monochrome STN LCD, backlit, transfective, 16 gray scales, etched glass	9.5" monochrome STN LCD, backlit, transfective, 16 gray scales, etched glass

Figure 1. Comparison of 710T and 730T

	ThinkPad 750P	ThinkPad 360P
Processor	486SL, 33 MHz	486SX, 33 MHz (SL Enhanced)
Memory	4 MB expandable to 20 MB	4 MB expandable to 20 MB
Memory Checking	Parity	Non-parity
Display	9.5" monochrome STN LCD, backlit	9.5" dual scan color STN pen, backlit
Battery	5.1 to 12 hours	3.3 to 7.0 hours
Weight	6.1 pounds (without floppy disk drive)	6.3 pounds (without floppy disk drive)
Design Features	TrackPoint II Modular design	TrackPoint II Modular design

Figure 2. Comparison of 750P and 360P

types of documents. In addition, the pen-digitizer combination can replace the mouse or coexist with it. Pen can complement the keyboard, creating a powerful, editing tool—as comfortable as a red ink pen.

IBM spent a great deal of development resource on the display's surface texture. Internally referred to as "track right," IBM's unique etching process gives a pen-to-screen response that's almost exactly like pen-to-paper.

To make the pen experience even more familiar, WriteWare, based in San Jose, California, has delivered a dual function pen and stylus, the Stealth Stylus II. With a twist of the pen, you can go from scrolling through the system's calendar to completing a crossword puzzle in the *New York Times*. The pen has also proven to be an excellent tool for entering graphic data in a mobile environment.

Wireless communication capability is important to users of mobile pen systems. Using built-in PCMCIA expansion slots to add data/fax modems or network

communication adapters increases the potential applications for these systems. To ensure that various cards work in IBM systems, ThinkPad Proven, a program to test system application and interchangeability, is now available.

Accurate handwriting recognition is also critical to the acceptance and success of pen-based computing. Today, the term remains a misnomer since it is really *hand-printing* recognition, although cursive is certainly in the embryonic stage. You can increase accuracy of printing recognition in most cases by training the recognition engine to learn your style.

The ThinkPad Family Grows

Pen-based computing has developed along multiple product lines with enough emerging new terms describing the various product classifications to fill a book. (See the Glossary in the Little Solutions section of this magazine for a listing of pen-based computing terms.) IBM is currently developing general-purpose tablets, convertibles, and handhelds. Categorized by intended use, applications, and capabilities, IBM has emphasized reducing the size, weight, and price, while increasing the processor speed, storage, and communication capability/flexibility. Pen systems tend to be leaders in the areas of miniaturization, durability, PCMCIA technology, and power savings.

ThinkPad 730T

IBM is in its third generation of general-purpose tablets, having entered the market with the 700T and expanded its opportunities with the 710T. The ThinkPad 730T puts the power of the computer into the hands of people who use clipboards and paper in their everyday work; it extends the benefits of automation to new levels within the organization. The ThinkPad 730T, with its SL Enhanced Intel 486SX 33 MHz microprocessor, is available with 4 MB or 8 MB of standard memory (upgradable to 20 MB or 24 MB) and 105 MB of PCMCIA hard disk storage.

This tablet, unlike its predecessors, weighs under four pounds. The battery life has increased—now between four to ten hours—allowing you to keep on working anytime, anywhere. Its rugged construction and durable magnesium shell, coupled with the inherent sturdiness of PCMCIA hard disk drives, ensure that the

730T can withstand the knocks, drops, and spills of daily walk-around use.

The 730T accepts a standard port replicator and AC adapter. You can attach an external display and keyboard for non-pen desktop use. The 730T provides a reasonably priced alternative for mobile workers who need pen capabilities and system flexibility. See Figure 1 for a comparison of the 710T and 730T.

ThinkPad 360P

The ThinkPad 360P brings to the value notebook market the same elegant styling and standard-setting technology inherent in the IBM ThinkPad 750 models. As a member of the 360 family, IBM's ThinkPad 360P provides a pen for the field and a keyboard for the office in a versatile notebook package. This pen category is expected to gain market share as it continues to become even more price competitive. See Figure 2 for a comparison of the 750P and the 360P.

The ThinkPad 360P offers a bright, 9.5-inch (actual diagonal viewable area) dual scan color STN LCD display, which, with a quick swivel of the fold-down display screen, converts the system from a full-function keyboard-based notebook to a pen computer.

With its untethered electromagnetic pen, the 360P allows you to capture handwritten notes, sketches, signatures, and diagrams. It is also ideal for completing forms.

The 360P continues the tradition of a no-compromise notebook first and a pen computer second. The purchase decision has no new technology risks associated with it; you need only to decide whether the two-tenths of a pound weight increase and battery hour range of 3.3 to 7.0 hours presents a balanced tradeoff. To expand the applications of a standard notebook to pen capabilities, IBM provides the ThinkPad 360P in two models.

Summary

Although there has not been explosive growth in the past two years, pen computing continues to offer significant application enhancements. It is part of the evolution—not revolution—towards HUMAN-CENTERED approaches to computing. It can replace keyboards in portable computers as well as extend the desktop computer's capabilities. With clear positioning of its numerous benefits, pen will address the needs of a variety of mobile users.

Customers have been extremely vocal about requirements for handwriting

recognition, pen-to-screen feel, and durability. IBM has not only addressed these requirements but has also made progress in industrial design, preloaded software, plus services and support. IBM is committed to this market and intends to drive additional innovations.



Deborah (Debi)

Dell is Product Manager, Market Strategy and Development, in IBM's mobile computing group in Boca Raton, Florida. She is responsible for

developing and implementing the ThinkPad "out-of-box" experience. She works with development to define future pen systems and their associated market development programs and is responsible for opportunity and market trend analyses for the ThinkPad family of products. Debi has held numerous management and staff positions in the personal computer area since 1982. She has a BBA from the University of Notre Dame and an MBA from Loyola University in Chicago. She is currently pursuing an MS in the Management of Technology from the University of Miami.

Bill Carr: Fastest Draw in the West

You won't find any splotches of paint on the walls. All the brushes have been locked away in a drawer somewhere. Good luck in trying to find a smock. And if you're looking for a canvas, try the 17-inch Super VGA monitor sitting off to one corner.

Oh, yeah—and don't ask to borrow his pen.

Greetings from the state-of-the-art commercial and virtual art studio of Dallas artist Bill Carr.

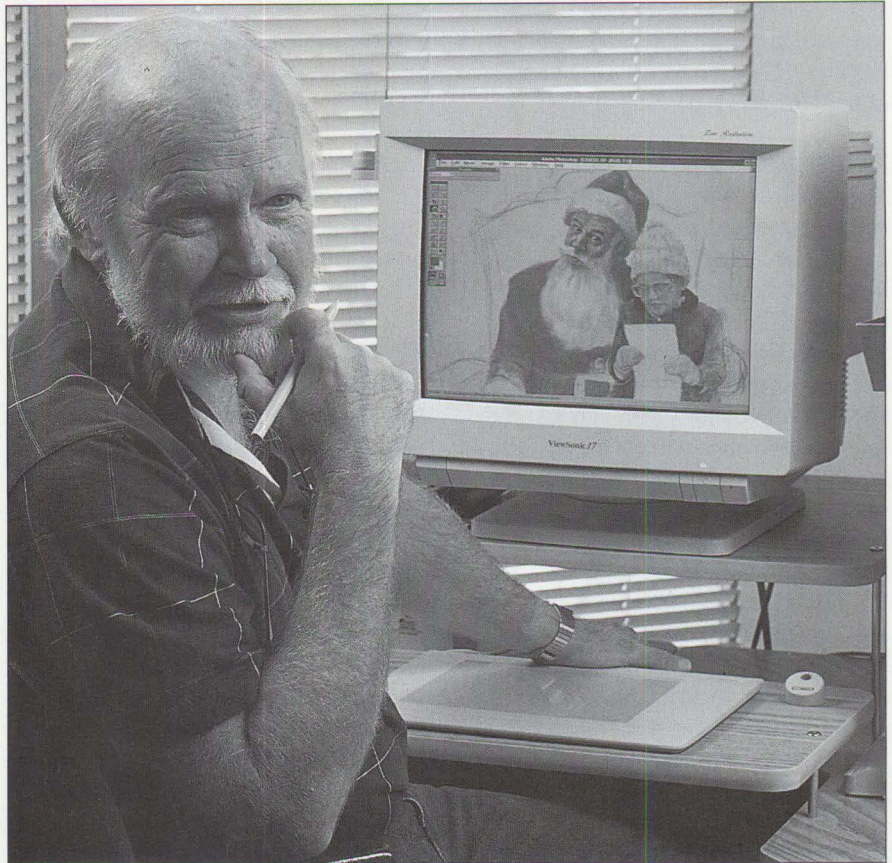
If you haven't noticed his clever cartoons and striking cover designs, then you probably haven't been reading *Personal Systems* very long. Appearing in these pages since 1990, Carr's cerebral illustrations help liven up the banality of techno-speak, not to mention simplify the sometimes perplexing concepts of the magazine's well-intentioned authors—including yours truly.

Personal Systems visited with Carr at his Dallas studio to discuss his recent transition from traditional media to pen-based computer-generated illustrations.

Tabula Rasa

Carr says that although he was drawn to drawing as a kid, it was his adolescent intention to become a physicist. But as a physics major at Arlington State University in Arlington, Texas, in the early 1960s, he would walk by the art building and covet the merriment the art students seemed to be making—and which the dour physics majors lacked. Remembers Carr, "It looked like they were having a lot more fun in the art building than I was having in the physics lab."

Carr decided he would follow his bliss and left college to hook up with Harry Bruner, a now-deceased Arlington artist who served as his mentor. "I've always viewed art as an apprenticeship . . . [and] most of the instruction I received came from Harry."



After spending several years under the tutelage of Mr. Bruner, Carr recognized that the market for skilled artists in the advertising trade was ever-burgeoning, so he landed a job with Arlington-based Corporate Graphics, a graphic arts studio (which, as it turns out, now provides publication services for both *Personal Systems* and *AIXtra* magazines). Carr says he learned a great deal about the technical side of the business while at Corporate Graphics but decided to strike out on his own as a freelance illustrator after two years there.

Carr's freelance clients have been as diverse as his talents. They include Steak and Ale, J.C. Penney, ferti-lome (a Bonham, Texas-based gardening resource company), even Dallas' own Cotton Bowl, for whom he sculpted a 50th Anniversary gold-plated championship trophy in honor of Sammy Baugh, the Cotton Bowl's first Most Valuable Player. It makes its home today in a Texas A&M trophy case.

Eventually, his talent found its way into the pages of IBM magazines such as *Personal Systems* and *AIXtra*, where, for several years, his cartoons and cover designs have greatly enriched the caliber of both publications. Carr initially did his work for IBM using traditional media such as ink and watercolors, but the computer revolution of the 1980s made him more and more aware of the potential for using computers to draw and paint.

No stranger to computers when he began freelancing for IBM, his first PC was an Osborne 01, bought back in the early 1980s. Carr remembers, "My wife told me, 'We need a computer.' When I asked her why, she told me, 'For my business.' So we bought one."

Using it principally for writing letters and creating dBASE files, Carr says that as interesting and useful as he found his new toy to be, it never occurred to him he would be able to create pictures using a

computer, especially considering the Osborne's virtually non-existent graphics capabilities.

But computers were something he could ill afford to ignore. And while the desktop publishing revolution, kindled by the advertising world's rapid adoption of the Apple Macintosh, did not escape Carr's attention, his skepticism about using such technology in the production of his own work lingered through the late 1980s.

"I didn't get excited about computers until about a year and a half ago," says Carr, "because before then, they were basically used to manipulate images rather than create them."

His first investment toward creating computer-generated art came with the purchase of a 286 machine that ran a simple paint program incorporating only EGA graphics. Carr says that although he found such capabilities entertaining, they were still a long way from permitting him to do the sophisticated and detailed work he was used to creating by hand—especially since there wasn't yet an adequate way for him to cost-effectively output his work.

And then the 486, 32-bit microprocessor arrived with its insanely fast clock speed and throughput. This, along with software that could finally emulate the use of a brush or pencil, convinced Carr the time for change had arrived. He could now use computers to do productive work and still attain the meticulous detail he was used to providing his clients. After investing in a 486 66-DX2 with 20 MB of RAM and a 540 MB hard drive, Carr started experimenting with CorelDraw. Using a mouse, he began using the computer to draw his cartoons for *Personal Systems*.

"His electronic drawings were a joy to behold," says *Personal Systems* editor Betty Hawkins, "because if you wanted him to, Bill could change them before your very eyes."

A Clean Palette

What about those skeptics who question the efficacy of Carr's using computers instead of traditional media?

"I'm interested in making images first and foremost," Carr insists. "Ultimately it's the concept that's important. All the hardware and software trickery in the world won't save a bad concept."

Carr maintains that one of the great benefits of being an artist is allowing one's self to experiment with images, which computing technology facilitates. However, lest any aspiring "virtual" commercial artists out there believe that using computers is necessarily going to give them a time-to-market edge for their work, think again.

"You learn all these things you can do on the computer, and all of a sudden you have the freedom to experiment, so using computers improves the final product rather than speeds it up."

However, Carr believes virtual illustrating certainly has its advantages. "There are no brushes to wash or dry, no palettes to clean. Yet you can change a color instantaneously, whereas you can't just go and change an oil painting."

The last real leap for Carr between painting and the computer, though, was his rediscovery of the pen—this one electronically driven.

"I was perfectly content with the mouse. When I first heard about pens, it seemed like they were somewhat esoteric and used mainly for engineering. I didn't think I'd be interested in using them."

But after reading positive reviews about some new software and hardware used to create art with digipads and pens, and after careful examination of the final

images created using this technology, Carr began to do some investigating.

"It was a combination of things that induced me to try using pens. The cordless pen meant there were no wires, which I couldn't have handled. Used in conjunction with a digipad that was pressure sensitive allowed the breadth of the pen stroke to vary depending on the pressure I applied. This made it seem more like the real thing."

So much so that Carr may never go back to painting.

"Pens were the last hurdle between the leap from traditional painting to the computer. They give you the ability to get directly to your work, and there's a level of sophistication in my work that requires them."

If Carr's latest cartoon and design work are any indication, his newfound computer-drawing *savoir-faire* is transcended only by his seasoned talent as an illustrator. Which causes me to wonder: Is there anything he regrets about his virtual transition?

"Yeah. I miss having something to hang on the wall."



Todd Watson has worked for IBM since 1991. He currently serves as the assistant editor for *SQ: Software Quarterly* and *AIXtra: IBM's Magazine For AIX Professionals*. He

has a bachelor's degree in English and a master's degree in Mass Media Studies, both from the University of North Texas in Denton.

Work Management in the Field

Work management has often been discussed indirectly by discussing its parts—many times without thinking of the whole. Major utility companies are now building the parts and planning for the whole. This article discusses how OS/2 and Pen for OS/2 can assist in building a complete work management system.

It's no secret. Major corporations are reducing their work forces by the tens of thousands . . . each.

For some companies, this is a result of declining business volumes. For other companies, it may be the result of deregulation, leading to competition and the pressure to lower costs. Companies whose business volume and business activity increase, or even remain the same, have found or must find ways for the remaining employees to handle greater work loads.

Utility companies (telecommunications, gas, electric, water, cable) are in the latter group. Their business volume typically increases each year, yet the larger utilities have consistently reduced their work forces each year. Some of the reductions have been technology driven (e.g., electronic switching centers), but most are due to consumer, regulatory, and competitive pressure to reduce or hold the line on service prices.

Although utility companies have large capital budgets, the most significant controllable and recurring costs include the personnel required to build, maintain, and deliver the services provided.

The expense for every utility company employee includes the normal hiring, training, retraining, supervision, office rental, support, and annually increasing payroll and benefit costs. Additionally, the utility employee brings along other cascading costs. A utility company crew (two

or more people) usually requires an expensive truck and trailer, clerical support, yard space, cellular phones or mobile radios, tools and equipment, electronic handheld computers, books of maps, and procedure manuals.

The Situation

"Even without the mandated 15% force reduction, we have work flow and work management problems. I know we're not using our peoples' skills efficiently.

"Will we ever have a way to work in the field that is truly better than what we do today?"

The Solution—Today

You call the gas company to ask that gas service be turned on at your new house next week.

The customer service representative enters your contact information (e.g., name, address, phone, along with the date your service will begin) into the gas company's customer information system (CIS). Today, this CIS is typically on a mainframe.

The clerk in the district work center prints out the work orders for the day from the mainframe. The supervisor reviews the work orders, estimates the time it will take to perform each activity, prioritizes the work orders, groups them according to location and type of activity, then assigns them to the work crews.

The work crews arrive, fill out their time sheets, review their daily assignments, pull copies of the appropriate facility maps, and head for their trucks.

They arrive at your newly constructed house, refer to the facility maps, use equipment to determine the exact location of the underground gas lines, dig up the street, tap in a gas service line to the main, install the gas meter, check to be sure everything is working safely and properly, itemize what they did, mark facility changes on the maps, and depart.

Depending on the nature of the work and the experience of the crew, they may have referenced the company's procedure manuals, which describe safety procedures, installation and maintenance instructions, operation of test equipment, etc.

After completing the day's work orders, the crew reports back to the work center. They turn in their completed work orders, red-lined facility maps, material lists, and time sheets.

The clerks input a voluminous amount of information from the crews' handwritten forms. The online or batch validation procedures identify missing or incorrect information, which is then put aside for checking with the crew the next day, or the crew is contacted by radio, interrupting their current job. A site visit may be required to complete the work order entry. Finally, the mainframe files and manual records are updated by clerks and drafters.

The Solution—Tomorrow

Although the same procedures are necessary, a few changes can eliminate unnecessary, redundant, error-prone tasks.

From the time the service request is first entered into the CIS, the ability to electronically manage the following accesses and additions to the information reduces the number of office personnel:

- Printing and transcribing the service request
- Assembling and managing the paper forms
- Validating and correcting the forms
- Revisiting sites
- Entering the completed service request forms into the computer

The field personnel still:

- Read and write information on service request forms, but on a Pen for OS/2-based pen tablet instead of on a paper form

- Reference company procedure manuals, but on the pen tablet from a CD-ROM (using hypertext) rather than by searching through six binders of paper
- Annotate the map of where their facilities are located, but on the tablet, not on the paper maps

The time it takes to write and sketch the new information on the forms and maps is the same. You won't save time there; however, the electronic forms, maps, and manuals will save you time (and therefore personnel) by:

- Getting the data from the CIS to the pen computer and back to the scheduling system and the CIS, thereby reducing the time to locate the applicable form, map, or page in the procedure manual via hypertext-like links
- Providing online validation to minimize or eliminate the correction cycle and the site revisits
- Automatically recording payroll time by work order
- Programmatically posting the forms entry and map annotation to the master system when, upon returning to the work center, a crew member connects the pen tablet to the docking station
- Automating the flow, thus making it easier to track work order progress and handle customer inquiries and complaints

Business Summary

Out of a work center's force of 20 personnel, we may save the costs of one office clerk and one crew of two people. It doesn't seem very significant; however, it does represent an approximate savings of 15% of expensive, annually increasing personnel costs.

The part that is eliminated is not quality, but the redundant nature of managing paper flow. There is no inherent benefit to a corporation to expend personnel and financial resources on paper and its system. There is benefit in the information that flows—but that information can flow from hand to pen to mainframe (or client/server).

The Hardware

There is a lot of discussion of "hardened" or "ruggedized" pen tablets or

convertibles for use by the utility crews. The feeling is that, based on the way other crew equipment is handled (abused), a fragile computer will suffer hard disk drive failure, cracked screen, dust/dirt/moisture inside the unit, and chips working free from their sockets.

Another group, perhaps in the minority, feels that too much emphasis is placed on ruggedness—that the crews handle various forms of electronic equipment every day, and that a special piece of electronic equipment such as the pen tablet may actually receive better treatment (especially if it looks fragile).

It's true that the crew vehicles vibrate more than the automobiles used by mobile sales people. But it can also be argued that the durability of the general purpose laptop PC has improved significantly during the last few years, to the point where it can survive in the crew trucks.

In the current release of Pen for OS/2, pen-unaware applications can use pop-up keyboard and handwriting pads.

With the pen tablet PCs using, in many cases, the same or comparable disk drives and other components as laptop PCs use, plus their use of PCMCIA (Personal Computer Memory Card International Association) cards (drives, etc.), pen tablets now have the same durability as laptops.

Color is finally coming to pen computers. Color is currently available only in convertible PCs (pen plus keyboard), such as the IBM 360P, but that technology is easily transferable to pen tablets. Color can significantly assist the person viewing facility maps. For example, utility companies may use colors to differentiate between different uses and classes of facilities, e.g., cable attached to power poles and cable buried in a trench.

Screen size and resolution are also considerations, since both can affect the ability

to clearly see the graphical images of utility company maps.

Some companies feel that light weight is important. Others do not. If the employees will be leaving the computers in the truck (perhaps mounted in the truck), weight is usually not a factor. Employees who need to use the tablet outside the truck (e.g., an inspector) feel weight is very important. Units in the two-pound range are available today.

The Operating System

Some companies will treat their initial deployment of mobile computers as dedicated, single purpose tools. For these uses, the DOS operating system may suffice.

Other companies, however, may see this deployment as an opportunity to provide a single electronic tool to the work force that can assist the employee in several different areas.

If forms are an important part of the employee's job, one of the graphical user interface (GUI) environments is helpful, especially if the employee occasionally needs a customer or property owner to "sign" a form, which the employee then prints and leaves with the signer. The quality and professional image of the form printed from a GUI environment is greater than that from a pure DOS application.

The GUI environment usually provides an easier mechanism to simultaneously open multiple applications. While this is not true multitasking, there are some benefits to an employee who may need to access forms, maps, and procedure manuals simultaneously, then compare the information from each. Spreadsheets and word processors may also be used.

A better choice is an operating system such as OS/2 that, in a GUI environment, supports preemptive multitasking without the resource constraints of the 16-bit DOS and Windows environment.

The stability of the operating system is extremely important. The utility company's employees do not think that an operating system or GUI that "crashes" or "GPFs" (incurs general protection faults) is helping them do their real job: getting service to a customer or repairing a

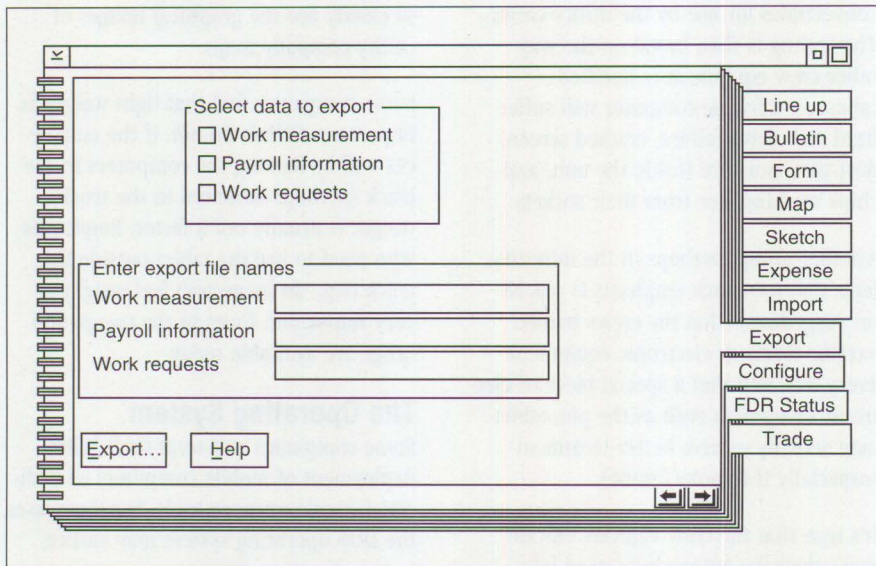


Figure 1. Utility Company Notebook Application

leaking gas line. There is no time to deal with computer problems. The application and the operating system must work the first time, every time. There must be no failures or other interference in getting the real job done.

Some of the more sophisticated applications needed by the employee take advantage of the OS/2 operating system's robust capabilities. While the employee is sketching the "as-built" information on the pen tablet, a background task may be receiving an emergency work order by radio or cellular connection. Or, periodically, a background communications link is started to transmit completed work order information to the work center.

As the employee displays a new map on the tablet, multiple threads assist in making it rapidly appear, even though an enormous amount of raster or vector map data is being processed.

If a poorly behaved application "crashes," the other applications continue. The operating system (OS/2) stays up and remains responsive. The beta testing of OS/2's latest release confirmed that OS/2 runs well in limited memory situations (4 MB or more) and is even more robust than OS/2 2.1.

Pen for OS/2 permits someone—who may not be keyboard trained, doesn't want to use the keyboard, or doesn't have access to a keyboard—to substitute a pen for both the keyboard and the mouse. The

currently shipping version of Pen for OS/2 replaces basic mouse function plus provides the ability to use a pop-up keyboard and a pop-up handwriting pad for entering text. Both of the pop-up text entry methods place the entered text in the entry field or control (e.g., multi-line entry [MLE] field) that has the focus.

The pop-up keyboard is a miniature keyboard image that can be brought up by a pen "gesture." It can remain displayed or be dismissed at will. The characters are selected from the keyboard as you would suspect, by tapping on the desired keycaps. The Shift and other control keys are also represented. The pop-up keyboard is provided more as a "security blanket" than as a desirable text entry tool.

The pop-up handwriting pad is a "combed" text entry field (a field with vertical lines separating characters), made visible by a pen gesture. The user enters text by using the pen to draw block letters (upper, lower, or mixed case) in the entry field. The handwriting pad control, using a built-in translation engine, converts the written text into printed or computer text. Once the handwriting is correctly translated to text, the text is placed near the text cursor of the entry field or control that has focus.

The quality and speed of handwriting translation engines are continuing to improve to the point that cursive text translation is now being tested.

Some entries require handwriting translation (unless the pop-up keyboard is used). But an application written for mobile or pen use should use radio buttons, pull-down lists of choices (combo boxes), check boxes, and spin buttons to minimize the amount of handwriting. This speeds information recording.

Pen for OS/2 provides a few new controls that can replace standard text entry fields. These new text entry fields allow you to write directly into the form's entry field. These entry fields will, under program control, either translate the handwriting to text or retain the handwriting, perhaps for signature purposes.

In the current release of Pen for OS/2, pen-unaware applications can use pop-up keyboard and handwriting pads.

For optimum performance, future releases should enable pen-unaware applications to behave much like pen-aware applications, allowing users to write directly on the pen-unaware text entry fields of the form.

Whereas the pen-unaware applications would automatically take advantage of direct handwriting into text entry fields and gesture recognition (including custom gestures and gestures that run macros or insert predefined text), pen-aware software will offer additional advantages.

Graphics-rich software will take more advantage of these capabilities than forms-only software. Drawing a rough approximation of an ellipse can generate a perfectly drawn ellipse via shape recognition. Or better yet, a sketched symbol may be translated into a utility company transformer symbol, perhaps even triggering the display of an entry form in which to write required information about that transformer. With OS/2, a PCMCIA Global Positioning System (GPS) unit can fill in the true latitude and longitude of the transformer (or meter or pole, etc.).

Another pen-aware feature that can be useful to a utility company is a very large "ink" field in which the employee can write a message, include a sketch, sign it, and fax the entire image from the pen computer to another location.

Pen for OS/2 provides the entry fields, application programming interfaces

(APIs), and interface layer to enable robust, easy-to-use software for people who work away from the office.

The Application

An application written under Pen for OS/2 can take advantage of the controls made available in CUA '91. The Notebook is a particularly useful control for pen applications.

A utility employee with little PC experience will find a familiar metaphor in the Notebook. Figure 1 illustrates its use in a utility company application under development. When the pen computer is turned on, the first thing the employee sees is a notebook filling the screen. The employee can easily "tab" from section to section.

This notebook includes tabs for:

- **Line up**—Lists the day's work requests for a specific crew, type of request, location, due date, and status. It includes Work Request Login, Logout, and Edit choices.
- **Bulletin**—Opens automatically when the crew logs in to the pen computer if unread messages have been broadcast to the unit since last login.
- **Form**—Shows specific details associated with a work request. Shows the location and nature of the problem or task, with areas of the form to be filled out by the crew.
- **Map**—Displays the map, if any, associated with the currently loaded work request. Includes view manipulation choices (zoom in/out), sketch and markup tools, and a symbol palette.

- **Sketch**—Provides an area and the tools to draw a new sketch related to the work request.
- **Expense**—Contains forms and summary information related to time and expense accounting. Will be uploaded to the regional and mainframe databases.
- **Import**—Imports data from a mainframe to a region's database for access by mobile units.
- **Export**—Exports data from the region's database to the mainframe (includes work measurement, payroll, and work request information).
- **Configure**—Contains configuration and maintenance pages (password, unit IDs, base IDs, crew IDs and makeup, and communications parameters).
- **FDR (Field Data Recorder) Status**—Logs communications errors which may occur in unattended operations.
- **Trade**—Helps transfer a work request from one field pen unit to another unit in the field.

These tabs will appear only when applicable to the particular user, active work request, and pen unit. For example, some of the choices are reserved for the crew supervisor at the base unit and will not appear on field units.

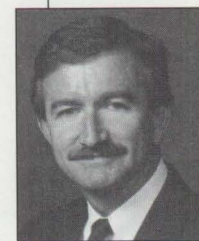
With Pen for OS/2, a robust application can be introduced to employees in a non-intimidating, familiar manner. The software can assist employees by presenting only valid choices, by keeping the information organized and in one

location—a single notebook—and by automatically validating data and moving information to and from the pen computer and the base PC.

Summary

After successful trials, major utility companies are beginning to deploy work management software in the field. The tangible benefits include managing the increased work load with the same size or smaller work force by reducing paperwork time and increasing time spent doing productive work. This has a direct effect on the cost of the utility's services and products.

Pen for OS/2 provides the needed pen interface (replacement for the keyboard and mouse), running on top of a solid, robust OS/2 operating system. Additionally, OS/2 provides developers with the notebook control, along with others, which eases the novice's familiarization with computers.



Frank Fortson is Vice President of Byers Engineering Company, Atlanta. With 1,000 employees, Byers provides engineering and software services to telecommunications and utility compa-

nies and has several pen computer projects completed or in development. He has a BSEE from Georgia Tech and an MBA from Emory University at Atlanta. Frank can be reached by phone at (404) 843-1000, by fax at (404) 843-2000, and on CompuServe at 71730,2157.

Communicating Without Wires: IBM's Mobile Communications Module

When portable computers were first introduced, they transformed the way people work. Now, wireless communications products are revolutionizing portable computing. This article describes IBM's Mobile Communications Module.

The Mobile Communications Module (MCM) is a powerful addition to IBM's growing portfolio of wireless computing products. The MCM delivers on the "anytime, anywhere" promise that the competition only aspires to. The IBM MCM package contains hardware as well as software.

Hardware Overview

The Mobile Communications Module is a high-function option specifically designed for the ThinkPad 750. Market studies have shown that traveling professionals are looking for integrated communication solutions. Users also want to minimize the number of devices they must travel with and reduce the time spent setting up the communications device. The MCM achieves these goals through an innovative, highly integrated design. As shown in Figure 1, the MCM replaces the floppy drive (which can be converted for external use).

When equipped with the MCM, the ThinkPad 750 becomes a sophisticated communicating machine capable of functioning as a circuit-switched or Advanced Mobile Phone Service (AMPS) cellular telephone, as a high-speed data/fax modem over either of these networks, or as a Cellular Digital Packet Data (CDPD) modem!

Because the MCM is capable of operating as a cellular device, it needs an antenna. Since users want a fully integrated solution, the antenna is ingeniously affixed to the system via a molded antenna

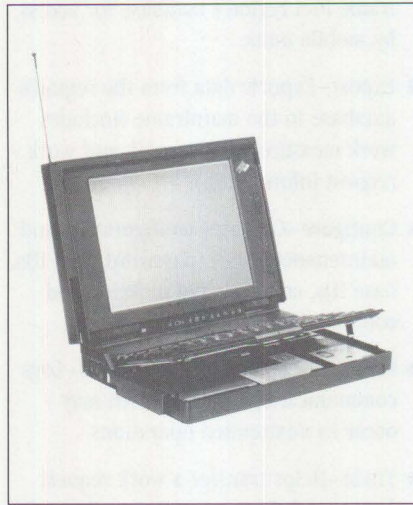


Figure 1. The Mobile Communications Module Replaces the Floppy Drive

assembly that fits over the top of the computer cover, as shown in Figure 2. For travel, the antenna is lowered into its housing.

Rounding out the hardware package is a telephone handset for use in either the cellular or circuit-switched voice mode and a data access arrangement (DAA) for sending data or fax over the telephone line.

Software Overview

The MCM product includes a suite of software, furthering the goal of an integrated solution. Both DOS and Windows versions of a data, fax, and phone application called BitCellular, as well as a set of utilities and a network driver interface specification (NDIS) driver are provided. An OS/2 NDIS driver and utility programs are available from the IBM PC Company BBS (call [919] 517-0001) and will ship with the product later this year.

The MCM can operate in a variety of modes, such as a cellular telephone or a cellular modem. The software packaged with the MCM simplifies the modem commands (similar to the Hayes-AT standard) that place the MCM in the desired operating mode.

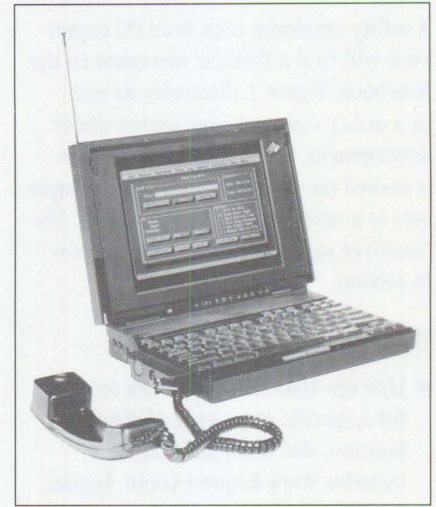


Figure 2. The Mobile Communications Module Installed on a ThinkPad 750C

The Windows version of BitCellular gives you a set of icons, shown in Figure 3. When you double-click on a particular icon, the MCM is placed into the corresponding mode and the application is invoked. For example, when you double-click on the cellular phone icon, the MCM is placed into cellular voice mode and then a cellular phone application is invoked, as shown in Figure 4.

Similarly, if you want to use the MCM as a cellular modem, exit the cellular phone program and double-click on the cellular modem icon. This switches the modem from cellular voice to cellular modem mode, and you are presented with the BitCom application.

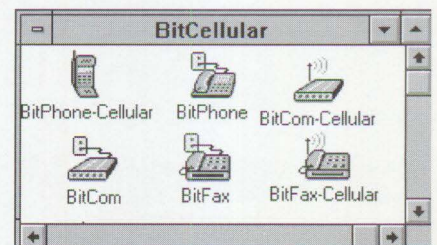


Figure 3. BitCellular Icons

The MCM module can also operate with other data/fax applications. Depending on the application and your experience level, this can be accomplished in a couple of ways. Prior to invoking the data/fax application, the MCM utility program can switch the modem into the desired mode. Alternately, the utility program can set a default power-on mode. For example, if the MCM is generally used as a cellular phone, the default power-on mode can be set to cellular voice.

Finally, the modem initialization string can be modified to create a customized modem profile. The MCM installation diskette provides custom modem profile examples. Future versions of the diskette will include profiles for other popular applications, such as Lotus cc:Mail.

Transforming Mobile Computing

The IBM Mobile Communications Module truly transforms mobile computing. With the same system, you can place or receive telephone calls and send or receive data or faxes over either cellular or landline networks from a variety of environments, such as a hotel, a taxi, or even the airport. Additionally, the MCM supports

CDPD for low-cost data communications. The easy-to-use MCM provides robust communication functions for the needs of mobile computers today and for years to come.

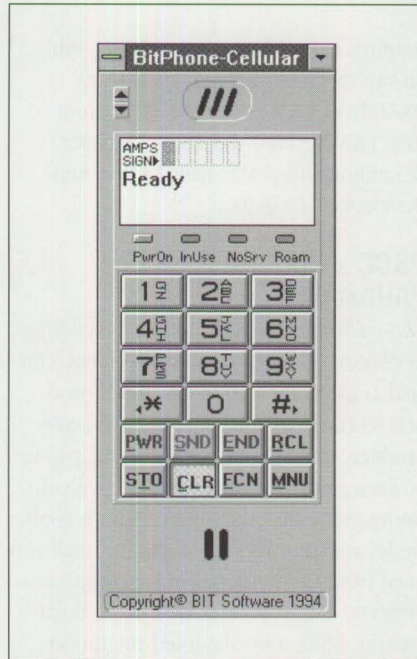


Figure 4. MCM Cellular Phone Application



Dana L. Beatty is a staff programmer in the wireless data department for IBM's Consumer Systems organization in Boca Raton, Florida. She joined IBM in 1985 in Austin, Texas. Ms.

Beatty was the software project lead on the IBM Mobile Communications Module product, the industry's first CDPD product. She has written articles for *IBM Personal Systems* magazine and *IBM Personal System Developer*, has instructed system engineers at the Arthur K. Watson International Education Center, and has presented at SHARE and GUIDE conferences. Ms. Beatty received her BA in Computer Science from the University of Texas at Austin.

Correction

In the "NetBIOS, SNA, and NetWare IPX Coexistence Under OS/2" article in the September/October issue, a name was listed incorrectly in Figures 7 and 10. In Figure 7 (page 64) near the bottom of the figure, "MAXBUFFSIZE" should read "XMITBUFSIZE." The name appears both in the figure's example and bottom paragraph. Also, in Figure 10 (page 66), "MAXBUFFSIZE" should read "XMITBUFSIZE" in both the figure's example and the figure's two concluding paragraphs.

Are You Moving?

Please let us know when you change your address. Just fill in your new address at right, and either

- 1) fax it to **(817) 961-7218**, or
- 2) mail it to **Personal Systems
IBM Corporation
Internal Zip 40-B3-04
One East Kirkwood Blvd.
Roanoke, Texas 76299-0015**

Name _____

Company _____

Address _____

City _____ State _____ Zip _____

Phone (____) _____

(Please include old mailing label if possible.)

Tomorrow's Networking Today—from IBM's Personal Systems Competency Center

Think back to a few years ago: individual departments in your organization wanted to share printers and data on a local level. Tackling the task on their own (without bothering the “glass house guys”), they picked their favorite products and tools to make their environments workable. These “LANlords” emerged all over your organization, and soon other people outside these discrete little empires also needed to share the printers, applications, and data. Central monitoring was not happening, desktops were inconsistent, and code distribution was via the “sneaker net.” You probably began downsizing and “rightsizing.” You realized that the desktop environment was here to stay. And there you were with your “hodge-podge” standard!

Now imagine this: you have access to a group of technical experts who support enterprise customers for a living. While these experts specialize in IBM's personal systems monitoring, operating systems, application development, network and workstation products, they also know who to contact about all the other products used in your environment. What if these same experts actually understood the “hodge-podge” standard and could objectively work with you to build a migration plan to get you on another standard? This new standard could help get your desktop and LAN products working together to run your business.

Just suppose you could get in contact with people who could design your network today to meet tomorrow's requirements. Well, you can! IBM's Personal Systems Competency Center (PSCC) offers these skills to you. Our business is enabling you to implement solutions that work for your particular business.

What Is the PSCC?

We are IBM's national service and support specialists for personal systems software. For years, IBM's enterprise customers have turned to us to provide technical

support, consulting, programming, and on-site services for products such as OS/2, DOS, LAN Server, NetWare from IBM, LAN NetView, Database Manager, Communications Manager, LAD/2, and Developers' Toolkits.

PSCC's Perform Services Philosophy

The customer always has the flexibility to choose all or part of our services. Our goal is to enable you to use IBM's products to run your business. We want our products to be successful; we want you to be successful. Although we can give you sound guidance to accomplish both goals, we let you choose how much guidance you need from us. We can manage complex projects, design your network and document it, build a documented migration plan, develop or review your mission critical application code, build tools you need, or implement any or all of the migration. And the list goes on . . . The fact is, *you* make the decision.

PSCC's Qualifications

PSCC experts have been there; we've done it. We offer the experience, access to developers, and knowledge of application programming interface (API) structures for OS/2, LAN Server, and NetWare. Call us for more information at (800) 547-1283. And look for our “PSCC Focus” pieces on our experts sprinkled throughout future issues of *Personal Systems* magazine.



Kim Hudson is an Advisory Marketing Support Representative with the Personal Systems Competency Center (PSCC) in Roanoke, Texas. Since joining IBM in 1984, Kim has worked with LAN Systems products, spending six years in LAN Server Development in Austin and the last four years with the PSCC as a Certified NetWare Engineer (CNE) and LAN Specialist. She is currently responsible for support programs and marketing the PSCC services. Kim holds a BA in English from Texas A&M University.

For Personal Systems services call (800) 547-1283.

The PSCC specializes in:

- Custom Services
 - Consulting
 - Design reviews
 - Strategic planning
 - Application Programming
 - Prototype Development
 - Contract coding
 - Enabling
 - Server capacity planning
 - Solutions workshops
 - Performing
 - Systems management services
 - Systems integration
 - LAN migrations (LAN Server and NetWare)
 - Performance tuning
 - NetWare and OS/2 Interoperability
- Technical Support Programs Through the Personal Systems Support Family
 - Consult Line
 - Customer Application Assistance
 - House Call
- Information Delivery
 - *Personal Systems* magazine
 - IBM TV programs
- Technical Support Activities
 - Technical Coordinator Program
 - TalkLink electronic Q&A
 - Customized workshops

Customers Speak Out About Consult Line

Never before have administrators been responsible for so much—from end user support to strategic planning. At IBM we can relate to that. That's why we announced Consult Line, a Personal Systems Support Family service that connects our consultants with you via conference calls (see Figure 1). Now you have direct access to IBM experts with their in-depth knowledge and experience.

But you don't have to take our word for it; our customers have a lot to say about their Consult Line experiences!

"I would recommend this service to other customers for involved projects/problems. It provides a good step between phone technical support and on-site services."

If you just need to touch base with someone by phone or to electronically ask an installation or "how-to" question about your OS/2 or LAN product, we recommend Support Line. But when you're looking for in-depth consulting skills for complex issues, Consult Line delivers.

"This is the type of help needed to ensure we develop solutions that are applicable for the long haul."

Our experts specialize in leading-edge technologies. That's why we are confident that the solutions we recommend to you today will run your business for many tomorrows. Consult Line is specifically designed for:

- Systems management strategies
- Performance issues
- Capacity planning
- Application porting/reviews
- LAN design reviews
- Communications planning

Personal Systems Support Family	
Unique Platform Offerings	Cross Family Offerings
<ul style="list-style-type: none"> ■ Technical Connection Personal Software CD-ROM ■ <i>Personal Systems</i> Magazine ■ Desktop Application Support 	<ul style="list-style-type: none"> ■ Support Line ■  Consult Line ■ House Call ■ Forum

Figure 1. Personal Systems Support Family Offerings

Administrator's To-Do List

- Install new router without upsetting LAN traffic.
- Consolidate our 16 current LAN Server domains into three—no, wait, make that ~~two~~—no, put them all in one domain.
- Figure out a way to centralize code distribution.
- Talk to application development group about migrating our applications.
- Document the server and workstations' backup and recovery plan.
- Develop migration plan of NetWare upgrade.
- Call IBM Consult Line at (800) 547-1283 for assistance with all the above items!

- Database performance or migration planning
- Objects strategies

"The responders expressed dedication and professionalism."

"The response was timely, accurate, and complete."

Consult Line provides you with access to some of IBM's premier technical resources from the National Technical Support

Center. Through Consult Line, you schedule a consultative conference call with our technical experts, who will advise and consult with you to interpret, analyze, guide, design, or study whatever you need for your system.

"I would have spent days to get the information on my own."

"This allows me to be more productive and not get bogged down in complex technical issues."

"The breadth of my product set, coupled with a small support staff, makes this an essential service for me."

Think of us as extensions to your own support staff. You can access an entire pool of technical resources whenever you need them without having to maintain those resources on a continual basis. When you need us, you call us.

"What a practical billing system with no contracting hassle."

To draw up your Consult Line contract, all you have to do is call the Personal Systems Project Office at (800) 799-7765 or contact your local IBM representative. Once you have your contract in place, just call (800) 547-1283 to initiate a Consult Line call.

Your contract serves as a retainer; there is no charge for Consult Line until you actually use the service. Consult Line charges consist of the call (an hourly rate times

the number of people involved in the call, times the number of hours to complete the call), the time IBM specialists spend analyzing information you provide for the call, plus time preparing recommendations to resolve your problem. Before we even begin your call, you will receive an estimate of the amount of time expected to complete the consultation.

"Great help! You were responsive and right on the money."

We aim for 100% customer satisfaction. Our commitment to you is that we will return your call within eight business hours to schedule the conference call. It's all backed by a satisfaction guarantee. If you are not satisfied for any reason, notify IBM in writing within one month, and if we can't resolve the issue to your satisfaction, we'll refund charges for the time you were dissatisfied.

It's no wonder so many customers are so satisfied with Consult Line. The program

was designed by customers for customers. So the next time your "to-do" list exceeds your "know-how-to-do" list, call (800) 547-1283 and ask for Consult Line assistance.



Kim Hudson is an Advisory Marketing Support Representative with the Personal Systems Competency Center (PSCC) in Roanoke, Texas. Since joining IBM in 1984, Kim has

worked with LAN Systems products, spending six years in LAN Server Development in Austin and the last four years with the PSCC as a Certified NetWare Engineer (CNE) and LAN Specialist. She is currently responsible for support programs and marketing the PSCC services. Kim holds a BA in English from Texas A&M University

For Personal Systems services call (800) 547-1283.

NEW VERSION FOR OS/2

DESCRIBE® Word Processor 5.0

The highest quality, NATIVE, 32-BIT, OS/2 wordprocessor available. Developed for OS/2 since 1989, "DeScribe is

the best written software in my department...including OS/2." Ron Garrett, IBM Corp., NY. *Buy DeScribe today.*

\$299 DeScribe 5.0 SE — Subscription Edition includes complete software and documentation, PLUS free upgrades and support through Dec. 31, 1995.

\$159 DeScribe 5.0 CX — includes complete 5.0 software and documentation, free installation support and access to Pay Support Services.

\$29 Lights — Continuous CPU Monitoring Utility. Automatically included in DeScribe SE and CX products.

To order, call: DeScribe, Inc.
CREDIT CARDS ONLY

1-916-646-1111 (West Coast)

1-813-732-5500 (East Coast)

*Execute REXX procedures from within DeScribe. Pass up to 100 variables.
*LAN, Site License, Windows™ and Windows NT versions available.

New DeScribe 5.0—Leader of the Pack

DeScribe 5.0 for OS/2 is here! This article details the features of this full-bodied, 32-bit application and tells how it can enhance your word processing and graphics projects.

Since its inception in 1989, DeScribe has been the only 32-bit word processor developed exclusively for OS/2. Coming directly out of the newspaper business, it might be characterized as an industrial strength word processor with the grace and finesse of a fine desktop publishing program. For those who have been initiated into this frame-based word-smithing powerhouse, there is good news—version 5.0 is out. Always an application designed for ease and practicality, DeScribe 5.0 now boasts new features that are either not available or not fully evolved in similar programs.

With DeScribe's editing and formatting features, you can use many different fonts in a variety of sizes while controlling the appearance of text with character set width, kerning, letter, and word spacing. A new Quick Format option enables you to see format changes before implementation. Even if you proceed and aren't satisfied with the outcome, Unlimited Undo will restore your work, step by step, all the way back to the point at which the document was last saved. This is accomplished with a slide bar, which also lets you restore steps by moving the slider forward.

Documents can be displayed in outline, draft, or WYSIWYG (what you see is what you get) views. The enhanced Zoom utility enlarges or reduces the size of your on-screen document for easy editing. You can also use it to compare and edit two views of the same document simultaneously. Personalizing DeScribe is a snap. From custom Tool Icons (you can customize existing tools or create separate tools of your own) to the Managers (provided for custom tools, document and stationary layouts, indexes, Table of Contents [TOCs], styles, special characters, frames, and

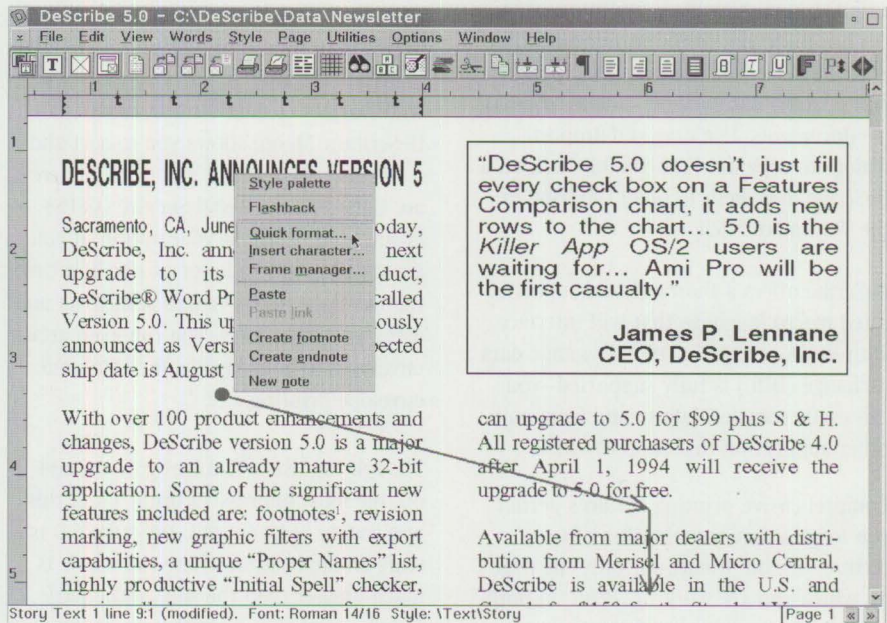


Figure 1. Linked Frames

menus), you can have it your way. Bubble Help (small pop-up explanations of tool icons) makes it impossible to lose your way. New, context-sensitive menus appear at a click of the right mouse button to facilitate your work flow.

Threaded Snapshots automatically back up your work—seamlessly—to protect you from system crashes. If the system terminates abnormally you can recover most—if not all—of your document from the snapshot. You can set the recording frequency through the detailed DeScribe preferences dialogs. DeScribe has a full range of user-definable settings including menus, macros, toolbars, colors, formats, dictionaries, etc.

The Spell Checker provides easy correction of your document through an interactive Definitions Dictionary and Thesaurus. There are also separate User Dictionaries (for your unique or context sensitive words), Document Dictionaries (for terms pertinent to a specific document only), as well as Group Dictionaries specifically designed for local area network (LAN) use.

"DeScribe 5.0 doesn't just fill every check box on a Features Comparison chart, it adds new rows to the chart... 5.0 is the Killer App OS/2 users are waiting for... Ami Pro will be the first casualty."

James P. Lennane
CEO, DeScribe, Inc.

can upgrade to 5.0 for \$99 plus S & H. All registered purchasers of DeScribe 4.0 after April 1, 1994 will receive the upgrade to 5.0 for free.

Available from major dealers with distribution from Merisel and Micro Central, DeScribe is available in the U.S. and

The frames surrounding text and graphics on document pages allow you to position text or graphics anywhere on a page. Linked Frames link one or more frames on the current page with frames on other pages (i.e., when an article begins in the front of a newsletter and is continued in a later section). Figure 1 shows two frames of an article linked together.

Stretchy Frames will grow with the amount of text placed into them. Figures or graphics can be maintained with the text that describes them through the Attach Frames feature. Header, Footer, and Template Frames can be set to repeat on all pages. Frames are as easy to move and size as windows on your desktop—making DeScribe one of the most flexible and powerful OS/2 layout tools around.

Tables are simple to create and manipulate in DeScribe. They will hold up to 100 columns and can contain as many as 100,000 cells. You can create multiple header rows, shade the cells, and maintain column styles when adding rows. Tables support simple arithmetic (e.g., multiplication, division, averaging) with fast select and sums.

DeScribe imports and exports text from every major word processor (more than 100 text filters are included) and translates 25 graphic file formats. You can use the built-in drawing tools to create your own graphics as well. Integration features don't stop here—DeScribe is an archetypal 32-bit true multitasking, multithreading OS/2 application. DeScribe supports drag-and-drop functions for graphics, fonts, and printing assignments—single or multiple documents. Use drag-and-drop in dialogs to organize lists. Double-click on a DeScribe document to open DeScribe in the Workplace Shell.

DeScribe offers a thorough and sophisticated macro language that will interface with REXX macros in OS/2. Dynamic data exchange (DDE) is fully supported—you can easily transfer data to and from any other application that supports DDE.

Comprehensive printing features permit you to print any combination of text, picture, or note frames—or only the page on which you are working. Print on both sides of the paper, even if your printer doesn't support duplex printing. You

can create your own booklets with DeScribe's Signature and Two-Up printing capabilities. Use Labels to create and print labels, or use Mail Merge to print personalized letters (or labels) from a mailing list.

DeScribe's Mail Merge is one of the most powerful around. Not only is it exceedingly fast, but it also supports data from a wide variety of data formats other than DeScribe's. Merge allows you to sort and select records and will automatically create United States Postal Service (USPS) Postnet bar codes, at your option. If you are creating only a letter or two at a time, the Envelope utility makes setting up and using envelopes easy—you can even attach envelopes to your layouts for automatic envelope printing.

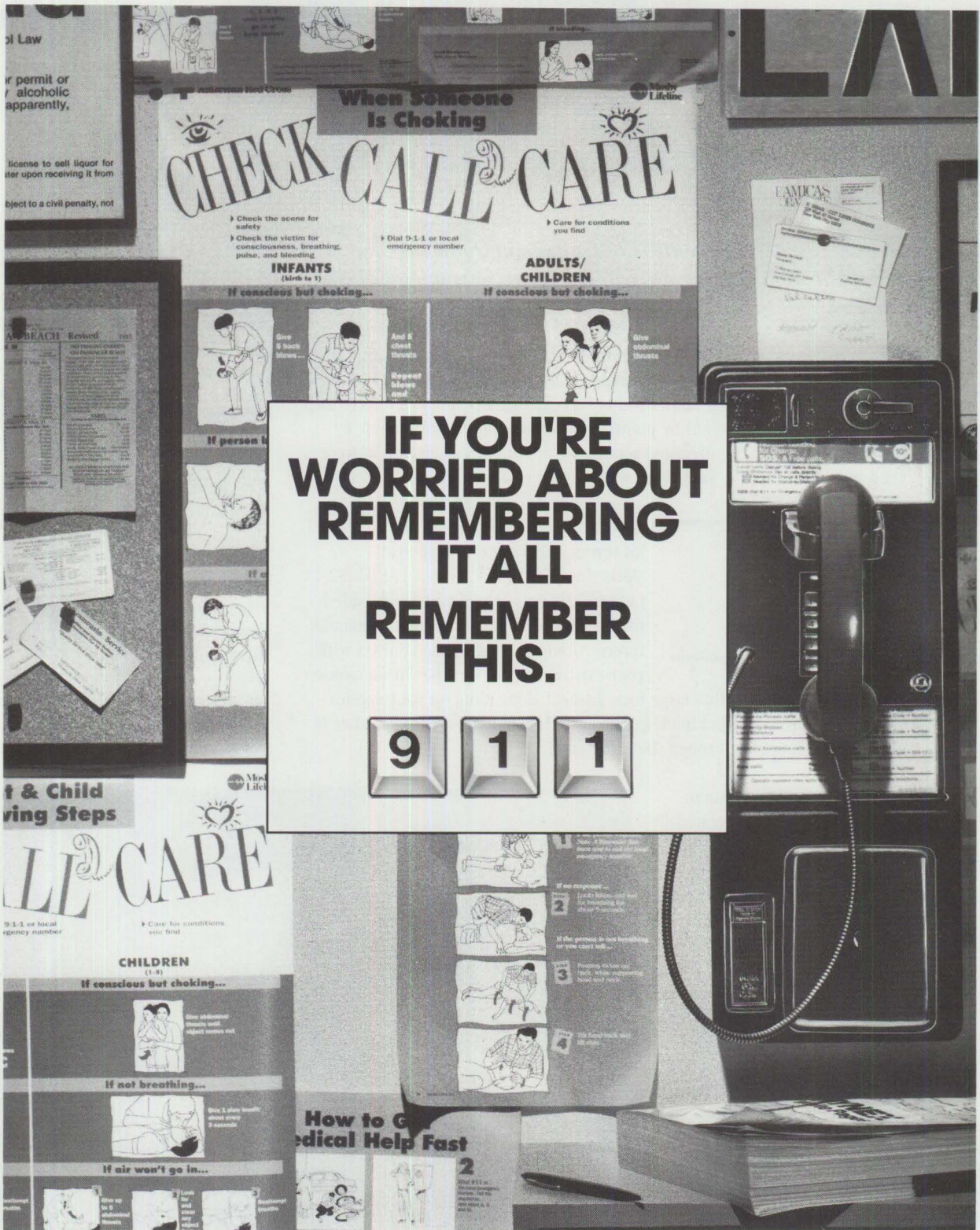
Though the list of features goes on and on, the most impressive thing about this application is its Gestalt: DeScribe 5.0 is truly an application where the whole is much greater than the sum of the parts. This becomes apparent the moment you sit down to use DeScribe for the first

time—and every time thereafter. If you are familiar with this product in its 4.0 incarnation, then you'll be pleased and impressed with version 5.0; if you've never used this product before, then you're in for a real treat.

For further information on DeScribe 5.0 for OS/2 or available Windows versions—Windows for Workgroups or Windows NT—contact DeScribe Inc., 4234 N. Freeway Blvd., Sacramento, CA 95834. Voice (916) 646-1111, Fax (916) 923-3447



Geoffrey Hollander is the president of Mail Pouch, an information handling company and computer services bureau specializing in creating and maintaining effective databases—primarily for direct mail campaigns and marketing. He has been in the direct mail and list business for over 12 years. He has also worked extensively with IBM in testing OS/2 2.0 and 2.1 and is a computer hardware and software review writer for several industry magazines.



In an emergency, help isn't on the way unless someone calls. So don't hesitate, call 9-1-1 or your local emergency number before you do anything else. It's one life-saving technique that's always easy to remember.



To learn more about life-saving techniques, call your Red Cross.



Super-Fast PenDOS

This article discusses the IBM PenDOS operating environment—its architecture, application development, and comparisons to other pen environments.

PenDOS is a pen operating environment that runs on top of existing DOS operating systems, adding pen support and capabilities for existing DOS applications. PenDOS allows you to run existing DOS applications (which know nothing about the pen) by pointing to desired objects with a pen, by writing text that is recognized and sent to the application as if the text were typed in, and by tapping keys on a “soft,” on-screen keyboard.

Rick Abbott
IBM Corporation
Boca Raton, Florida

You can purchase PenDOS as an end-user kit through IBM's Direct Response Marketing program. (Call [800] 3IBMOS2 [342-6672].) It is also available preloaded from a variety of mobile computer manufacturers. Although you can use PenDOS with your existing mouse, writing with a mouse

is like trying to write with a large rock! Instead, depending on your application, you will probably find it advantageous to buy a digitizer that attaches to your desktop computer through the serial port.

Mobile users are beginning to buy computers with integrated digitizer displays. This mobile market, where speed and power management are prime concerns, is where PenDOS really outshines other pen operating systems.

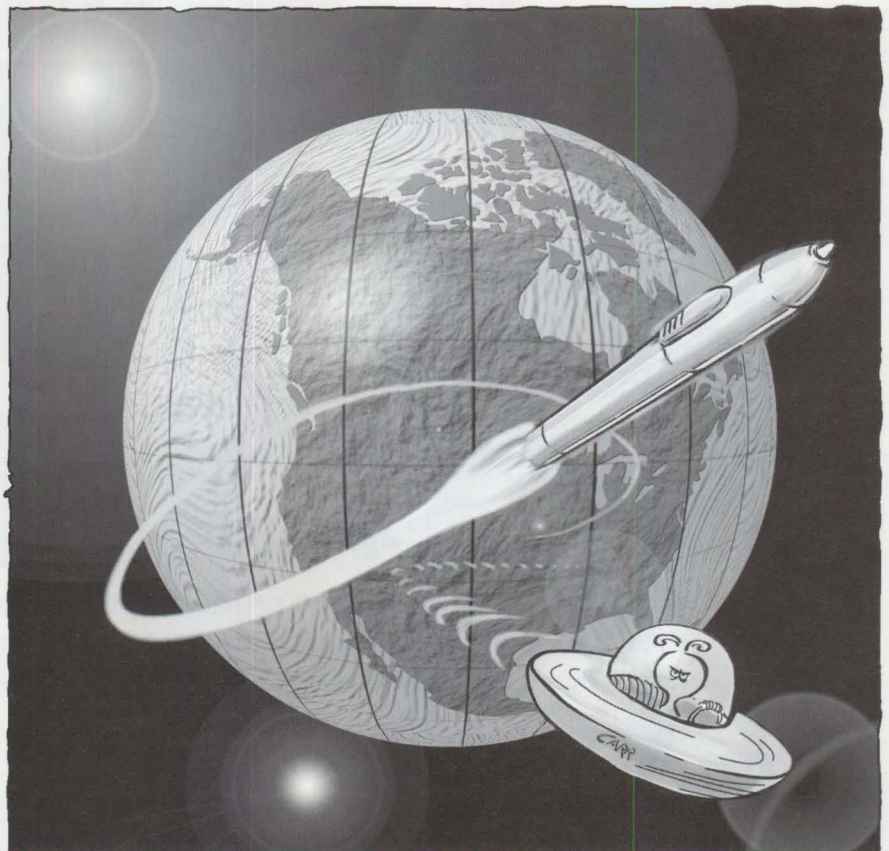
PenDOS Implementation

PenDOS is a 48 KB terminate-and-stay-resident (TSR) program that runs on top of DOS 5.0 or higher. This TSR emulates a computer mouse, provides a soft, on-screen keyboard for keyboardless tablet computers, and accesses the handwriting and gesture recognition engine.

The handwriting recognition engine runs in about 450 KB of high memory, using the expanded memory specification/extended memory specification (EMS/XMS) virtual control program interface (VCPI) memory manager. A gesture

macro editor lets you remap the actions associated with each gesture for a program or a group of programs. (*Gestures* are editing symbols that give a command; for instance, a “pigtail” gesture means delete a single character.) A trainer is provided that allows you to “train” the recognition engine to your specific writing style.

Two applets come with PenDOS. The first, a fax applet, allows you to draw and/or write a note to be faxed and then to write the fax number to be dialed. The second applet is an example of expense-account tracking and shows how intuitive it is to track numbers when you can simply write in the expense amount. The product also includes PSETUP, which allows you to control where ink-flow appears in relation to the pen tip.



PenDOS Uses

You can do two basic things with PenDOS: run existing applications that know nothing about the pen (pen-unaware applications) and run applications written to the PenDOS application programming interface (API) (pen-aware applications).

To run a pen-unaware application, you start the application after installing PenDOS. Usually, on a pen computer, you use a mouse-aware shell or program starter to start applications by tapping on the program name or icon. If no shell or starter is available, you can still start the application from the DOS command prompt by simply holding the side (barrel) button and moving the pen in proximity to (close to, but not touching) the upper right corner of the screen until the "PenDOS menu" appears (see Figure 1).

Now, tap on K to bring up the PenDOS keyboard (Figure 2), then type the program name to be started. Or, tap on WW, which brings up the Writing Window (Figure 3).

When the writing window appears, write the program name, then hit the Send or Enter key to start the desired application.

Once the pen-unaware application is running, you can point to or mark items using the pen. PenDOS will send the appropriate mouse commands to the application to perform the desired action.

The pen is a more efficient pointing device than a mouse, because a pen can be picked up and pointed directly at a desired item. (A mouse must be physically moved some distance, so it can't "point" directly at an item.) You can also make gestures in a pen-unaware application. For instance, in an editing program, you can make the "insert" or "^" gesture, which brings up the Writing Window on top of the application. The recognized text will be sent to the application at the point where the tip of the ^ gesture was drawn.

A pen computer is generally used with pen-aware applications, but the ability to use existing and familiar applications is a definite advantage. You would probably not try to write an entire document or build an entire spreadsheet with a pen, but you might want to modify a form letter and then fax it from your mobile computer. Or if you are a tax consultant

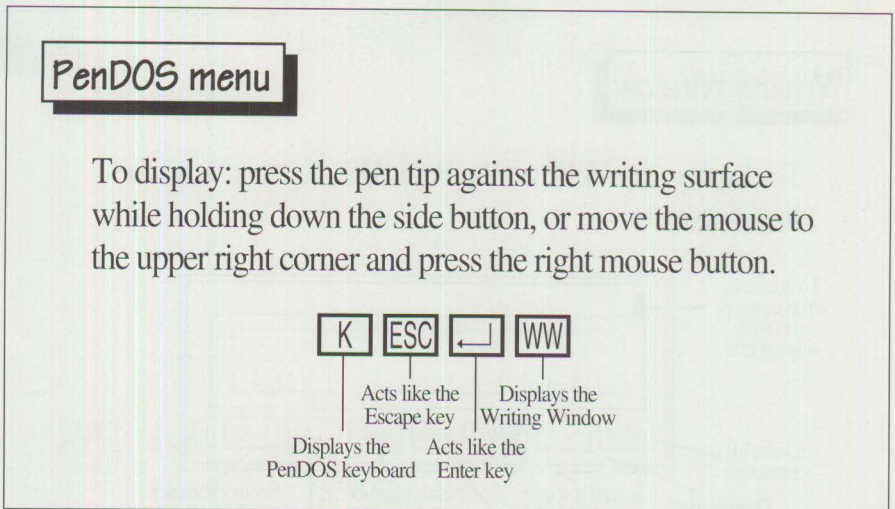


Figure 1. PenDOS Menu

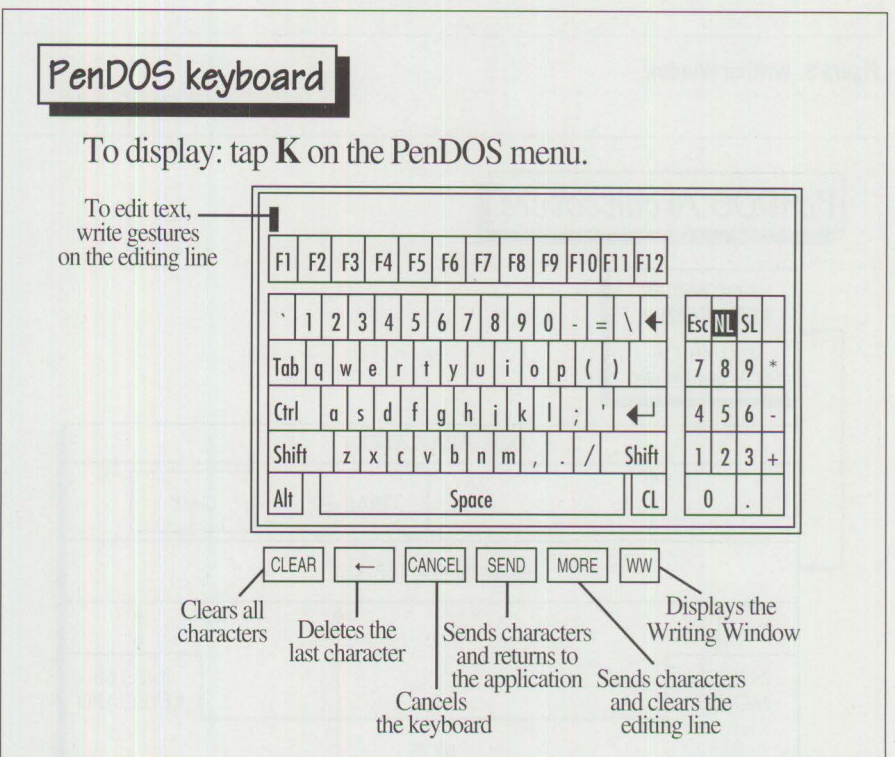


Figure 2. PenDOS Keyboard

or mortgage broker, you might want to change a few cells of a spreadsheet while you are with a customer.

A pen-aware application is used in a much more intuitive way than a pen-unaware application. A pen-aware application allows you to enter handwriting directly into a field rather than into a pop-up Writing Window. Pen-aware applications generally disable gestures while in the application, since a well-designed application does not require them. Most applications in this category simulate filling out

a form with information that is either used on the spot (such as a mortgage calculation) or used later on a server or host (such as a parking ticket).

Good pen-aware applications minimize the use of handwriting input through selection boxes, scroll lists, etc. Some pen-aware applications eliminate redundant handwriting by providing a list of previously recognized entries for a given field. You can write a new entry or tap on an existing one. Some of the development tools for PenDOS allow a non-programmer

Writing Window

To display: tap **WW** on the PenDOS menu or write the Insert gesture.

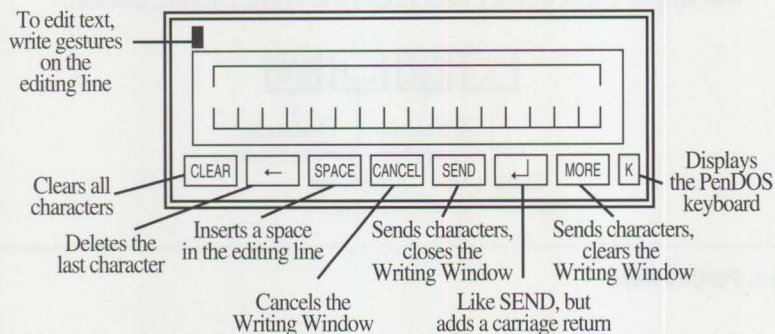


Figure 3. Writing Window

PenDOS Architecture

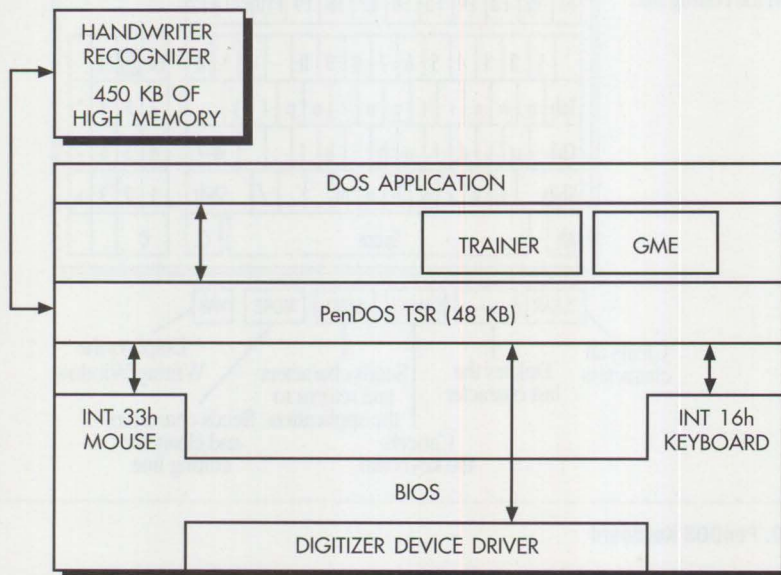


Figure 4. PenDOS Architecture

to develop a graphical, pen-aware application in just a few days.

Architectural Overview

The overall architecture of PenDOS is shown in Figure 4.

The core of PenDOS is its 48 KB TSR. This component manages input from the pen digitizer device and determines whether

ink should be displayed (as in handwriting input mode or gesture input mode) or not displayed (as in regular pointing or mouse emulation mode).

The TSR services the PenDOS API calls from a pen-aware application, providing inking service in both text and graphics modes and a pop-up handwriting window for use in pen-unaware applications.

The TSR manages data flowing into and out of the handwriting recognition engine. For pen-unaware applications, the TSR converts recognition results into standard DOS INT 16h keyboard interrupts. For all applications, the TSR converts pen movement into DOS INT 33h mouse interrupts, allowing the application to "see" pen movement as easily as mouse movement. Finally, the TSR executes the keystroke actions associated with a gesture by using specified or default mappings. The gestures may be mapped to either keystroke or mouse actions.

The handwriting recognition engine or "recognizer," which runs in high memory, carries the registered trademark Handwriter and was developed by Communication Intelligence Corporation of Redwood Shores, California. Handwriter is very fast; users describe its recognition performance as "snappy." Seven language versions are currently available: US English, UK English, French, German, Italian, Spanish, and Japanese (including both Katakana and Kanji). Chinese, Korean, and Taiwanese may be available in the future. All recognizers use less than 0.5 MB of high memory except the Japanese version, which uses about 1.5 MB.

All of the recognizers recognize text in three modes: boxed, ruled, and gridless. In *boxed* mode, you are instructed to write inside a visible box. The recognizer can then determine when one character ends and another begins; all character strokes should be inside, or begin inside, a box. The task of distinguishing which strokes belong to a character is called *segmenting*; segmenting is easiest for the recognizer in boxed mode.

In *ruled* mode, things get more difficult for the recognizer, since the boxes are gone and only an underline ("rule") remains. The recognizer can use the line to help resolve capital-letter versus lowercase interpretations, but segmenting between characters horizontally becomes more challenging. Handwriter is so robust that you can write one character directly on top of another in ruled mode and get excellent recognition.

Gridless mode is the most difficult. In this mode, no boxes or lines are shown; you

simply write in an open window with up to 40 degrees of tilt. Now the recognizer must really work to determine the intended case of a character as well as its segmentation.

Much effort has gone into developing these engines. Handwriter recognition engines seem to outperform competitive engines in the accuracy of untrained (walk up and use) results. (More about recognition accuracy later.) Even if two or more people use the same computer, Handwriter performs well.

The engines can be trained to a particular user's handwriting style by using the supplied trainer, but most users don't seem to need it.

Future versions may include language modeling and word-list post processing. *Word-list post processing* means recognition results can be improved by cross-checking the results with a user-provided word list. Language modeling relies on common word structure in a given language to improve recognition accuracy.

The gesture macro editor is responsible for setting up the mapping tables (gesture to keyboard or mouse actions) that are used by the PenDOS TSR. Eight gestures (shapes) are available, and each has a default association or mapping. You can modify the mappings for a particular program by naming the application's .EXE file, then changing the gesture-action pairs. This allows you to use consistent gestures across different programs, even if the programs use different keystroke or mouse commands to achieve similar functions.

As an example, many editing and spreadsheet programs use different commands to delete data. You can simply map the "pigtail" gesture, which usually means delete a single character, to achieve consistent results across the applications. Figure 5 shows the gestures and their default associations.

The PSETUP application allows you to adjust where ink flow is displayed in relation to the pen tip. Many users hold the pen tip at varying angles. Some left handers hold the pen at angles quite different from right handers. All of these pen-alignment differences are easily corrected by PSETUP.

Gestures

To write gestures: hold down the pen's side button or press both mouse buttons.

Gesture	Action	Universal
	Delete a character.	yes
	Delete a highlighted block.	yes
	Display the Writing Window and insert text at this location.	yes
	Insert a space.	yes
	Tap—simulates clicking the right mouse button.	yes
	Copy a highlighted block.	no
	Paste previously copied characters.	no
	Undo the last action.	no

Figure 5. Gestures Menu

Figure 6 contains a list of currently supported hardware devices. More are being added all the time.

PenDOS in IBM's PC DOS

A limited-function version of PenDOS comes with every copy of IBM's PC DOS. This version includes the PenDOS core, which provides mouse emulation, soft-keyboard emulation, and the pop-up handwriting window. The "limited" part refers to the handwriting recognition engine, which recognizes numbers and gestures but not characters.

If you like the limited-function PenDOS and want to get full character recognition plus the trainer and gesture macro editor, you can return the coupon included in the PC DOS package, along with a small fee, and receive the rest of the PenDOS components. This arrangement gives PC DOS customers a significant savings over the end-user price for PenDOS.

AceCAD Acecat
 APT GLIFFIC
 CalComp D-Pad
 Compaq Concerto
 Dauphin 5000
 Dauphin DTR-1
 Fujitsu 325Point
 IBM ThinkPad 360T
 IBM ThinkPad 710T
 IBM ThinkPad 730T
 IBM ThinkPad 750P
 Kurta XGT
 Logitech Mouse
 MicroSlate Datellite
 Microsoft Mouse
 NCR 3125
 NCR 3130
 NEC VERSAPad
 Phoenix Pen BIOS
 Samsung PenMaster
 Toshiba Dynapad
 Wacom 510c
 Wacom HD648A
 Wacom PL100V

Figure 6. Hardware Devices Supported by PenDOS

PenDOS Versus Windows for Pen Computing

I am continually asked to compare PenDOS with Windows for Pen Computing. While there is no clear winner for every situation or environment, I feel that PenDOS is a better, faster, and more cost-effective solution for most mobile needs.

First, let's discuss "better, faster." The handwriting recognition speed and accuracy of Handwriter on PenDOS seems to be much better than that of Windows for Pen Computing. I say "seems to be" because there is not yet an industry-recognized benchmark or standard test for measuring handwriting accuracy. However, internal handwriting tests show a significant difference in both the speed and accuracy of handwriting recognition. I have also had hundreds of people at industry shows and conferences tell me that the PenDOS handwriting recognition is much more accurate and "snappy" (referring to the speed of recognition).

What about "more cost-effective"? I have had customers do pilot projects on both PenDOS and Windows for Pen Computing. One application was for inventory control by delivery personnel, a fairly straightforward form-fill application. The PenDOS version ran fast on a 2 MB RAM mobile computer. The Windows for Pen Computing version needed 8 MB of RAM to obtain similar performance. Since most delivery personnel are not concerned with manipulating the Windows graphical user interface and simply want a fast graphical user interface in the application, PenDOS provided a more cost-effective solution (a savings of 6 MB of RAM on every mobile machine).

I talk with many users of Windows on desktop computers who assume that they should run Windows for Pen Computing on their mobile machine so they can run the same applications. This seemingly good idea doesn't work out in actual projects. The reason is simple: desktop applications are not written with the mobile, keyboardless user in mind. Good pen applications are designed with some key differences that make them much more suitable for the mobile worker:

- Good pen applications for the mobile worker minimize handwriting, or at least redundant handwriting. Because the pen is such a natural, fast pointing

device, you can efficiently point to short selection lists.

- Good pen applications provide a larger handwriting input area than the area provided by a desktop application expecting keyboard input. (Almost everyone's handwriting is larger than the average typed font.)
- Good pen applications allow you to easily review data without using keys like Esc or Page Up.
- Good pen applications limit the search domain for many fields to minimize recognition errors. One example of a limited search-domain field is a numeric-only field, which recognizes only numbers. Others might be valid account numbers, states of the United States, valid ZIP codes, and so on.
- Mobile workers generally need applications that make data gathering easy and efficient. Desktop applications are usually rich and extensive in the function they provide; sometimes they are too rich and therefore consume too much resource for the mobile user.

Because desktop applications are not optimized for the mobile environment, a well-designed mobile pen application can outperform a desktop application in terms of usability and speed for the specific functions needed.

When you want to exchange data with a desktop Windows database or spreadsheet application, it's often best to write a robust mobile application to run on PenDOS. This application can maximize ease of use with speed and cost efficiency. This PenDOS application then simply feeds the data in the proper format to the desktop Windows application.

What about multitasking? If you need true preemptive multitasking, certainly OS/2 and Pen for OS/2 are the clear choice. But many mobile users may do only one or two tasks. Because both Windows and IBM's PC DOS give you this task-switching ability (PC DOS does it via Task Switcher), task switching in itself is not a reason to choose Windows for Pen Computing over PenDOS.

What about graphics? Windows gives the programmer a rich set of graphical user interface (GUI) objects, but at a cost. That

cost is size and performance. Almost all of the function in the Windows GUI that is needed for a mobile application is available in most of the development tools for PenDOS.

Toolkits for Writing PenDOS Applications

DOS programmers can write directly to the PenDOS API. Call IBM's PenAssist program at (404) 835-9900 for a toolkit that specifies the API and includes some sample code. Libraries are included for C and Assembler languages. The PenDOS API consists of eight basic function calls that allow the programmer to open recognition windows, get recognition events, write to recognition windows, etc.

While many programmers are very efficient at writing code at this low level, you can still benefit from using one of the many high-level development tools available for PenDOS:

Menuet/CPP—Autumn Hill Software Inc., (303) 494-8865—A complete GUI application toolkit implemented in C++ and based on Motif. Menuet/CX, which offers more cross-platform capability, is also available.

Clarion Pen Developer—Clarion Software Corporation, (800) 345-5444—A rapid GUI application development environment with a built-in database manager. This product received *PC Magazine's* "Award for Technical Excellence" and "Editor's Choice" awards, as well as *InfoWorld's* "Recommended Products Assurance Seal."

Pen-Friend—C-Star Software, England, +44-51-666-1104—A form-fill application generator that can be used by non-programmers.

HyperPAD—IQ Technologies, (713) 876-0030—Allows novice programmers to build applications by simply cutting and pasting the desired screen objects. It includes two dozen applications that can be customized.

MetaWINDOWS—Metagraphics, (408) 438-1150—Provides a rich graphics toolkit for C, C++, and Assembler programmers.

Power PEN PAL—PEN PAL Associates Inc., (415) 917-6950—Provides a graphical

application development environment suitable for both non-programmers and experienced programmers. PEN PAL can be used with existing C code to turn non-pen programs into pen-aware programs.

HI-SCREEN Pro II—Softway, Inc., (800) 338-2852—A powerful user interface system that supports nearly all popular programming languages including C, C++, BASIC, Pascal, COBOL, FORTRAN, xBASE, and others.

Zinc Application Framework 3.5—Zinc Software Inc., (801) 785-8900—Enables writing multiplatform applications. Supported platforms include DOS, Windows, Windows NT, OS/2, and OSF/Motif.

Because only the GUI objects needed for the application are linked, these applications are usually much smaller than a comparable Windows application or system. In fact, a tool like PEN PAL is specifically intended to rapidly develop form-fill applications for the mobile user. (See the "Development Environment for Pen-Centric Applications" article in this issue.) PEN PAL applications can be developed in much the same manner as Windows Visual Basic applications, but the PEN PAL application will be much smaller with its objects more custom-tailored to the mobile user. The resulting application usually requires less memory and runs faster.

Develop Fast, Run Fast

PenDOS is offered as part of a family of pen offerings from IBM. It provides an excellent solution for the user needing a fast, single-task, resource-efficient pen operating environment. In fact, PenDOS "screams" on any 486 pen computer and needs only 2 MB of memory. If you want to develop fast and run fast, PenDOS is the obvious choice.

Rick Abbott is an Advisory Programmer with the IBM Natural Computing Technology team in Boca Raton. He joined IBM 11 years ago after graduating from Ohio State University with a BS degree in Computer Science. Rick is currently the PenDOS project manager. His Internet address is rabbott@vnet.ibm.com.

VNR KNOWS CLIENT/SERVER



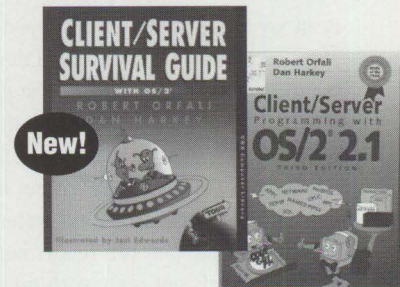
Ask for these and other VNR titles at your local bookstore.

Van Nostrand Reinhold

115 Fifth Avenue, New York, New York 10003
1-800-544-0550 73373.64 @compuserve.com

OS/2® is a registered trademark of the IBM Corporation.

Read these two important books from bestselling authors Robert Orfali and Dan Harkey...



Client/Server Survival Guide with OS/2®

Provides a sweeping tour of client/server and distributed objects. An easy-to-follow guide that comprehensively reviews the technology, standards and over fifty commercial OS/2 client/server products. Offers 969 pages of essential information plus 400 illustrations.

\$39.95 0-442-01798-7
IBM #SR28-5494

Client/Server Programming with OS/2® 2.1, 3/E

The Second Edition won "The OS/2® Book of the Year" from OS/2® MONTHLY. Readers said individual chapters were, by themselves, *worth the price of the book*. And they're right! This new 1,142-page edition is a *must have* for all client/server and OS/2 programmers.

\$39.95 0-442-01833-9
IBM #G325-0650-02

Please circle #11 on reader service card.

1644

Pen for OS/2

Pen for OS/2 is IBM's pen environment for the OS/2 operating system. This article includes an overview of the architecture and major subsystem functions, the OS/2 Pen input method and its use of OS/2 Presentation Manager, plus the future directions for Pen for OS/2.

IBM Personal Operating Systems Group's vision of natural pen computing ranges from the handheld, battery powered, keyboardless personal digital assistant to HUMAN-CENTERED desktop pen support for OS/2 on the PowerPC. At this point you might ask, "Why use a pen? What advantages does it provide that I can't get with a mouse?"

The answer is that the pen offers more function than the mouse. The mouse is an x-y pointing device equipped with buttons and tracking movement. The pen is a more natural data device, incorporating all the mouse's function as well as revealing the pen's height, pressure, and proximity to the screen device. In addition, the pen reports more data points than the mouse, resulting in higher resolution. *Data points* are the x-y coordinate positions reported to the operating system by the particular pointing device (mouse or pen). Whereas the operating system either consolidates or samples mouse data points, the pen can report between 80 to 200 points per second at 200 to 1,000 points per inch, with no point consolidation, allowing for better handwriting accuracy and smoother curves. The pen facilitates natural computing; integrated sensor and display devices help to mimic the pen and paper paradigm.

Judy Schwait
IBM Corporation
Boca Raton, Florida

Software for Today

As a system software extension to the IBM OS/2 2.1 operating system, Pen for OS/2 (Pen) supports the pen as an input device in the desktop and portable computing arenas. It encompasses the midrange to high-end markets targeting the 32-bit multitasking environment.

Pen exploits the "ink" paradigm with note taking, text and image annotation, freehand drawing, signatures, and teleconferencing functions. With a Workplace Shell interface, Pen uses Presentation Manager (PM) for pen-based input and recognition. It is packaged as a set of dynamic link libraries, device drivers, and tools.

Although the pen is the primary source of input, Pen for OS/2 supports, without modification, existing applications that use the keyboard and mouse. These applications that were not designed for use with the pen are called *pen-unaware* applications. The Pen Compatibility Layer handles this compatibility function by mapping the pen events to the mouse and keyboard events. Compatibility support is provided for pen-unaware applications in PM, virtual input/output (VIO), DOS, and Win-OS/2 sessions. Pen for OS/2 has complete mouse emulation for use with OS/2 and existing applications.

Pen currently supports hardware device drivers for pen-enabled notebook computers, tablet computers, and opaque desktop tablets from IBM, Kurta, Wacom, Calcomp, Logitech, APT, AST, GRiD, Compaq, Dauphin, TUSK, and others that are designed for using the pen as the primary input device.

Gestures

A key feature of Pen is its support for recognizing gestures and handwriting. *Gestures* are symbols representing sets of strokes that, when recognized, are mapped into specific commands or command sequences. You can use Pen's predefined gestures or customize your own gesture mappings. For example, you can map a gesture to send the keystrokes for the DIR command to an OS/2 window. Gesture and text recognition support is available for all existing applications as well as those written especially for Pen.

Pen's Workplace Shell interface allows device, system, and gesture customization through the use of new Workplace Shell pages and objects. The Customization object lets you train the system for your particular style of handwriting and change systemwide gesture assignments.

You can also configure gestures on a per-object basis through the Gesture page in the Settings notebook of Program objects and Program File objects. Pen settings have also been added to the Mouse object and Sound object.

Pen-Aware Applications

The degree to which a program uses Pen's capabilities determines its pen-awareness. Pen-aware applications take advantage of the new controls, application programming interfaces (APIs), and messages defined in the Pen for OS/2 Developer's Toolkit.

You can use the Pen functions to various degrees to develop Pen applications. At a

minimum, you can create a pen-aware application using Pen to detect gestures in your application development. For a full-blown pen application, you can use all the features contained in the Toolkit to manipulate processing and to interpret the pen input for the application. Programs can also narrow the context of character recognition to increase accuracy.

Pen for OS/2 extends the functions of the existing PM input subsystem by providing new APIs as shown in Figure 1.

Pen for OS/2 Architecture

Pen for OS/2 provides device independence that shields you from the differences in hardware devices. During installation, the device driver (furnished by the manufacturer) registers itself and defines all events and device capabilities with the IBM Pen for OS/2 Device Services. The Device Services layer provides a consistent programming interface to software developers. The Toolkit offers tools for writing pluggable drivers.

New window control APIs provide an interface to the new controls supplied with the Pen extensions: handwriting recognition control and sketch control. These APIs can be used to customize and manipulate data flows. The sketch control provides stroke inking and buffering for creating applications requiring signature capture and annotation. The handwriting recognition control allows you to build forms in an application through handwritten entry. Using this control, strokes are inked and recognized, and editing and correction gestures are handled. Two Pen for OS/2 tools that use these controls are the Handwriting Input Pad and the Sketch Pad.

Pen for OS/2 supplies sample applications and tools to deal with pen-unaware applications:

- Gesture Practice lets you view and practice drawing predefined gesture shapes.
- Sketch Pad uses the sketch control to collect strokes and capture images that you can cut and paste to the clipboard to use as bitmaps in a pen-unaware application.
- Telepen allows communication through handwritten notes and graphics across

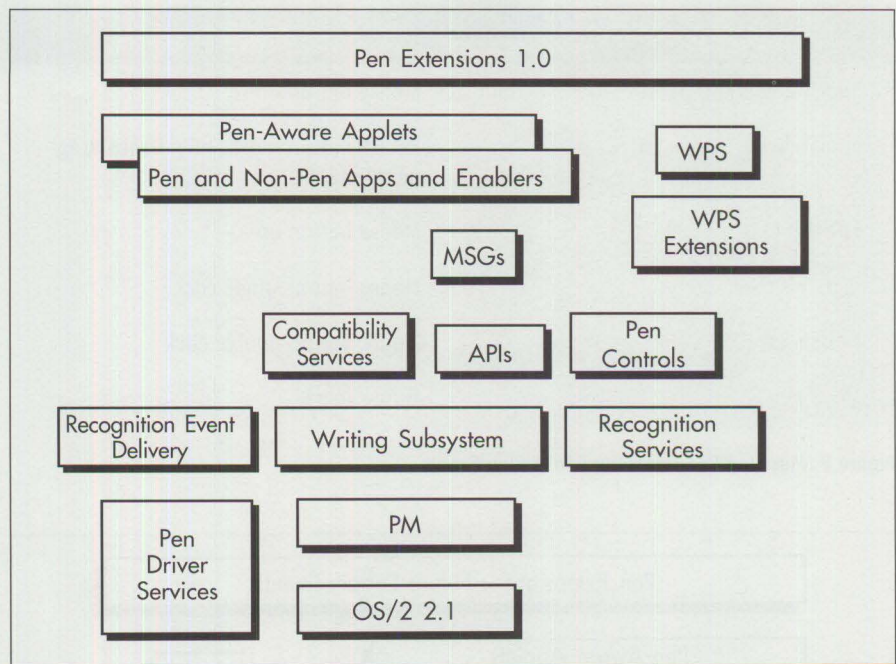


Figure 1. Pen for OS/2 Components

a local area network (LAN). Its purpose is to act as a networking conferencing application.

- Pen Tool Bar provides easy access to functions such as emulating the right mouse button, starting the Handwriting Input Pad, or displaying the Pop-Up Keyboard.

The Pen writing subsystem APIs see and control the pen and stroke data, interface with the pen subsystem facilities, and provide device and system control. New OS/2 messages, such as WM_TOUCHDOWN, WM_LIFTOFF, WM_EXIT_PROXIMITY, and WM_RECO report the various events and state changes associated with Pen.

The writing subsystem delivers the strokes. It receives stroke data from the input queue, determines which window gets the data, and sends PM messages to that window. Pen maintains a stroke buffer that collects all points in pen movement between the touch-down point and the lift-off point. On stroke completion, Pen sends a WM_STROKE message to the application. At this point, the application can access the stroke data through an API.

Recognition Event Delivery

The Recognition Event Delivery (RED) component helps you interpret command-recognition events such as gestures. Its purpose is to deliver recognition results

to applications. The RED component maps these recognition results to assignments defined by you or the system. You can access and set these assignments through the Program or Program File objects settings and the Pen Customization object settings.

Assignments can be predefined commands packaged with Pen such as Close Window, or they can be the name of a program to be started. The predefined command Send Keystrokes lets you play back a set of keystrokes to the target window when a gesture is drawn.

For pen-unaware applications designed to work with mouse and keyboard input, the Compatibility Layer provides the necessary interface. It allows programs to work in the pen environment without being altered for pen use. The main function of the Compatibility Layer is to convert pen events to mouse and keyboard events or to invoke special-purpose command handlers that can be registered with the system. For pen-unaware applications, the Compatibility Layer collects strokes on behalf of the application, then tries to recognize the strokes as a gesture. If a shape is matched, an event is sent to the Recognition Event Delivery component.

Some examples of mapping of Pen for OS/2 operations to mouse events are shown in Figure 2.

Pen Operation	Mouse Event
Touch down and pause	Mouse button down
Touch down, pause, move	Mouse button down, then begin drag or selection
Lift off	Mouse button up
Tap	Mouse button single click
Double tap	Mouse button double click
Move pen	Mouse move

Figure 2. Mapping Pen Operations to Mouse Events

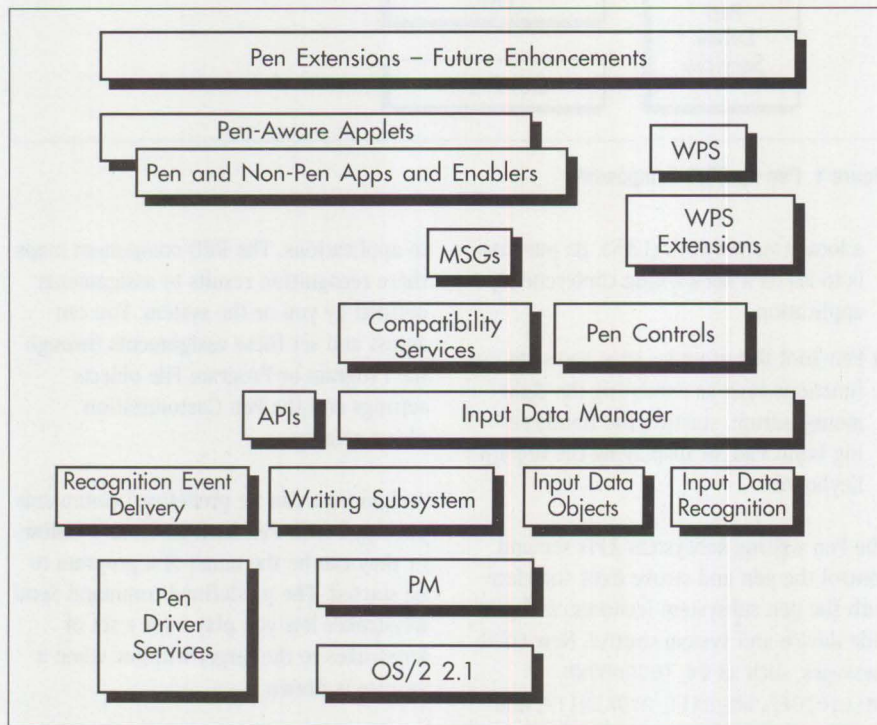


Figure 3. Pen Extensions—Future Enhancements

The Future of Pen

Tomorrow's version of Pen for OS/2 will have new programming interfaces for handwriting and stroke collection. This includes the Input Data Framework (IDF), a new system object model (SOM)

framework using the Input Data Objects (IDO) to capture and manipulate ink, the Input Data Recognition Objects (IDR) to recognize ink, and the Input Data Manager (IDM) to process results. Other new features include enhancements to the

handwriting recognition control, handwriting recognition and editing support in the single line edit (SLE) and multi line edit (MLE), and new APIs and messages. These enhancements can further simplify making existing applications pen-aware and can help create new pen-aware applications.

Also in the future are enhancements for writing in any text window, adjustable pen input rate, gesture assignments for more Workplace Shell objects, asynchronous support for Telepen, integrated Workplace Shell gesture support, and visual and functional updates to the pen sketch and handwriting recognition controls. Figure 3 displays some of these plans for pen products.

The Vision

Pen for OS/2 provides an open architecture with a number of well-defined socket interfaces for device and recognition providers. The pen opens up features in the operating system and applications that were not previously available with the keyboard and the mouse. It allows for freehand drawing, gives a more natural input device, and interprets ink as handwriting and gestures. The vision for Pen for OS/2 is to establish the pen as a primary source of input for OS/2.



Judy Schwait has worked for IBM for five years. She is a Senior Associate programmer in Boca Raton, Florida, working with the Pen for OS/2 Software Development team

on the handwriting recognition programming interfaces.

A Development Environment for Pen-Centric Applications

Power PEN PAL from PEN PAL Associates, Inc. is a pen application development environment (ADE) within which you, as a developer, can design and build customized applications to run on pen-based computers under the DOS operating system. This article outlines the capabilities of Power PEN PAL and describes the Power PEN PAL ADE and how it fits in the pen-based computer arena.

Power PEN PAL was designed for people who have some background in programming. The application designer uses a high-level language that is almost self-documenting. If you are familiar with constructing database or spreadsheet macros, or with any programming language, you'll find Power PEN PAL delightful to learn, easy to use, and down-right habit-forming. The applications you can produce with Power PEN PAL are limited only by your imagination!

Nathan Gold
PEN PAL Associates, Inc.
Los Altos, California

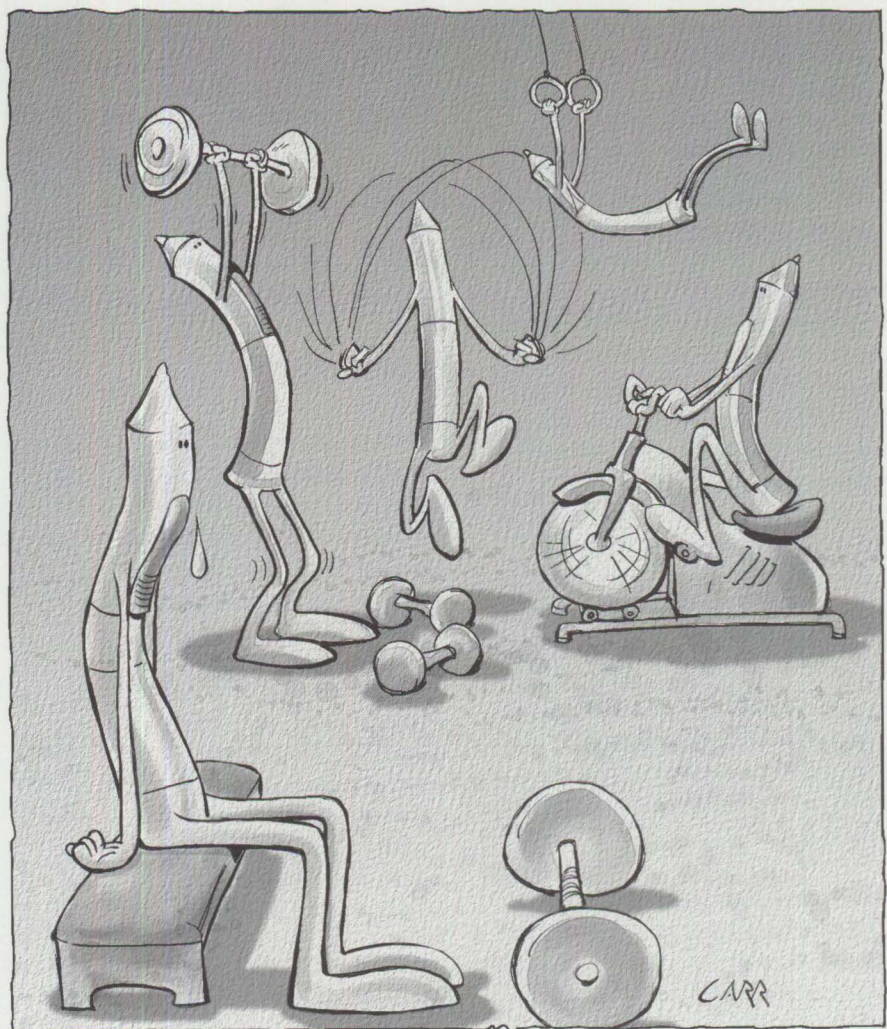
Power PEN PAL, a tightly integrated development environment, lets you link in your own custom C code. Developers using Power PEN PAL report being able to write, debug, and test applications in half the time it would take in C or another language.

The Application Development Environment User Interface

Power PEN PAL offers you an easy-to-use interface with a complete set of tools. The ADE comes packed with a rich set of features that help cut the development time and allow for many changes during the

development cycle. You are given a full compiler with many features not found in most development environments available today:

- The screen-design feature set allows for the ultimate in creativity when designing end-user screens. Currently, screens can be designed for seven sizes: 640 x 480, 640 x 400, 640 x 200, 320 x 480, 320 x 240, 256 x 320, and 200 x 320 pixels.



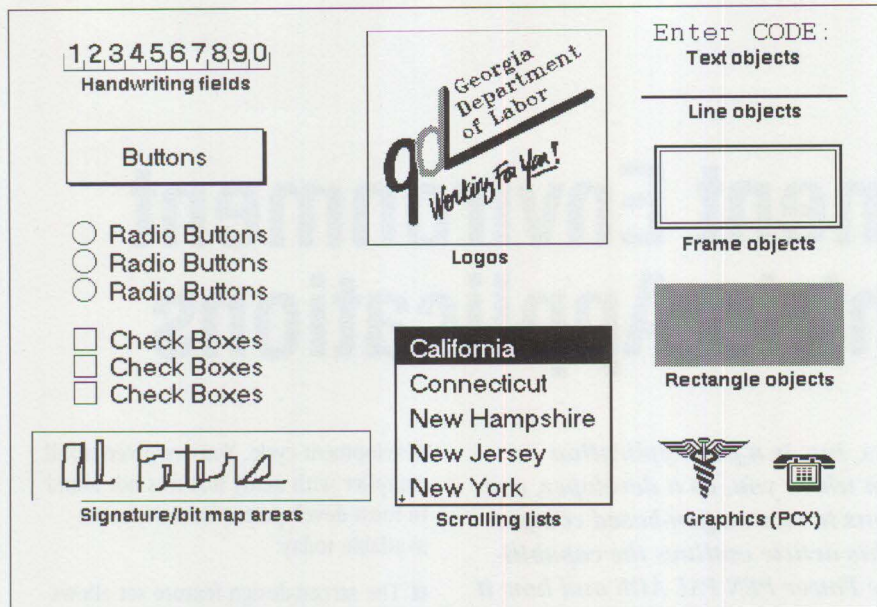


Figure 1. Power PEN PAL Object Types

- A built-in database engine provides the ability to read and write dBASE-compatible files with full index usage.
- A data communications engine provides XMODEM and YMODEM protocols for use with direct-connect, dial-up communication. Radio-frequency (RF) modem communications currently works with a variety of RF modems.
- Menus can be accessed either by mouse or the standard Alt and Ctrl keys.

Screen Design

Screen design offers a WYSIWYG (what you see is what you get) environment within which to develop each screen. A full selection of object types enables you to control precisely how the end user interacts with your application. When designing an application, you can choose either landscape or portrait format, depending on the screen's orientation. Figure 1 shows some of the object types available in Power PEN PAL.

To place an object on the screen, simply choose the Object menu (Figure 2), and select an object. Then place that object on the screen, and enlarge or shrink it to the desired size.

Once you've placed the objects on the screen, you may need to align them to one side or space them either horizontally or vertically. In addition to aligning the objects, you may need to match sizes. To

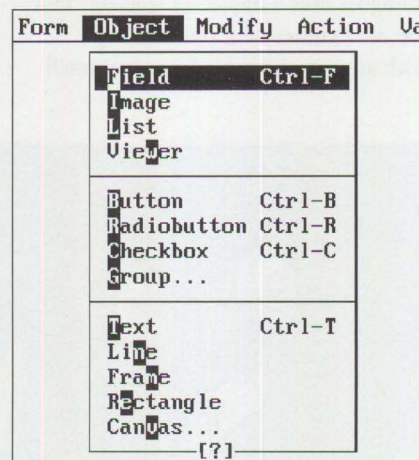


Figure 2. Object Menu

do these things, Power PEN PAL offers a Modify menu (Figure 3) with a set of choices for aligning, centering, stretching, nudging, even-spacing, and same-sizing your objects. These capabilities make it easy to quickly produce professional looking screens.

A clipboard enables you to duplicate objects on the same screen or to copy objects to another screen in your application. By pasting objects from one screen to another, you can be assured that the copied objects will be in precisely the same place, making your applications more intuitive and easier to use.

Power PEN PAL also has a "subform" feature, which gives you a quick way to re-use the same objects and actions in

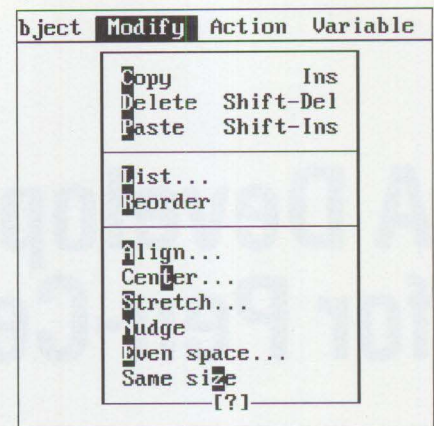


Figure 3. Modify Menu

multiple screens. This feature eliminates the need for duplicate objects and code throughout your application.

Programming Your Application

You will find Power PEN PAL's application creation environment easy to use and to remember. A syntax builder is built into the menu system, eliminating the need for you to memorize yet another programming language. Also, an extensive online, context-sensitive help system guides you to all the information you'll need to develop your application.

Each screen has its own set of events.

For example, Figure 4 shows how to program a Start-Button event. As a compiler, Power PEN PAL offers you control similar to that provided by lower-level languages such as C.

While your Power PEN PAL program is running, you can call your own executable C routines or execute any DOS internal or external command from inside your Power PEN PAL application. (The only limitation is the amount of conventional memory available while your application is running.)

All statements in Power PEN PAL automatically contain the correct syntax, so it is difficult to make syntactical errors. By using the syntax builder, your code will be almost self-documenting, making it easy to maintain the program in the future. Even if several people co-design an application, all the code will look the same.

While designing your application, you may compile and execute your program whenever you wish. There are no

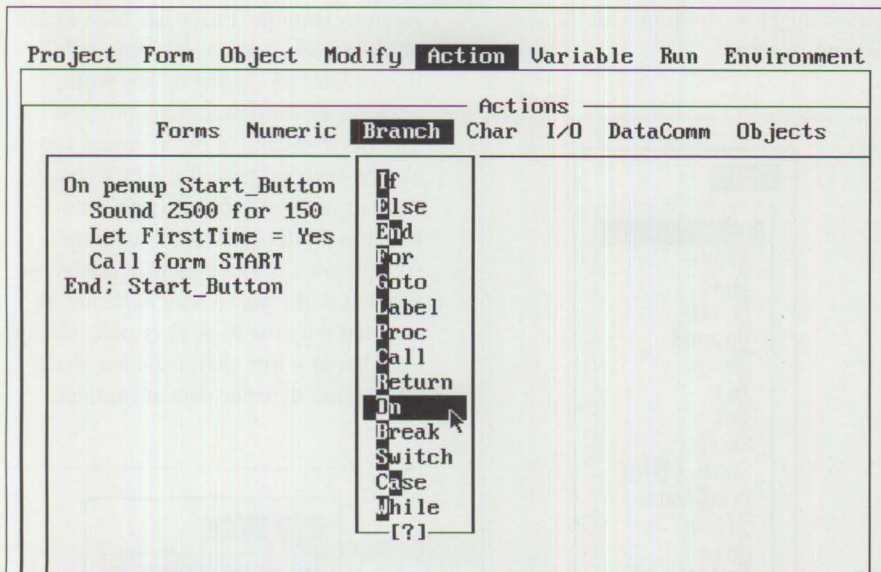


Figure 4. Programming a Start-Button Event

stopping points that you must reach before testing the application.

Debugging your programs in Power PEN PAL is a snap. You can debug on your desktop or laptop machine. If a compiler error occurs during development, Power PEN PAL opens the form and leads you directly to the line of code containing the error.

Once you've fully debugged your application, the program is simply downloaded to the pen computer for both alpha and field testing. All compilation errors are caught on the development machine. You'll never see a compiler error while a program is executing on the pen computer, because the code that resides on the target pen computer is intermediate code that the compiler has verified and approved.

Programming Example

In the following programming example, all programming statements are selected from menus in the Action window. Each menu gives you a set of statements that can be combined to perform your program's needed functions.

Project Menu

The *Project* menu (Figure 5) has two statements to "chain" more than one PEN PAL application together. Chaining allows you to maintain separate applications and to link them together with a CALL or GOTO statement.

The *System* statement lets you issue statements to DOS, such as DEL XXX.DBF. The ? is for online, context-sensitive help.

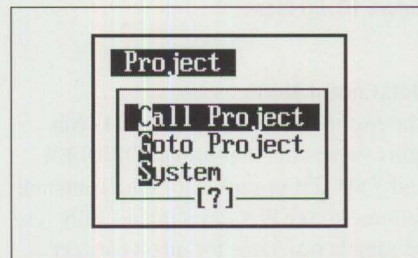


Figure 5. Project Menu

Forms Menu

The *Forms* menu (Figure 6) contains the statements needed to navigate through your application. Field check lets you check to be sure that certain fields have been entered. Current field returns the field name that is currently being used.

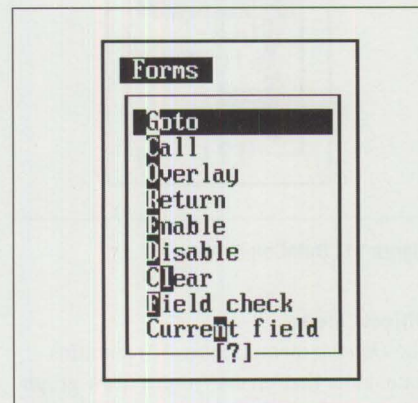


Figure 6. Forms Menu

Numeric Menu

The *Numeric* menu (Figure 7) contains the statements for the basic math functions including addition, subtraction, multiplication, division, and modulo functions.

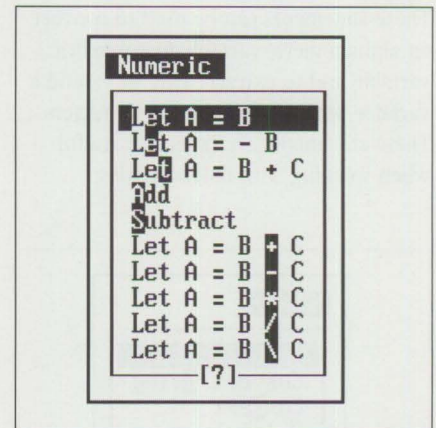


Figure 7. Numeric Menu

Branch Menu

The *Branch* menu (Figure 8) contains standard conditional tests If-Then-Else, Switch, and Case, as well as For and While.

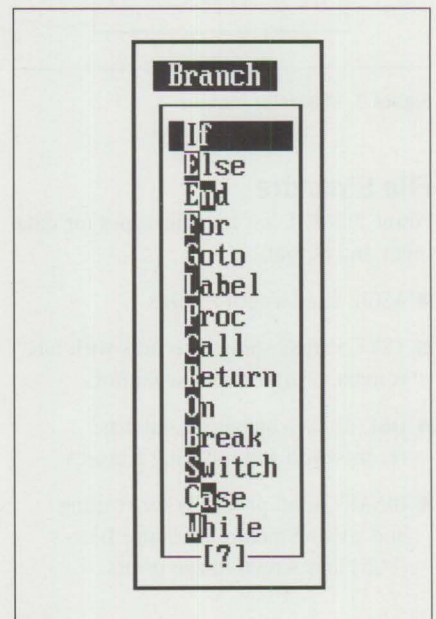


Figure 8. Branch Menu

In addition, Power PEN PAL can call procedures and pass multiple parameters to and from these procedures. Procedures may be local to the form on the screen or global to the entire application. By making procedures global, you can access them anywhere in your application and use them in any event.

Character Menu

The *Character* menu (Figure 9) contains statements for character and string manipulation. Power PEN PAL offers a variety of statements for complete control over all alphanumeric and numeric variables. These statements can be used to convert an alphanumeric variable to a numeric variable and to extract, trim, or extend a variable with any number of characters. These statements are especially useful when working with database files.

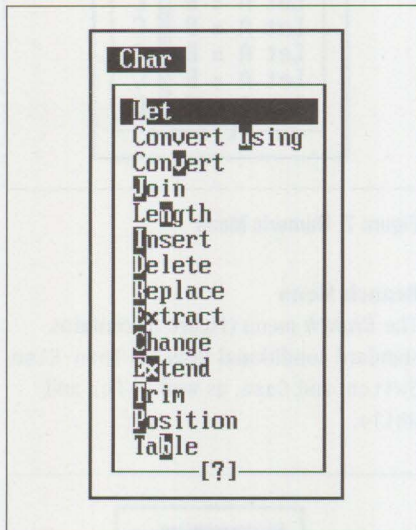


Figure 9. Character Menu

File Structure

Power PEN PAL has four file types for data input and output:

- ASCII, fixed-length records
- TEXT, variable-length records with tab, comma, or other field separators
- DBF, dBASE-compatible database records with full indexing features
- BINARY, used primarily for reading and writing picture exchange files (PCX) and screen image prints

I/O Menu

The *I/O* menu (Figure 10) contains statements used during the file input and output operations. This menu has all the statements you need to interact with your files while your application executes. Database files have special commands such as *Seek exact* and *Previous*, which work on dBASE-compatible files with full indexing. File and record locking and unlocking is built in for use with files on a network, where more than one

person might be working with the same file and/or record.

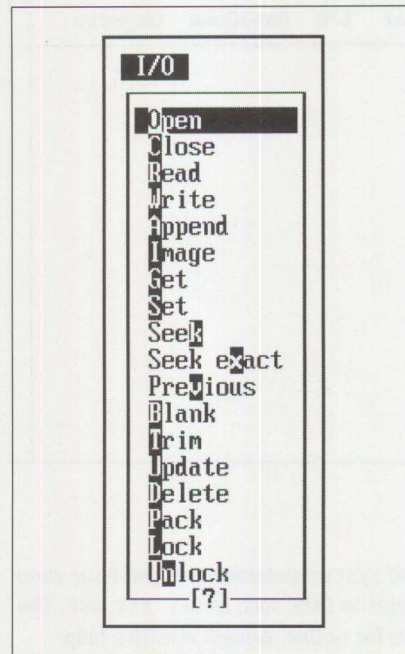


Figure 10. I/O Menu

DataComm Menu

The *DataComm* menu (Figure 11) contains statements that provide XMODEM and YMODEM protocols for data communications. Power PEN PAL supplies fully tested sample programs for direct-connect data transfer through a null-modem (serial) cable, as well as dial-up for telephone communication. Power PEN PAL has also been successfully linked to a file server for RF modem data transfer.

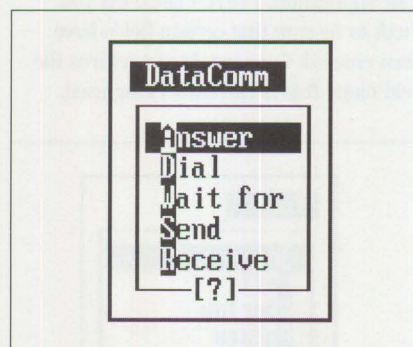


Figure 11. DataComm Menu

Objects Menu

The *Objects* menu (Figure 12) contains statements that enable you to draw graphics at execution time. This gives your application the ability to read and write PCX images while the application is

running. Once the image has been drawn on the screen, you can save it to a PCX file for later processing by any paint, drawing, or word-processing program. Any electronic ink in those images can also be saved as part of the PCX image. Basic drawing statements can be combined to produce paint-like programs (sample code is provided with the Power PEN PAL ADE). We've seen applications with not only the basic electronic ink capture, but also line charts and bar charts drawn with dynamic data at runtime!

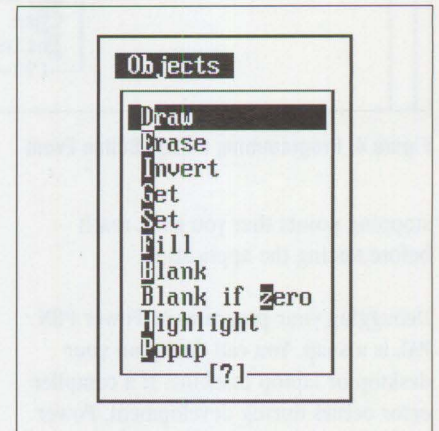


Figure 12. Objects Menu

Miscellaneous Menu

The *Miscellaneous* menu (Figure 13) contains statements for retrieving the system date and time, beeps and sounds, and international numbers and currency. The *Keyboard* statement returns the scan code of any key pressed on the keyboard. This feature lets you create keyboard-aware

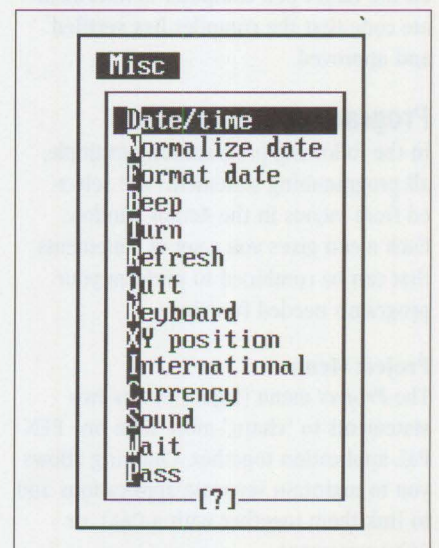


Figure 13. Miscellaneous Menu

code for execution on a pen computer with physical keys or a keyboard, as well as on a desktop or laptop computer.

Handwriting Recognition

When your application requires input from the user, handwriting recognition may be appropriate. If handwriting recognition makes sense, the next decision is whether you want upper case only or mixed case—an important decision that can affect the success of an application.

While collecting data, the user may need to fill in a block, write a character or number, or select a letter or number from a list of choices. To increase accuracy and to reduce errors and frustrations, you can specify alpha only, numeric only, or alphanumeric areas on the forms requiring handwriting. This can greatly increase the handwriting recognition accuracy.

As an example of what the handwriting recognition might look like, Figure 14 illustrates a handwritten entry, and Figure 15 shows how the handwritten entry is resolved into alphabetic characters.

You can display an alphabetic or numeric keypad (Figure 16) to enter data into any field. No programming is required to use these pop-up keypads or enlarged fields. You simply determine whether the user taps once or twice on the field or presses a button. You can also customize the pop-up keyboards to include only the keys you want to show and to include PCX icons, which act as buttons.

Development System Requirements

To design and develop PEN PAL applications, you need a minimal hardware configuration:

- 386 (or above) desktop or laptop computer
- VGA monochrome or color monitor
- DOS 3.3 or later
- Microsoft-compatible mouse
- 1 MB RAM
- 1 MB hard-disk storage

Executing on the Pen Computer

You must install a PEN PAL Control Program (PPCP) on each pen computer running PEN PAL applications. Any

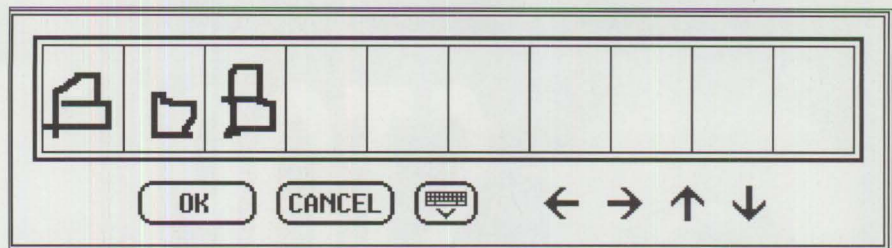


Figure 14. Handwritten Entry

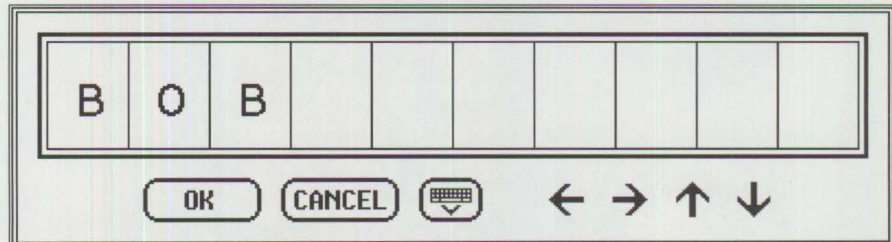


Figure 15. Resolution of Handwritten Entry

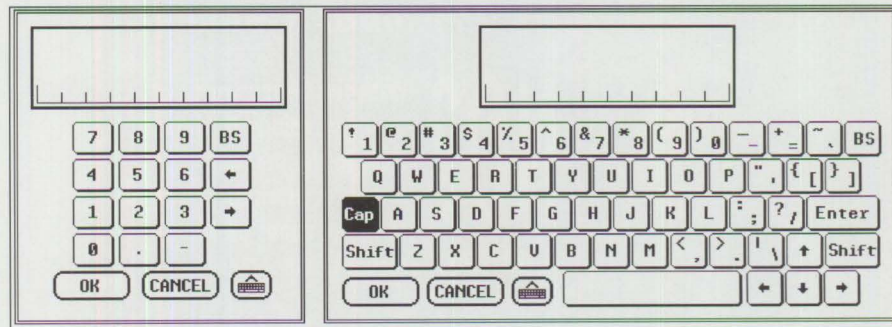


Figure 16. Pop-Up Alphabetic and Numeric Keypads

number of PEN PAL applications can be executed with a single PPCP. You can download your application and any other files needed at runtime with the download feature or a file-transfer program. Once you download your application to the pen computer, the PPCP executes the application.

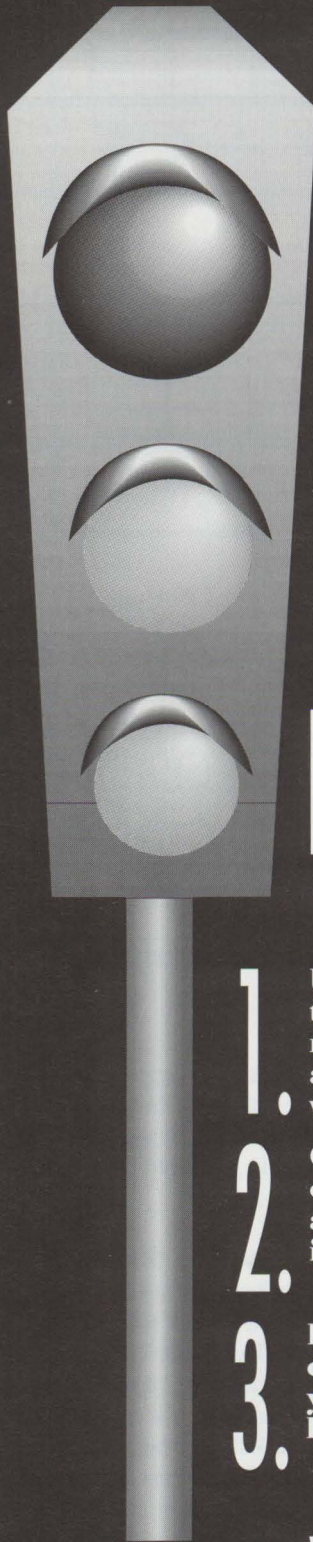
The Control Program uses the PenDOS Handwriter Recognition System developed by Communication Intelligence Corporation or the PenRight handwriting translator developed by PenRight Corporation. The handwriting recognition modules are included with the Power PEN PAL ADE for testing.

Power PEN PAL Applications

Power PEN PAL is currently being used for a variety of data collection and data validation applications. One application that has been drawing a lot of attention is in pilot test on the floor of the New York Stock Exchange (NYSE). The

following look at this application illustrates that Power PEN PAL can be used to design complex, robust applications as well as simpler, more straightforward applications.

Papyrus Technology, a Wall Street company, has developed a pen-based trading system for use by their specialists on the trading floor of the NYSE. The application, called the Daily Trading System, keeps track of the trades made for each stock throughout the day and gives the specialists immediate access to their buy/sell positions on any stock. Papyrus has successfully used the serial ports of pen computers to upload data from each pen computer to a laptop that performs a companywide profit and loss statement. They have also connected their application to a file server through a Novell network using a radio-frequency modem. No changes were required to the Power PEN PAL program in order to use the RF modem.



STOP!

**Have you used
the reader service
card to request
fast, free
information
about the products
and services
advertised in
Personal Systems?**

NO? With the heavy traffic of
new technology to choose
from in the personal
computer market, you need
to know about all the most
recent developments.
Caution.

- 1. Use the advertiser's index
to get the reader service
numbers of the products
and services for which you
want to receive literature.**
- 2. Circle the same numbers
on the reader service card
and fill out the necessary
information.**
- 3. Drop it in the mail (at no
charge!), and we'll give
your request the green
light!**

YES.
Smart move.

Copying or reprinting material from this magazine is strictly prohibited without the written permission of the editor. Titles and abstracts, but no other portions, of information in this publication may be copied and distributed by computer-based and other information-service systems.

IBM believes the statements contained herein are accurate as of the date of publication of this document. However, IBM hereby disclaims all warranties as to materials and workmanship, either expressed or implied, including without limitation any implied warranty of merchantability or fitness for a particular purpose. In no event will IBM be liable to you for any damages, including any lost profits, lost savings, or other incidental or consequential damage arising out of the use or inability to use any information provided through this service even if IBM has been advised of the possibility of such damages, or for any claim by any other party.

Some states do not allow the limitation or exclusion of liability for incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This publication could contain technical inaccuracies or typographical errors. Also, illustrations contained herein may show prototype equipment. Your system configuration may differ slightly.

IBM has tested the programs contained in this publication. However, IBM does not guarantee that the programs contain no errors.

This information is not intended to be a statement of direction or an assertion of future action. IBM expressly reserves the right to change or withdraw current products that may or may not have the same characteristics or codes listed in this publication. Should IBM modify its products in a way that may affect the information contained in this publication, IBM assumes no obligation whatever to inform any user of the modifications.

Some of the information in this magazine concerns future products, or future releases of products currently commercially available. The description and discussion of IBM's future products, performance, functions, and availability are based upon IBM's current intent and are subject to change.

IBM may have patents or pending patent applications covering subject matter in this document. The furnishing of this document does not imply giving license to these patents.

It is possible that this material may contain reference to, or information about, IBM products (machines and programs), programming or services that are not announced in your country. Such references or information must not be construed to mean that IBM intends to announce such products, programming, or services in your country.

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation whatever.

The articles in this publication represent the views of their authors and do not necessarily represent the views of IBM. This publication may contain articles by non-IBM authors. IBM does not endorse any non-IBM products that may be mentioned. Questions should be directed to the authors.

Publication of advertising material in this magazine does not constitute an expressed or implied recommendation or endorsement of IBM of any particular product, service, company, or technology. IBM takes no responsibility whatsoever with regard to the selection, performance, or use of any advertised products. All understanding, agreements, or warranties must take place directly between the vendor and prospective users.

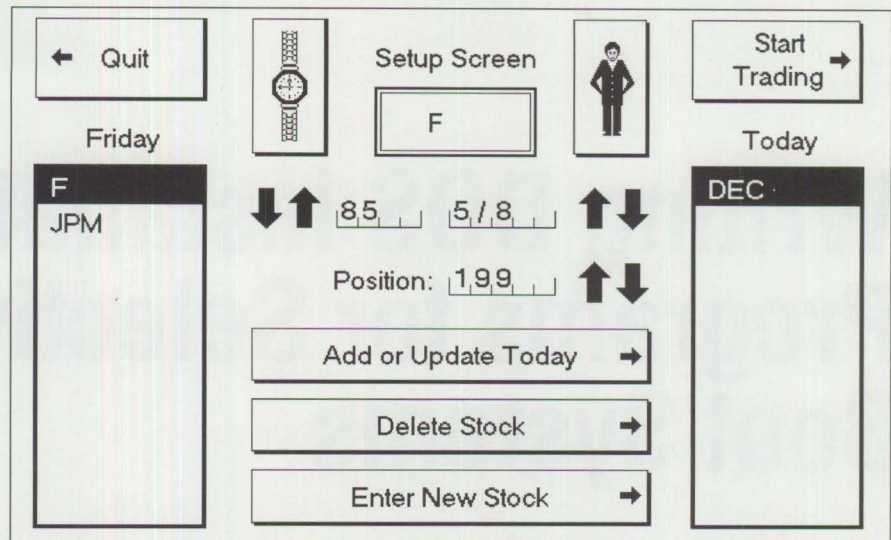
Initially, the major objection to this application was that the traders could write faster than they could use the pen computer. After many weeks of testing, Papyrus Technology found a way to increase the speed of entering trades to the point at which the trader can now make 15 trades using the pen computer in the same amount of time it takes to hand-write 10 trades.

There are two main benefits of the Daily Trading System. First, each of the traders, as well as the managing firm, can do a profit and loss calculation for the entire firm within 10 minutes, whereas in the past they could only make an educated guess—and sometimes the position of the firm was not known until well after the market closed. Second, the traders can never make an illegal trade, since the application catches all illegal short trades. (The NYSE can sell a trader's seat on the exchange if illegal trades occur.)

Figure 17 displays one of the main screens in the Daily Trading System.

Stock Trading Application Statistics
The Daily Trading System has 51 screens. It took approximately 200 hours of developing and testing to reach the point at which Papyrus Technology felt comfortable about bringing it onto the trading floor. The application has been on the floor since February 1992.

According to Papyrus Technology, the most beneficial aspect to the whole development effort was the ability to quickly have a prototype on the pen computer to show the specialists and traders what was possible. Then the famous rule of design came into play—you don't know what you want until you get something, then you know it's not what you wanted. The traders who saw the prototype told Papyrus what to change, and within two weeks Papyrus made all of the changes. Once again, they heard from the traders, who were quite willing to help design the human interface. This process continued for several months and led to the success and widespread acceptance of the application.



Screen design copyright (c) 1991-1994 Papyrus Technology

Figure 17. Daily Trading System Setup Screen

Bar Codes for Inventory Tracking

Power PEN PAL is also being used in inventory applications that require bar codes. Depending on the bar code scanner, you should be able to read as many as 13 different bar code symbologies. (Some typical symbologies are UPC, CODABAR, MSI, Code 3 of 9, EAN/JAN, Interleaved 2 of 5, Code 2 of 5, Code 93, and Code 128.) Sample code for bar-coding is included in Power PEN PAL.

All pen computers that have a serial or keyboard port are capable of using a bar code wand or gun. Once the bar code has been scanned, the Power PEN PAL program searches a file and recalls the last information for that bar code. If the bar code does not exist, the program allows new bar codes to be entered at that time. After the inventory has been completed, the updated file is transferred to the computer that has the master database.

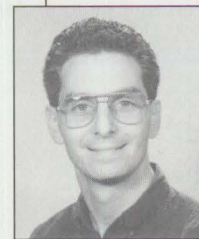
Bring a Pen-Centric Application to Life

You've just read an encapsulated description of the Power PEN PAL application development environment. Pen computers are rapidly becoming the next generation in computer technology. Power PEN PAL runs on the ever-popular DOS operating

system and on all pen computers that are commercially available today. Although PEN PAL is not a Windows application, you can execute a PEN PAL application from an icon within Windows, just as you would any other DOS program.

See how easy it is to bring a pen-centric application to life? Try Power PEN PAL!

PEN PAL Associates, Inc.
220 Main St., Suite 206
Los Altos, CA 94022
Voice (415) 917-6950
Fax (415) 941-9550
MCIMail userid 617-1946



Nathan Gold is manager of market development for PEN PAL Associates, Inc. For the past three years, he has taught corporate and independent developers how to

design, build, and implement pen-based applications using the Power PEN PAL Application Development Environment. Prior to that, he spent 10 years with ISSCO Graphics Software, training and supporting users designing and building mainframe computer graphics applications and executive systems. He holds a BS degree in Computer Science from the State University of New York at Stonybrook.

Writing DOS Installation Programs for Selective Boot Systems

Programmers should be aware of Selective Boot when writing DOS installation programs. Selective Boot, a feature of IBM PC DOS 6.1 and later versions, lets you conditionally execute sections of the CONFIG.SYS file, thus providing a way to alter your operating environment at boot time. While this powerful feature gives you flexibility, it can wreak havoc on installation programs that do not consider Selective Boot. Some installation programs, such as the one provided with the IBM Mobile Communications Module, were developed with the Selective Boot feature in mind. This article explores the IBM Mobile Communications Module installation program's method for handling Selective Boot.

How often have you used an installation program packaged with an after-market hardware or software product, only to have it render your simple CONFIG.SYS or AUTOEXEC.BAT file unusable? Now imagine the same installation program operating on a system with a complex configuration such as one that uses the Selective Boot feature of IBM PC DOS. The outcome can be unpredictable.

Similarly, how often have you tried to follow printed instructions to manually update your CONFIG.SYS or AUTOEXEC.BAT file? Some vendors have taken this approach rather than adding intelligence to their installation programs to handle the Selective Boot feature. This approach requires you to have enough skill and understanding to perform these steps without error.

Dana Beatty
IBM Corporation
Boca Raton, Florida

The installation program for the IBM Mobile Communications Module (MCM) was written to accommodate Selective Boot. Before examining this installation program in detail, let's discuss Selective Boot.

What is Selective Boot?

Selective Boot is an IBM PC DOS feature that enables you to specify various CONFIG.SYS and AUTOEXEC.BAT environments. At system boot time, you can select the environment most suitable to your current needs.

This feature is especially useful to mobile workers with portable computers. For example, as a mobile worker you may have three distinct operating environments: the office, home, and the road. When you are in the office, you want the system to boot up with the token-ring local area network (LAN) drivers installed. At home, rather than needing the token-ring LAN drivers, you need to load the Personal Computer Memory Card International

Association (PCMCIA) modem support. On the road, you may want wireless LAN support.

Because it is becoming more and more common to use a computer in multiple environments, something had to be done to eliminate the need for different CONFIG.SYS and AUTOEXEC.BAT files each time you switch from one environment to another. This requirement led to the evolution of conditionally executed statements in the CONFIG.SYS and AUTOEXEC.BAT files, and Selective Boot was created to specify the conditions of installation.

Advantages of Selective Boot

The advantages of Selective Boot are many:

- Device drivers and protocol stacks that tie up precious DOS memory are loaded only when the environment warrants it (the software that looks for the hardware is loaded only when needed).
- Annoying error messages indicating that certain hardware is absent (such as a token-ring LAN card or cable) are no longer displayed.
- You no longer have to save multiple CONFIG.SYS and AUTOEXEC.BAT files for specific operating environments. Instead, simply use the conditional keywords in the CONFIG.SYS and AUTOEXEC.BAT files for invoking the Selective Boot feature.

For more information about how to implement Selective Boot under IBM PC DOS, refer to the *Disk Operating System User's Guide*, Version 6, June 1993, pages 39 through 44.

Mobile Communications Module

The MCM is IBM's latest wireless communication product. Specifically designed to fit into the floppy drive bay of the ThinkPad 750 notebook, the MCM can support data, fax, and voice over either public switched telephone networks (PSTNs) or advanced mobile phone service (AMPS—the cellular system used in the United States and Canada). In addition to all these modes, the MCM also supports Cellular Digital Packet Data (CDPD). CDPD is an open standard based on IBM technology (for which a patent application has been filed) that breaks data into packets and then sends it out during idle time on existing analog cellular voice channels. CDPD uses transmission control protocol/internet protocol (TCP/IP) to transmit data. The IBM MCM ships with a network driver interface specification (NDIS) driver to facilitate TCP/IP communications.

MCM is an option for the ThinkPad 750, and it requires the end user to install hardware and software. As its name implies, the communications module is designed specifically with the mobile worker in mind. As such, it is entirely possible that the system will be used in different environments.

For example, you can use the notebook in the office environment, where it is attached to a LAN running TCP/IP over a PCMCIA token-ring or Ethernet card. You can also take the notebook computer on the road and rely on the MCM for wireless connectivity.

Selective Boot Example

For the scenario just discussed—using a notebook computer in both an office and a mobile environment—this section spells out the contents of the CONFIG.SYS and AUTOEXEC.BAT files. It also shows how Selective Boot, depending on the operating environment, executes some but not all of the statements.

Figure 1 shows a sample CONFIG.SYS file and Figure 2 illustrates the corresponding AUTOEXEC.BAT file for this scenario.

In Figures 1 and 2, for purposes of illustration only, the letters at the left delineate the conditionally executable sections. You select the specific sections to be executed, as explained.

```
A--> DEVICE=C:\DOS\HIMEM.SYS
A     DEVICE=C:\THINKPAD\IBMDSS01.SYS /S0=2
A     DEVICE=C:\THINKPAD\IBMDOSCS.SYS
A     DEVICE=C:\THINKPAD\DICRMU01.SYS /MA=C000-CFFF
A     DEVICE=C:\THINKPAD\ICPMDOS.SYS
A     DOS=HIGH
A     FILES=30
A     BUFFERS=10
A     [menu]
A     menuitem=OFFICE,Office LAN Configuration
A     menuitem=MOBILE,Mobile CDPD Configuration
A--> menuitem=HOME,Home Configuration

B--> [OFFICE]
B     LASTDRIVE=Z
B     DEVICEHIGH=C:\WINDOWS\PROTMAN.DOS /I:C:\WINDOWS
B     DEVICEHIGH=C:\WINDOWS\IBMTOKCS.DOS
B     DEVICEHIGH=C:\WINDOWS\WORKGRP.SYS
B--> DEVICEHIGH=C:\WINDOWS\SMARTDRV.EXE

C--> [MOBILE]
C     DEVICE=C:\TCPDOS\BIN\PROTMAN.DOS /I:E:\TCPDOS\ETC
C--> DEVICE=C:\TCPDOS\BIN\DOSTCP.SYS

D--> [HOME]

E--> [COMMON]
E     DEVICEHIGH=C:\DOS\ANSI.SYS
E     DEVICEHIGH=C:\DOS\SETVER.EXE
E     DEVICEHIGH=C:\DOS\POWER.EXE
E--> SHELL=C:\DOS\COMMAND.COM /P /MSG /E:2048
```

Figure 1. Sample CONFIG.SYS File Using Selective Boot

```
F--> @echo off
F     SET ETC=C:\TCPDOS\ETC
F     SET TCPBASE=C:\TCPDOS
F     PROMPT $p$q
F     PATH=C:\DOS;C:\WINDOWS;C:\WINDOWS\SYSTEM;C:\THINKPAD;
F     SET TEMP=C:\DOS
F     LH C:\DOS\MOUSE.COM
F     LH C:\DOS\DOSKEY
F
F--> goto %config%

G--> :OFFICE
G     C:\WINDOWS\SMARTDRV.EXE
G     C:\WINDOWS\net start
G--> goto end

H--> :MOBILE
H     PATH=C:\TCPDOS\BIN;%PATH%
H     c:
H     cd\tcpdos\bin
H     c:\tcpdos\bin\netbind
H     c:\tcpdos\bin\tcpstart
H--> goto end

I--> :HOME

J--> :End
```

Figure 2. Sample AUTOEXEC.BAT File Using Selective Boot

PC DOS 6.1 Startup Menu

1. Office LAN Configuration
2. Mobile CDPD Configuration
3. Home Configuration

Enter a choice: _

F5=Bypass startup files

F8=Confirm each CONFIG.SYS line [N]

Figure 3. Sample Startup (Selective Boot) Menu

User's Selective Boot Choice	Configuration Description	Conditional Section
1	Office LAN Configuration	[OFFICE]
2	Mobile CDPD Configuration	[MOBILE]
3	Home Configuration	[HOME]

Figure 4. Mapping Between User's Choice and Conditional Section

MAIN PROGRAM

```
Draw opening screen
| Draw screen background and border
| Draw title
Parse command-line arguments
| Get and store each argument
| Validate the installation path
| Validate the COM port number
Get PROTMAN paths from CONFIG.SYS
| CALL Parse CONFIG.SYS
| If rc = OK
|   store results
| Else
|   display error message
If PROTMAN paths are found
| Process PROTMAN paths
| | Get the protocol driver name from the PROTOCOL.INI file
| | Get the multiboot description string, if available
| | SWITCH (protocol driver name)
| |   CASE (DOSNDIS$):
| |     Tell the user that the configuration is for IBM's TCP/IP
| |     Display that the multiboot description is available
| |     Ask if the user wants CDPD support added here
| |     If yes
| |       CALL Process the PROTOCOL.INI
| |       CALL Update CONFIG.SYS
```

Figure 5. MCM Installation Program Flowchart (continued on next page)

When the computer is powered up, you see the Startup menu in Figure 3. The Startup menu is constructed using the text in the three [menuitem] lines in the [menu] section in the CONFIG.SYS file.

You must select 1, 2, or 3, depending on your current operating environment. Once you make this choice, the following criteria determine which sections will execute:

- In the CONFIG.SYS file in Figure 1, section A and the section labeled [COMMON] are executed under all conditions, no matter which Selective Boot option is chosen.
- In section A, in the part labeled [menu], there are three operating environment choices—OFFICE, MOBILE, and HOME. The text attached to those choices corresponds to the text in the three options in the Selective Boot menu (Figure 3). The same three [menu] choices in section A also correspond to the bracketed labels [OFFICE], [MOBILE], and [HOME], atop sections B, C, and D respectively. Sections B, C, and D are conditional sections that are tied to the choice made in the Selective Boot menu.
- PC DOS has a mechanism for mapping your Selective Boot choice to the conditional section to execute. Imagine a “jump” table like the one in Figure 4. The first column represents your Selective Boot choice; the second column contains the text in the [menuitem] lines in the CONFIG.SYS file; and the third column specifies which conditional section to go to. After you choose your Selective Boot environment, PC DOS finds that choice in the “jump” table, then goes to the corresponding conditional section of the CONFIG.SYS file.

Therefore, if you select choice “1” (Office LAN Configuration), the conditional section [OFFICE] (section B) executes, as well as the two sections (A and E) that execute in all cases. A similar rationale results in sections F, G, and J executing in the AUTOEXEC.BAT file shown in Figure 2. Finally, the TCP/IP stack is configured to operate over a PCMCIA token-ring card.

Selective Boot choice “2” (Mobile CDPD Configuration) is selected when you want to load NDIS driver support for the Mobile Communications Module. In this

case, CONFIG.SYS sections A, C, and E, and AUTOEXEC.BAT sections F, H, and J execute.

If you select choice "3" (Home Configuration), then sections A, D, and E of the CONFIG.SYS file execute, along with sections F, I, and J of the AUTOEXEC.BAT file. In this case, the TCP/IP LAN software is not loaded.

Installing Software Under Selective Boot

While the boot scenarios described above are simple, they present quite a dilemma to a software installation program. Since the installation goal of the MCM product is to minimize end-user intervention, the program has to be able to detect a Selective Boot occurrence as well as to account for an instance of a TCP/IP stack that may not be intended for use with this product. The MCM installation program method is straightforward. (Follow along with the flowchart of the program, shown in Figure 5.)

The installation program first determines whether the current version of DOS supports Selective Boot. If it does, the program proceeds to parse the CONFIG.SYS file, looking for occurrences of the string PROTOCOL.INI, which indicates the presence of a LAN stack (a requirement for installing an NDIS driver). If a PROTOCOL.INI statement is found, the installation program checks the protocol driver name in an attempt to recognize common TCP/IP protocol stacks. It then saves the path and the line numbers where the PROTOCOL.INI statements were found.

Likewise, if it detects one or more PROTOCOL.INI statements, the installation program then passes back through the CONFIG.SYS file to determine whether the statement appears within a Selective Boot section. (See the "Selective Boot Example" section for how to identify a conditionally executed portion of the CONFIG.SYS file.)

If a PROTOCOL.INI statement is inside a Selective Boot section, the installation program retrieves the Selective Boot item description (such as "Office LAN Configuration") and uses it to help guide you in the installation process. It does this by presenting a screen that lists the

```
| | CASE (PKTDRV$):
| |     Tell the user that the configuration is for FTP's TCP/IP
| |     Display that the multiboot description is available
| |     Ask if the user wants CDPD support added here
| |     If yes
| |         CALL Process the PROTOCOL.INI
| |         CALL Update CONFIG.SYS
| | CASE (NETMNG$):
| |     Tell the user that the configuration is for FTP's TCP/IP
| |     Display that the multiboot description is available
| |     Ask if the user wants CDPD support added here
| |     If yes
| |         CALL Process the PROTOCOL.INI
| |         CALL Update CONFIG.SYS
| | CASE (NETBEUI$):
| |     Ignore this stack
| | DEFAULT:
| |     Tell the user that, during configuration, an unknown
| |         TCP/IP stack was found
| |     Display that the multiboot description is available
| |     Ask if the user wants CDPD support added here
| |     If yes
| |         CALL Process the PROTOCOL.INI
| |         CALL Update CONFIG.SYS
| |     END SWITCH
| END
Draw closing screen and display closing message

PARSE CONFIG.SYS

Get DOS version number
If DOS version number < 2 then
    return 'Invalid DOS version' error code
Else if DOS version < 6 then
    clear multiboot capability flag
Else if DOS version >= 6 then
    set multiboot capability flag
Else
    return 'Cannot run under OS/2' error code
Get the boot drive
Build the path to CONFIG.SYS
Open CONFIG.SYS
For each line in CONFIG.SYS
|
| Check the line for "DEVICE"
| If found
|     Check the line for PROTMAN
|     If found
|         Check the line for /I:
|         If found
|             Copy the path and store the line number
|
Close CONFIG.SYS
Return(rc)
```

Figure 5. MCM Installation Program Flowchart (continued on next page)

```

PROCESS PROTOCOL.INI

Back up original PROTOCOL.INI
Initialize default values
Search for CDPDMAC section in PROTOCOL.INI
If found
    Tell the user that a CDPD configuration already exists
    Ask if the user wants to update it
    If yes
        Read values from CDPDMAC section of PROTOCOL.INI
    Else
        exit
Query the user for a baud rate
Write values to CDPDMAC section of PROTOCOL.INI
Change the protocol driver BINDING statement to CDPDMAC

UPDATE CONFIG.SYS

Backup the CONFIG.SYS
Open CONFIG.SYS and open a temporary file
Copy all lines from CONFIG.SYS to the temporary file, up to the
    PROTMAN statement line
Add a CDPDMAC device statement, if not present, to temporary file
Copy the remaining CONFIG.SYS file to the temporary file
Overwrite CONFIG.SYS with the temporary file
Delete the temporary file

```

Figure 5. MCM Installation Program Flowchart

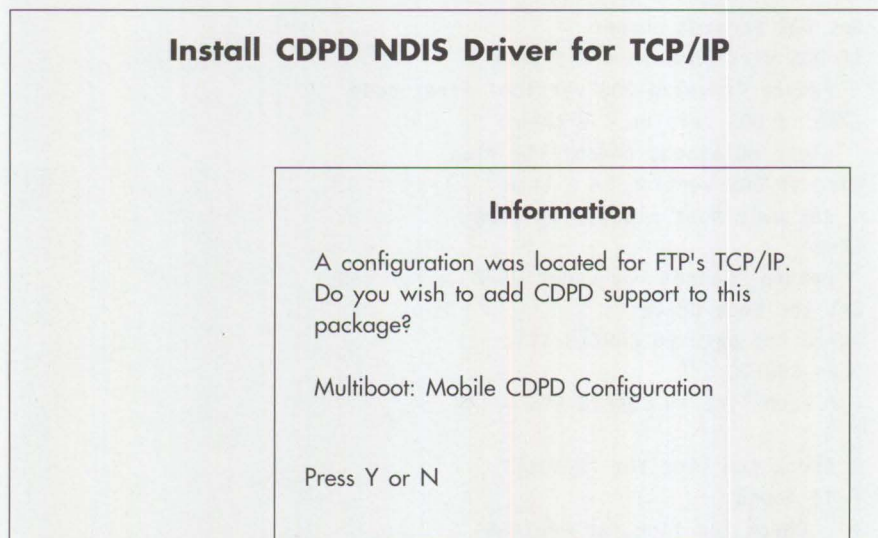


Figure 6. MCM Installation Program Menu

```

[MOBILE]
DEVICE=C:\TCPDOS\BIN\PROTMAN.DOS /I:E:\TCPDOS\ETC
DEVICE=C:\CDPD\CDPDMAC.DOS
DEVICE=C:\TCPDOS\BIN\DOSTCP.SYS

```

Figure 7. Sample Selective Boot Section After MCM Installation

Selective Boot sections where the MCM installation program can insert the NDIS driver statement, as shown in Figure 6.

Figure 6 shows the first area in the CONFIG.SYS file where the MCM program detects an NDIS driver. Using the Selective Boot section description, the installation program indicates the area where the driver can be installed. The installation program will continue to prompt you for each Selective Boot section that contains an NDIS driver.

After the MCM software installation process is complete, section C of the CONFIG.SYS file appears as shown in Figure 7.

Extending the Technique

Selective Boot is a powerful option that adds flexibility to the boot-up process. As more and more users migrate from desktop to portable systems, the Selective Boot feature will become more commonplace. As a result, software installation programs need to handle the Selective Boot feature.

The technique for writing installation programs discussed in this article can be extended to many other software installation programs. Adding this support into an installation program will not only make your installation process easier, but it will also reduce the chances of introducing end-user error.



Dana L. Beatty is a staff programmer in the wireless data department for the consumer systems organization in Boca Raton, Florida. She joined IBM in 1985 in Austin, Texas. Ms.

Beatty was the software project lead on the IBM Mobile Communications Module product, the industry's first CDPD product. She has written articles for *IBM Personal Systems* magazine and *IBM Personal System Developer*, has instructed system engineers at the Arthur K. Watson International Education Center, and has presented at SHARE and GUIDE conferences. Ms. Beatty received her BA in Computer Science from the University of Texas at Austin.

OS/2 for PowerPC: Transforming Architecture into Implementation

Implementation is the litmus test of an operating system's architecture: does it work? This article describes how the architects of IBM's OS/2 for PowerPC used this philosophy to produce a product that delivers on the promises of the Workplace architecture.

The needs of an operating system implementor may vary from the design objectives of an operating system architect. An operating system architect's goal is to design a system that satisfies users' requirements. Architects combine their understanding of users' needs, their command of the latest technology available, and their knowledge of how things *should* work to create the design.

Conversely, implementors must maintain the spirit behind the architect's original goals while being constrained by deadlines, staffing limitations, and, most frustrating of all, how things *really* work.

Jeri Dube and Scott Winters
IBM Corporation
Boca Raton, Florida

OS/2's Metamorphosis to the PowerPC

The OS/2 for PowerPC operating system is an excellent example for illustrating the metamorphosis from operating system architecture to operating system implementation. This product is the first implementation of IBM's new scalable architecture—an architecture that addresses the issues of developers while meeting customer demands.

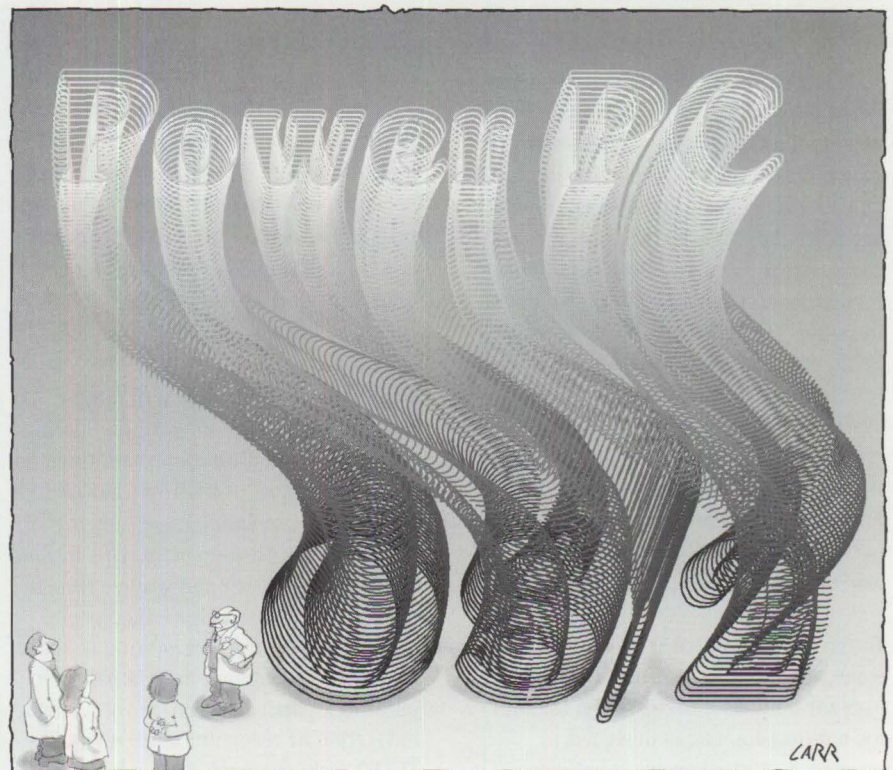
The designers were given several customer-derived requirements:

- Reduced complexity
- Easy to use, manage, and update

- Scalable and portable to a wide range of hardware platforms
- Investment protection in legacy software

The emerging technologies that architects needed to incorporate into the design included:

- Scalable, modular design
- Reusable code
- Compound document architecture
- HUMAN-CENTERED technology
(HUMAN-CENTERED technology is the



use of human-like interactions in the product's design)

■ Emulation technology

Reduced End-User Complexity

The irony of reducing complexity is that it isn't an easy thing to do! Many facets of working with computers need to be simplified. The Workplace architecture focuses on the complex decisions that have to be made with computers. For example, an end user buys a particular application to solve a problem or accomplish a task. That end user wants to focus only on the merits of the application—how it will solve the problem or accomplish the task. However, to make appropriate application choices, customers need to understand the hardware they are using as well as the operating system and other applications on their systems. This is especially true when considering an application that needs to communicate with other systems.

To ease the complexity of the customer's decision-making burden, operating system architects designed an open system—a system so open that an end user can go into any software store, buy any software package, and not worry about what operating system the application needs. The Workplace-architected system allows users to focus on buying the best software package needed for the task rather than on the system requirements to run that software.

To achieve this unprecedented openness, Workplace architecture needs to accommodate the majority of application programming interfaces (APIs) that the computer industry uses. The idea is to build multiple "personalities" sharing the same basic system resources. Each personality represents an existing competitive operating system such as DOS, OS/2, Windows, UNIX, etc. The personality exports the system services and functions that are available when running that operating system. For example, if the personality is OS/2, then the user interface is the OS/2 Presentation Manager. Similarly, if the personality is UNIX, the user interface is X-Windows.

To ensure the system is not too cumbersome, the middleware that the industry uses for database, networking, telephony, multimedia, etc. is designed to be shared. With sharable middleware,

each of the personalities present in the system can request service from the middleware server.

Reduced Developer Complexity

Reducing complexity is an issue for programmers as well as for end users. Object-oriented technology simplifies programming by hiding complexity—reusing and combining previously developed components from a set of simpler modules to create a complex solution.

The Workplace architecture incorporates IBM's System Object Model (SOM) and Taligent object frameworks. SOM allows an object written in one language to be incorporated into an object-oriented program written in another language. Frameworks reduce complexity by providing a function's general design for implementing in an application, yet allowing the developer to customize that function. Because of this, frameworks decrease the amount of design and coding required to implement a technical innovation.

Easy to Use and Enhance

Another aspect of reducing complexity is to develop a system that is easy to use and enhance. The Workplace architecture achieves this through the modular system design, through HUMAN-CENTERED technology, and through compound document architecture.

The Workplace architecture's modularity changes the entire dynamics of managing a system. With a modular structure, new function does not have to come in the form of a completely new release; it can be added one piece at a time without disturbing the rest of the system. This creates a more stable environment for enhancing and improving the system's function.

The best way to improve a computer system's usability is to make the interaction with the end user more inviting and natural. The goal of HUMAN-CENTERED technology is to create more human-like interactions with computers. This technology includes speech and gesture recognition, where users navigate the system simply by speaking or gesturing to the computer, rather than using a mouse to point to a particular icon. Beyond simple navigation or recognition, HUMAN-CENTERED technology might also have an

"agent" that users direct to do a task. For example, the user might tell the agent to "dial Mary's extension," and the agent complies.

A compound document architecture such as OpenDoc changes the user's entire perspective when producing a document containing output from multiple applications. This architecture simplifies document creation. Instead of focusing on individual applications required for document creation, the user can focus only on the document itself. As the user comes to the section of the document that needs another application besides word processing (such as a spreadsheet), the user simply invokes the spreadsheet application from within the document.

Scalable and Portable

By using microkernel technology, an architecture can support system portability. The only code contained in the microkernel is code directly related to the hardware interface and common to all operating systems. By separating the hardware interface from the rest of the operating system, the microkernel-based operating system is easy to port to other hardware platforms.

The Workplace architecture achieves scalability from the design's modularity. Because the system is modular, it can be divided into pieces; a hardware platform with a small random access memory/direct access storage device (RAM/DASD) footprint includes less of the pieces than a larger hardware platform, but the core of the systems on both platforms is the same. In a more monolithic architecture, the system needs to be totally redesigned to accommodate different hardware platforms.

Investment Protection

Perhaps the most important customer requirement is protecting pre-Workplace software investments. Workplace customers have invested a great deal of money in developing and/or acquiring software before acquiring a Workplace system. The Workplace architecture protects these investments by providing emulation technology allowing the binaries of legacy software to run on the Workplace system independent of the hardware platform. For example, any DOS application that runs on complex instruction set

computer (CISC)-based hardware will run in emulation mode on OS/2 for PowerPC.

Implementing the Architecture

To achieve complete openness and reduce complexity, the basic system architecture is based on an industrialized version of the Mach microkernel called the IBM Microkernel. This enhanced microkernel supports multiple operating system API sets or "personalities." In addition, the IBM Microkernel supports service requests from the operating system personalities to the middleware (or shared services) applications (see Figure 1).

The IBM Microkernel supports implementing a modular environment that is easily ported to different hardware platforms. This environment allows the personalities and the shared services to have their own protected address space and to talk to each other via the microkernel. For example, in release one of OS/2 for PowerPC, the file system is a shared service as opposed to being an integrated part of a monolithic operating system. When a personality requires file system services, the service is requested through the microkernel using an interprocess communication (IPC) mechanism. In release one, networking will also be a shared service. The other middleware applications will become shared services in subsequent releases of OS/2 for PowerPC.

Since the system is modular and portable, OS/2 can be scaled and ported to other hardware platforms. In the first OS/2 for PowerPC implementation, the target platform is the PowerPC 6XX chip family. Using the microkernel-based architecture, the OS/2 for PowerPC implementation accomplishes two objectives:

- The OS/2 user and programming interface was ported from Intel to PowerPC using a new set of tools to recompile and relink.
- The policy management portion of OS/2 was recoded to handle a new type of portable kernel—the IBM Microkernel. The rebuilding of policy parts solidifies the current investment in the OS/2 API set and then acts as a basis for porting OS/2 to any new hardware platform on which the microkernel is ported.

After the first release, elements of OS/2 for PowerPC can be scaled from a 64 MB

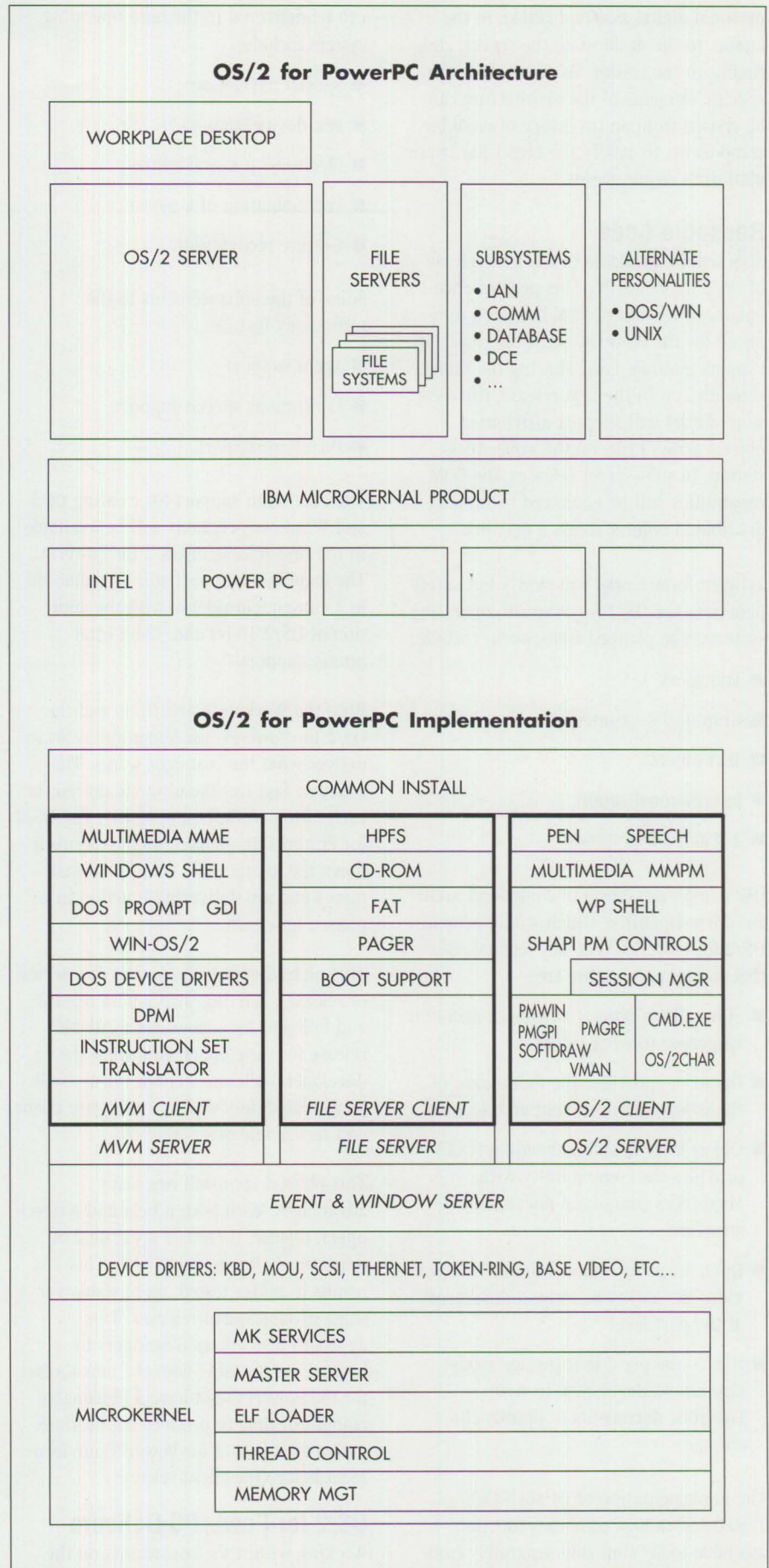


Figure 1. OS/2 for PowerPC Architecture and Implementation

personal digital assistant (PDA), to the laptop, to the desktop, to the server, and, finally, to the cluster. To accomplish this, specific elements of the architecture can be chosen from an inventory of modular components to satisfy the target hardware platform's requirements.

Reusable Code

SOM will be available in the first release of OS/2 for PowerPC. This performance-enhanced version of SOM has been optimized for the PowerPC hardware and will support multiple tasks sharing the same class library. In the first release, this version of SOM will support distributed objects across tasks on the same workstation. In subsequent releases, the SOM capabilities will be enhanced to support distributed objects across a network.

Taligent frameworks will slowly but surely penetrate the OS/2 for PowerPC operating systems. The planned frameworks include:

- Transport
- Graphical user interface
- Text object
- Internationalization
- 2-D and 3-D graphics

IBM's implementation of compound architecture is OpenDoc, which will appear in OS/2 for PowerPC. The key technologies that comprise OpenDoc are:

- SOM—allows objects written in different languages to work together
- OpenDoc—provides the foundation of the compound document architecture
- Object linking and embedding (OLE)—provides the compatibility with Microsoft's compound documents structure
- Open scripting architecture (OSA)—provides the ability to script a document at the part level
- Bento—the persistent storage model that allows developers to write OpenDoc documents to permanent storage

The implementation of HUMAN-CENTERED technology combines function available today (but sold separately from the base operating system) with enhanced technology. The types of functions that

can be delivered in the base operating system include:

- Speech navigation
- Pen device support
- Electronic ink capabilities
- Pen emulation of a mouse
- Gesture recognition

Some of the enhancements to the technology include:

- Agent support
- Continuous speech support
- Dictation support

The emulation support for existing DOS and Windows programs will be available in the first release of OS/2 for PowerPC. The emulation support will be enhanced in a subsequent release with the addition of OS/2 16-bit and 32-bit Intel binary support.

Both the Workplace architects and the OS/2 for PowerPC implementors want to deliver what the customer wants. The architect lays out the ultimate design for each of the Workplace products. The OS/2 for PowerPC implementors have broken down the architecture into functional pieces and are delivering function in a phased approach.

This phased approach consists of a series of releases, starting with a beta release and followed by a generally available release for developers. Following the developers' release, a client release will be available, followed by enterprise client and server releases.

This phased approach has many advantages. With both a beta and a developers' release, there is a great deal of opportunity for user feedback. This results in better tested, more stable versions of subsequent releases. This approach also allows developers to become comfortable with the new toolset for the PowerPC and have a reasonable amount of time to produce applications native to the OS/2 for PowerPC environment before the client release.

OS/2 for PowerPC Delivers

Working within the constraints on the implementors, the implementation goals of the architecture are eventually

achieved. The implementation merely prioritizes the elements of these goals and makes them available in an order that will satisfy the majority of customers.

OS/2 for PowerPC—the first implementation of the Workplace architecture—delivers on all the promises of Workplace by offering:

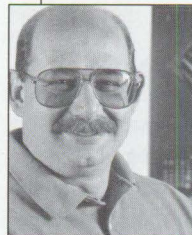
- Portable and scalable software
- HUMAN-CENTERED computing
- High quality, reusable software
- Open, distributed environment
- Investment protection

As time goes on, OS/2 for PowerPC will enhance all of these areas. OS/2 for PowerPC is only the first Workplace operating system that shows how IBM transforms software innovation into industry advancement.



Jeri Dube is a planner for IBM's Workplace products in Boca Raton, Florida. She is one of the original members of the Workplace planning team. Before moving to Boca Raton, Jeri worked

as a systems test planning manager, a customer relations representative, and an internal manufacturing efficiency consultant for IBM's Large System Division in Poughkeepsie, New York. Jeri also worked as an IBM marketing representative and a programmer focusing on performance evaluation on IBM storage products. She received a Master's degree in Operations Research from Georgia Tech.



Scott Winters is an IBM Senior Technical Staff Member in Boca Raton, Florida. His current assignment is chief architect of Workplace OS/2. Previously, Scott was the lead architect in

the OS/2 Multimedia Systems Software group where the MMPM/2 product was created. He received a BS degree in Computer Science from the University of Florida in Gainesville.

Questions and Answers

What hardware do I need to try pen computing?

No matter which pen operating system you choose, you will need some special hardware to use pen input. You can have a system with an integrated digitizer and display that is a self-contained pen computer, or you can have a generic desktop system with an attached digitizer. For the desktop system, the attached digitizer usually connects through the system serial port. Typically, the easiest (and least expensive) way to configure pen hardware is to install an opaque tablet with the proper software.

Which operating system is best for my application?

All the available operating systems have different strengths. Pen for OS/2 provides all the benefits of base OS/2, being a true 32-bit preemptive multitasking operating system. PenDOS provides a small footprint and fast operating environment on the DOS platform.

Why does IBM have two pen operating environments?

Although PenDOS and Pen for OS/2 are separate products, they are similar in their use and function. IBM has attempted to maintain a consistent "look and feel" for both systems. Currently, both systems use pop-up handwriting pads and pop-up keyboards to provide alternative input methods. The two systems are also complementary because PenDOS is a small

system, which is valuable in vertical DOS application environments, and Pen for OS/2 is designed to take advantage of all the capabilities of the OS/2 base operating environment.

Can I run PenDOS on a system that already has Pen for OS/2 or Windows for Pen Computing installed?

PenDOS cannot run concurrently on a system with either Pen for OS/2 or Windows for Pen Computing installed, because the different pen operating environments compete for many of the same hardware resources. PenDOS will run on these systems as long as the other pen environments are not active. For example, you can configure a dual boot system for Pen for OS/2 and Pen DOS. However, PenDOS can run in a DOS VDM (DOS window) on a base OS/2 system. Within the DOS window, PenDOS can function normally. Similarly, PenDOS can run in a DOS session of Microsoft Windows.

How do I assign specific meanings to gestures in PenDOS?

In the PenDOS product, an application program called Gesture Macro Editor (GME) is provided (in the \PENDOS\GMEDIT subdirectory), which allows you to assign different meanings (or macros) to a total of eight different defined shapes.

Can I write in cursive?

Today, even though many companies are working on the technology, no cursive recognition system has taken the lead in

the marketplace, although some systems such as Apple's Newton, are using cursive handwriting recognition. When filling out forms, users typically—even on pen and paper—fill out only one letter per box on the form. This is consistent in the current pen environments.

How do I assign specific meanings to gestures in Pen for OS/2?

When using Pen for OS/2, you can customize gestures for each application or for the whole session. For specific application assignments, use the pop-up menu for the object to view the Settings notebook. For sessionwide assignments, use the Gesture page of the Customization object. Within the Settings notebook, there is a page labeled Gesture with a list of 58 defined shapes that can be customized.

Can I train my pen application to recognize my handwriting?

Both PenDOS and Pen for OS/2 can be "trained" to learn your handwriting. In Pen for OS/2, select the Customization object and open the Training page. You are given several sentences to write so the system can learn your handwriting style. The "handwriting set" is saved for you. In PenDOS, an application program called Trainer in the \PENDOS\TRAINER subdirectory can be used on a character-by-character basis to train the application to recognize individual letters, numbers, or symbols. A template is created for each user and can be set as the default template.

Pen Glossary

Active pen: A pen that contains some type of electronics that either emits signals to the digitizer or acts as an antenna so the digitizer can identify the pen position.

Barrel button: Many pens have a small button on one side for requesting or initiating commands. Pressing the button can also indicate another mode of

operation. For example, a depressed pen barrel button may signal the operating system to recognize that the pen is emulating mouse button two, or the mode could indicate the system will now recognize gestures only.

Bezel buttons: Buttons built into the case (bezel) of a pen-based computer or

peripheral device, used to request or initiate a command.

Boxed-mode recognition: When in this mode, users write either in small boxes with one character per box or in a "combed field" with one character between each comb line. An alternative to boxed-mode recognition is unruled

(gridless) handwriting recognition. In *unruled* recognition, the characters are written on a straight line with no vertical separators to define space between the characters.

Case-sensitive: The ability to distinguish between uppercase and lowercase letters during handwriting recognition.

Combed field: An input field for handwriting recognition that provides indicator lines to separate each character.

Convertible notebook computer: The typical notebook-sized PC, which includes a keyboard, but also includes an embedded digitizer for pen use. The display screen and digitizer can fold down or be lowered to allow the user to write with the pen in a comfortable position.

Digitizer: The device used to capture pen input. It converts pen positioning over a flat surface into x-y coordinates used by the application software to locate the cursor. In addition to x-y coordinates, some digitizers can sense z-axis position, pressure, and angle of pen deflection.

Double-tap: To touch a screen with a pen twice in rapid succession within a small area, emulating a double-click with a mouse.

Embedded digitizer: A digitizer embedded in a notebook or tablet PC. The PC is a self-contained computer system with integrated display and digitizer. In this case, the user writes directly onto the display screen of the computer.

Gestures: Pen strokes or series of strokes that are repeatable shapes and are recognized by the pen operating system. Gestures are symbols that are given a specific meaning by the operating system or customized by the user. A good example of a gesture is the "pigtail" symbol used in text editing to indicate a deletion. Making the pigtail symbol over a character or set of characters will delete the chosen text.

Gesture mode: An input mode in which the system interprets pen input as gestures, as contrasted with mouse-emulation mode.

Handwriting field: An application input field that accesses the system's

handwriting recognition application programming interface (API). This field can be a series of boxes on a form, a straight line, or an open space.

Handwriting recognition engine: The software that consists of some type of mathematical algorithm that interprets pen input strokes and converts them to recognized text characters.

Ink: A set of points identified by the pen operating environment that represents the path of the pen over the digitizer. The display image is rendered in such a way that it appears to the user as though ink is flowing from the end of the pen onto the display.

Mouse-emulation mode: An input mode in which the system interprets pen input as mouse input, as contrasted with gesture mode.

Opaque tablet: A desktop-attached digitizer that is not embedded into the PC. The opaque tablet sits next to the desktop PC and is used the same way a mouse is used. The pen is placed over the digitizer to locate the cursor, but the user must look at a separate display attached to the desktop system to see the cursor displayed.

Passive pen: A pen that works with the type of digitizer that senses the pen location through physical contact with the digitizer. There are no electronics in the pen itself, and therefore, any pointed object can be used for a pen.

Pen-aware or aware application: An application that recognizes the pen operating system APIs and takes advantage of them to use a pen as the standard input device. This is the case when an application is designed to use a specific pen operating system or environment.

Pen-centric: An application or operating system designed specifically for the pen. The pen is considered the primary input method, with only backup provisions made for keyboard use. Remember, pen-centric does not mean only handwriting recognition but refers to the entire design of the input method.

Pen-unaware or unaware application: An application that has been designed without regard to any pen

operating system APIs—programs written to use a keyboard or mouse as primary input. A "mouse-aware" application not designed for pen will typically work with the pen system, but no function has been designed into the application to take specific advantage of the pen.

Pluggable recognition engine: A handwriting recognition engine designed for a particular operating system's engine interface. This allows recognition engines from multiple sources to be used in the same pen operating system environment.

Proximity: When using a pen digitizer, the concept of coming within a certain distance of the surface of the digitizer without actually making contact with the surface. This allows the digitizer to sense z-axis motion with the pen. The typical distance of being "in proximity" may be 1/8 to 1/4 inch above the plane of the digitizer surface.

Stroke: The collection of points between the point where the pen touches the digitizer surface to the point where the pen is removed from the surface.

Tap: To briefly touch the digitizer with the pen and then quickly remove it. Emulates a "mouse-click."

Tablet computer: A portable PC that has no keyboard. Typically these units are about the size of an 8.5 x 11 inch pad and are used primarily for capturing data in the field, for filling out forms or applications, or for sketching drawings and observations.

Tablet driver or pen device driver: A file that contains the code necessary to use an attached or embedded digitizer with a pen. Each digitizer normally requires a unique tablet driver for each operating system.

Trainer or handwriting trainer: An application written for the pen environment that allows users to "train" character recognition to their particular style. This should be used only to train characters that the handwriting recognition software has a difficult time interpreting. If accuracy rates are acceptable, it is advisable not to use a trained system, since its recognition is tuned to one particular style.

Corrective Service Information

Figure 1 shows maintenance release levels for the listed products. This information is effective as of September 20, 1994. CSDs may have been updated since press time.

To order all service packages—except for the OS/2 2.0, OS/2 2.1, OS/2 2.1 for Windows, and OS/2 2.0 Toolkit ServicePaks—call IBM Software Solution Services at (800) 992-4777. For the OS/2 2.0 ServicePak (XR06100), OS/2 2.1 ServicePak (XR06200), OS/2 2.1 for Windows ServicePak (XR06300), or the

IBM Developer's Toolkit for OS/2 2.0 ServicePak (XR06110) on diskettes or CD-ROM, call (800) 494-3044. Most OS/2 service packages are also available electronically from the following sources:

- **OS/2 Bulletin Board Service (BBS):** Once connected, select Option 2. (Corrective services are also listed under the General category on the IBMLink BBS.) To subscribe to the OS/2 BBS, call (800) 547-1283.
- **IBM Personal Computer Company (PCC) BBS:** Call (919) 517-0001.

Service packages are located in Directory 4.

- **CompuServe:** Download service packages from the IBM OS2 FORUM library (GO IBMSERV).
- **Internet:** Do an anonymous FTP from software.watson.ibm.com. Most packages are located in the \PUB\OS2 directory. TCP/IP packages are located in the \PUB\TCP\IP\OS2 directory.

—Arnie Johnson, IBM Corporation, Austin, Texas

Product/Component	Release	CSD Level	PTF Number	Change Date	Comments
OS/2 Standard Edition	1.3	XR05150	XR05150	2-10-93	
OS/2 Extended Edition	1.3	WR05200	WR05200	5-12-93	WR05200 replaces WR05050, which can no longer be ordered on diskette.
OS/2	2.0	XR06100	XR06100	9-1-93	XR06100 replaces XR06055.
OS/2 2.10 ServicePak	2.1	XR06200	XR06200	3-1-94	This package is not for OS/2 2.1 for Windows.
OS/2 2.11 for Windows ServicePak	2.11	XR06300	XR06300	5-24-94	
OS/2 Toolkit	2.0	XR06110	XR06110	9-1-93	
	1.3	XR05053	XR05053	3-23-92	
OS/2 LAN Server/Requester ServicePak	2.0	IP06030	IP06030	4-25-93	
OS/2 LAN Server/Requester ServicePak	3.0	IP07045	IP07045	4-28-94	Includes IP07001, IP07003 (DLR), and I07005. This package has a co-requisite for WR07045 NTS/2 ServicePak, which ships with it. If you already have a refresh level of 3.00.1, you don't need this package.
OS/2 Extended Services Database Manager ServicePak	1.0	WR06035	WR06035	11-18-93	Supersedes WR06001, WR06002, WR06003, WR06004, WR06014, and WR06015.
Database Manager DB2/2	1.0	WR07015	WR07015	1-19-94	Supersedes WR07010 and WR07012. Download from one of the BBSs.
DDCS/2	2.0	WR07016	WR07016	1-19-94	
DBM DB2/2 Query Manager SelectPak	1.00	WR07022	WR07027	7-6-94	
DBM DB2/2 V1 PC DOS REQ SelectPak	1.00	WR07023	WR07023	5-6-94	
DBM DDCS/2 V2 SelectPak	1.00	WR07024	WR07024	5-6-94	
DBM DB2/2 V1 and DBAT SelectPak	1.00	WR07025	WR07026	7-6-94	
Extended Services Comm Mgr ServicePak	1.0	WR06025	WR06025	11-29-93	
System Performance Monitor (SPM/2) ServicePak	2.0	WR06075	WR06075	12/10/93	

Figure 1. Maintenance Release Levels (continued on next page)

Product/Component	Release	CSD Level	PTF Number	Change Date	Comments
OS/2 Network Transport Services/2 SelectPak	2.00	WR07045	WR07045	4-27-94	
OS/2 LAN Adapter and Protocol Support SelectPak	2.20.2	WR07045	WR07045	4-27-94	
Communications Manager/2 Version 1.01 ServicePak	1.01	WR06050	WR06050	6-11-93	Available only on diskette.
CM/2 Version 1.11 ServicePak	1.11	WR06150	WR06150	5-31-94	
DOS	4.0, 4.01	UR35284	UR35284	9-26-91	
	5.0	UR37387	UR37387	9-22-92	
C Set/2 Compiler	1.0	CS00050	XR06150	6-29-93	
C Set C++ Compiler	2.0/2.01	CTC0002	XR06102	12-15-93	
C Set C++ Compiler	2.0/2.01	CTC0010	XR06190	9-15-94	
C Set C++ Utilities	2.01	CTM0006	XR06196	9-15-94	
C Set C++ Utilities	2.00	CTL0007	XR06197	9-15-94	
TCP/IP for OS/2 Base and Application Kit	2.0	UN64092	UN64092	8-24-94	
TCP/IP for OS/2 DOS Box Kit	2.0	UN57546	UN57546	8-24-94	
TCP/IP for OS/2 Extended Networking	2.0	UN60005	UN60005	6-21-94	
TCP/IP for OS/2 Programmer's Toolkit	2.0	UN57887	UN57887	6-21-94	
TCP/IP for OS/2 Domain Name Server	2.0	UN60004	UN60004	8-24-94	
TCP/IP for OS/2 Network File System	2.0	UN57064	UN57064	6-21-94	
TCP/IP for OS/2 X-Windows Server	2.0	UN60006	UN60006	8-24-94	
TCP/IP for OS/2 X-Windows Client	2.0	UN59347	UN59347	8-24-94	

Figure 1. Maintenance Release Levels

TRADEMARKS

Personal Systems has made every effort to supply accurate trademark information about company names, products, and services mentioned in this magazine. Trademarks not known that may have been inadvertently used in this magazine are the property of their respective owners.

AIX, CUA '91, HUMAN-CENTERED, IBM, IBMLink, OS/2, PowerPC, Presentation Manager, PS/2, SAA, Series/1, ServicePak, ThinkPad, WIN-OS/2, Workplace Shell; International Business Machines Corporation

AceCAD, Acecat; Ace Cad Enterprise Co., Ltd. ANSI; American National Standards Institute Apple, Newton, OpenDoc, Macintosh; Apple Computer Inc.

AST; AST Research, Inc. BitCellular; Bit Software Inc. C++; AT&T Corporation CalComp, D-Pad; California Computer Products, Inc. cc:Mail, Lotus; Lotus Development Corporation Clarion Pen Developer; Clarion Software Corporation Compaq, Concerto; Compaq Computer Corporation

dBASE; Borland International DeScribe; DeScribe Inc. ferti-lome; Voluntary Purchasing Groups Inc. Fujitsu, 325Point; Fujitsu Limited GO, PenPoint; GO Corporation GRiD, GRiDPad, GRiD Convertible; GRiD Systems Corporation HI-SCREEN Pro II; Softway, Inc. HyperPAD; IQ Technologies Intel, Pentium, 386, 486, 486SX, 486SLC; Intel Corp. Internet; Internet Inc. Kurta, Kurta XGT; Kurta Corporation Logitech; Logitech Inc. Menuet/CPP, Menuet/CX; Autumn Hill Software Inc. MetaWINDOWS; Metagraphics MicroSlate, Datellite; MicroSlate, Inc. Motif, Open Software Foundation, Inc. NCR; NCR Corporation NEC, Versa; NEC Technologies, Inc. New York Stock Exchange; New York Stock Exchange, Inc. New York Times; New York Times Company NetWare, CNE; Novell, Inc. Open Software Foundation; Open Software Foundation, Inc.

Papyrus Technologies; Papyrus Technologies Inc. Passport; Passport Designs, Inc. PC Magazine; Ziff Communications Company PCMCIA; Personal Computer Memory Card International Association PenDOS, Handwriter; Communication Intelligence Corporation PenRight; PenRight Corporation Phoenix; Phoenix Technologies, Ltd. Power PEN PAL; PEN PAL Associates Inc. Samsung, PenMaster; Samsung Electronics Co., Ltd. Taligent; Taligent, Inc. TelePad; TelePad Corporation Toshiba, Dynapad; Toshiba Corporation TUSK; TUSK, Inc. USA Today; Gannett Corporation Wacom; Wacom Co., Ltd. WriteWare, Stealth Stylus; WriteWare Windows, NT, Microsoft, Windows for Pen Computing, MS-DOS, Windows for Workgroups; Microsoft Corporation UNIX; X/Open Company Limited VX-REXX, Watcom; Watcom International X-Windows; Massachusetts Institute of Technology Zinc Application Framework; Zinc Software Inc.

IBM Personal Systems

These back issues of *Personal Systems* are available to provide valuable information. Indicate the desired quantity for the issues you want to order and complete the information on the following page.

September/October 1994

"Sneaker Net" or Systems Management?
 Like Father, Like Son
 The Book Shelf
 Cajun Electric Cooks Up OS/2 GUI with VisPro/REXX!
 Application Development by Program Integration
 IBM REXX for NetWare
 GammaTech REXX SuperSet/2—Give Your REXX Programs the Power of C
 BranchCard: A Viable Option to Stand-Alone Hubs
 A Hands-On Primer for REXX
 Visual REXX Development Environments
 CID Installation of OS/2 2.11 and LAPS
 Upgrading from Microsoft LAN Manager to IBM LAN Server 3.0
 Stretching Your LAN with LAN Distance
 DB2/2—More Than Ever Before!
 NetBIOS, SNA, and NetWare IPX Coexistence Under OS/2

July/August 1994

IBM's Personal Systems Support Family—Customer-Influenced Design
 OS/2 Times and Scores the 1994 Indianapolis 500
 Software Compatibility: Good Relationship or One Night Stand?
 Migrating Windows Applications to OS/2: Easing the Migration Path
 OS/2 Conference Draws Praise
 DCE: An Application Primer
 Distributed Performance Characteristics of IBM DCE for OS/2
 Architecture Soup: Understanding Modern IBM PC Architecture
 TSHELL: A Text-Based Alternate Shell for OS/2
 Extended Attributes for Files
 Developing Lotus Notes Applications
 Conserving Power with Personal System Power Management
 Superstor/DS Data Compression in PC DOS 6.x
 LAN NetView Object Registration Services

May/June 1994

"Wrightsizing" at USAir
 Getting the Word Out at Chemical Banking Corporation
 Back Up for the Future
 Lost in Cyberspace
 The Book Shelf
 Threads
 Redirected Installation of OS/2 2.x
 LAN Server Ultimedia 1.0 Performance and Tuning

March/April 1994

If I Only Had a Brain
 Speech Recognition Products Untie Your Hands
 Telecommuting in the '90s
 Point of View: Not Just Another Database Article
 Professional Certification Program from IBM

Celebrate the Past on Your Trip Back to the Future!
 OS/2 2.1 Performance Tuning Tips—Part II
 PC File Systems
 NetWare 4.01 for OS/2: Features and Installation
 NetWare Requester for OS/2, V2.01: Features and Installation
 What's New in Novell NetWare 3.12?
 LAN Analysis Using IBM's DatagLANce Network Analyzer
 NetWare Questions and Answers

January/February 1994

Plan, Plan, Plan Your NetWare 4.01 Network
 LAD/2 in the LCU and NetView DM/2 Environments
 Easy Setup of CID Code Servers
 Managing Token-Ring Bridges with IBM's LAN Network Manager
 IBM DCE for OS/2 Multiuser Application Performance
 Performance of Key Functions in DCE for OS/2
 VisualAge: Its Features and Virtues

November/December 1993

IBM PC-DOS 6.1: More Features than MS-DOS 6.0
 SystemView Information Warehouse DataHub
 Developing DataHub Tools
 Using MPPM/2 to Create Multimedia Applications
 Advanced Client/Server Computing Using the IBM ThinkPad
 Communications Manager/2: A New Look
 Overview of IBM NetWare 4.01
 OS/2 2.1 Performance Tuning Tips

September/October 1993

IBM PSP's LAN Systems Solutions
 An Introduction to PCMCIA
 PCMCIA Software: The Key to Compatibility
 OS/2 Support for PCMCIA Memory Cards
 Improving Remote Initial Program Load Performance
 Installing and Configuring CM/2 1.0
 Writing CID-Enabled Applications
 Integrating LAD/2, CM/2, and DB2/2 with IBM LAN NetView Start
 DB2/2—DB2 Comes to the Desktop

July/August 1993

OS/2 2.1—Everything You Wanted It to Be and More
 Using REXX to Customize the Workplace Shell—Part II
 Client/Server Application Development with OS/2 and CICS/ESA
 Upgrading to OS/2 LAN Server 3.0—Advanced
 Developing OS/2 LAN Server Services
 PCMCIA PC Cards Provide Expandability and Network Interfacing
 Using the IBM ThinkPad with OS/2 and CM/2

April 1993

XGA-2: Improving on a Good Thing
 IBM Personal Software Products: Product Line Update

Using REXX to Customize the Workplace Shell
 OS/2 Distributed Systems Management with LAN NetView
 Priming and Querying Your Start Network
 Multimedia Applications on IBM Token-Ring LANs
 OS/2 2.0 Print Tips
 Testing OS/2 PM Applications
 Accessing a Remote AS/400 Using OS/2 Extended Services
 Virus Information and Protection
 Migrating from APPC/PC to Networking Services/DOS
 OS/2 2.0 Resources
 OS/2 32-Bit Application Migration Workshops
 IBM OS/2 Products Available on CD-ROM

January 1993

PS/2 Desktop Security
 IBM 486SLC2: System Performance Implications
 Micro Channel Developers Association
 Trackpoint II: The In-Keyboard Pointing Device
 Why OS/2 2.0?
 OS/2 Distributed Systems Management
 CID: Remote OS/2 Configuration, Installation, and
 Distribution of PC Software
 Start/2: Putting the Configuration into CID
 LAN Server 3.0: New Thresholds in High-Performance Network
 Software
 The Future of IBM LAN Network Management
 Understanding and Using the Workplace Shell
 Distributed Processing: A Case Study
 Parallel Port Protocols
 Developing OS/2 PM Applications with Micro Focus COBOL
 OS/2: How About Notebooks?
 Loadable BIOS

October 1992

Exploring File Server Performance
 PS/2 3.5-Inch Rewritable Optical Drive
 Programming the XGA Video POS Registers
 Video Monitoring on Personal Computers
 Memory Address Space
 OS/2 2.0 Installation and Performance Considerations

OS/2 2.0 Application Support
 Cleaner Installation of Applications Under OS/2
 Creating Resizable Pushbuttons
 Configuring Parallel Ports for OS/2
 Performance Characteristics of ES 1.0 Database Manager
 AlertVIEW
 Screen Reader/2

July 1992

IBM PS/2 Server 295: New Thresholds for Client/Server
 Networking
 Comparing Architectures: Micro Channel and EISA (Part 2)
 Synergy by Design
 Pen-Based Computers
 Why Doesn't My Portable's Battery Last Longer?
 Planning Guidelines for Token-Ring Cabling
 Installing and Migrating Applications in OS/2 2.0
 Printing Under OS/2 2.0
 Installing the IBM 4029 LaserPrinter Under OS/2 1.3
 Serviceability Tools in OS/2 2.0
 Online Communication Using the OS/2 2.0 PM Terminal
 IBM Extended Services Database Manager
 NetWare for SAA
 Using the IBM DOS 5.0 Driver EMM386.EXE and
 Upper Memory
 The Solutions Evaluation Tool

April 1992

Comparing Architectures: Micro Channel and EISA
 Portable Computer Trends and Directions
 LCD Panel Technology
 The OS/2 Workplace Shell
 New Applications in OS/2 2.0
 Unattended Installation of OS/2 2.0
 OS/2 Communications Manager Trace Events
 IBM and Novell LAN Software Coexistence
 IBM 8209 LAN Bridge Connects Ethernet Clients to Novell
 and IBM Servers
 Backup and Restore in an IBM NetWare Environment
 The DOS Protected-Mode Environment
 DOS Disk Management
 Customizing Alphanumeric Screen Dimensions

BACK ISSUE ORDER FORM

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

TELEPHONE (_____) _____

Price is \$12.00 per issue, plus \$3.95 shipping & handling per copy. Overseas orders add \$9.95 shipping & handling per copy.

Texas residents add applicable sales tax.

I have enclosed a: Check Money order
 Charge to: VISA MasterCard AmEx Diners

CREDIT CARD NUMBER _____

SIGNATURE _____ EXPIRES _____

Send this form with a check or money order, payable to **NCM Enterprise**, to: NCM Enterprise, P.O. Box 165447, Irving, TX 75016-9939. You can also fax both pages of this form to (214) 518-2507 (please include VISA/MasterCard/AmEx/Diners number and expiration date), or call (800) 678-8014. All orders must be prepaid. Checks must be in U.S. dollars.

NEW FIBER OPTIC Pen Computing FOR THE DESKTOP

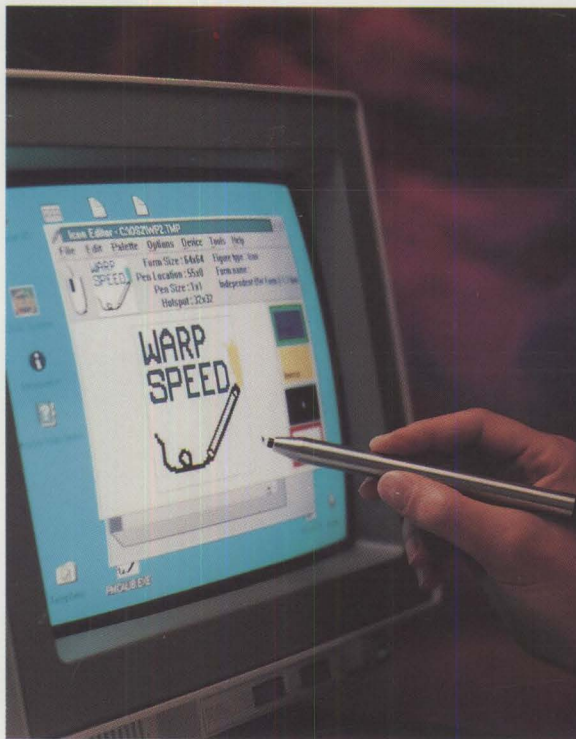
Under OS/2® 2.1, this new, fast input device allows you to take advantage of all the new drag and drop icons for fast target selection. Run everything the mouse does and more. Frustrated because you can't sign your name with a mouse? Add IBM's Pen for OS/2 software to create gesturing, sign your name and use handwriting recognition. Finally, click and go on your desktop monitor is a reality.

WHAT COULD BE EASIER?

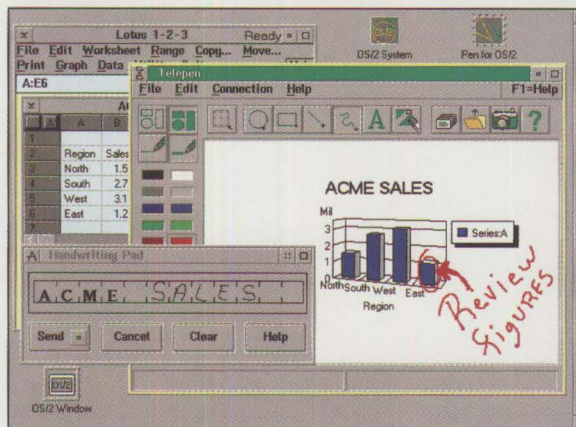
How much easier can pointing your finger be? Just hold the PEN in your hand and tap the tip at any CRT computer screen - your computer executes the command and you're off. A mouse simply cannot keep up!

GET YOUR DESK BACK.

Increase speed and accuracy and save desk space at the same time! One reason PENS are so easy to use is that they don't clutter up your desk with pads and hardware. You don't need any desk space for the PEN. The PEN stores neatly on the side of your monitor in a convenient holder.



WARP SPEED™ has developed a NEW fiber-optic PEN for any computer running OS/2.



Handwriting recognition, gestures, notes etc. are all made simple with the addition of IBM's Pen for OS/2 software.

CURSOR, CURSOR, WHERE'S THE CURSOR?

This game just became obsolete. You no longer need to go on a mouse hunt to find your cursor. Just ignore the cursor, touch the PEN to the target... the cursor just found you, instantly. This happens so incredibly fast you'll think the cursor is invisibly attached to the PEN.

JUST PLUG AND GO.

The WARP SPEED PEN for OS/2 comes complete with an adapter card (ISA or MCA), a high quality Stainless Steel PEN and PEN driver and calibration software for OS/2. Gesturing and handwriting recognition are available on IBM's Pen for OS/2 software.

RISK FREE INTRODUCTORY OFFER.

Make the jump to a WARP SPEED PEN for OS/2, try it for 30 days. If you don't agree that the PEN is far superior to the mouse, simply return it to us in its original box, and we will refund your money, no questions asked.



WARP SPEED™

Save
\$90.00

Call TOLL FREE (800) 874-4315 or (505) 258-5713 to order your WARP SPEED PEN for OS/2 and we will include IBM's Pen for OS/2 software for the low price of \$199.99. You save \$90.00 off the retail price of \$289.98 for both products. This is a limited time offer. Use your credit card or mail a check to Warp Speed, 1086 Mechem Drive, Ruidoso, NM 88345.

WARP SPEED is a trademark of Warp Speed Light Pens Inc. OS/2 and IBM are Trademarks of IBM Corporation.

Please circle #13 on reader service card.

Maybe You Can't Be In Six Places At Once...

*Relish®
Version 2.2 Spreads
Easier than Ever*

But now your
• Calendar,
• Phone Book,
• To Do List,
and other personal
information can

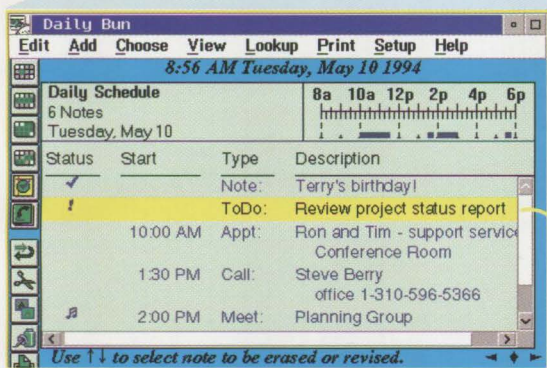


Relish Buns



Amazing Relish 2.2 Hot Buns

They're not files, not folders, not programs.
They're a new kind of Workplace Shell object
for dynamically viewing Relish information.



Here's how they work...

Buns give you views of your information when and where you need it. Use them just as you would Relish - or customize them to match your needs.

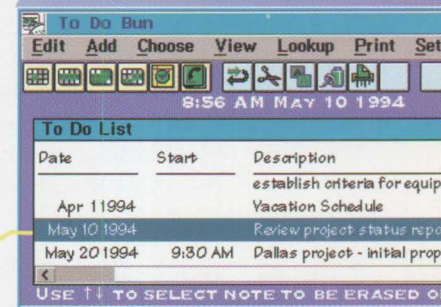
Aesthetically, change colors, fonts, window sizes and positions to fit your taste. And, there's a whole lot more.

Every bun can be copied and modified to present different collections of information.

Think of the possibilities.

One bun can show what To Do items remain for that important project. Another can have your meetings with Fred. Others for each category within your phone book. Put them in folders, on your desktop, anywhere you need them.

When you want just those project-related To Dos, open that bun and there they are. Need a printed copy? Just drag your bun right to a printer without even opening it.



To Do's for
Dallas Project



Meetings with
Fred Jones

Personal information where you need it,
when you need it, always up-to-date,
always consistent — a sure way to
Relish every moment of your day!

Only Relish 2.2 Gives You All This

- * NEW! Iconbar for one-click access to your preferred functions
- * NEW! Type-to-search lets you "just start typing" to find things fast
- * NEW! Floating entries (without times or dates) appear on current date
- * Entries can span any length of time from a few minutes to many days
- * Intelligent time and date recognition gives you quick keyboard entry
- * Alarms can be scheduled as far ahead of an event as you want
- * Quick-access reference calendar can remain on the desktop
- * Reminders are automatic; so is schedule synchronization on a LAN
- * The most extensive drag-and-drop support of any OS/2 program

Best of all, everything is always up to date. If you make a change through your complete To Do list, or put another project To Do on your calendar, your customized bun is automatically and instantly updated, right before your eyes!

Call 310•596•5121

**Sundial Systems
Corporation**

909 Electric Ave, Suite 204,
Seal Beach, CA 90740 USA

Relish

NEW Version 2.2 — one part of Sundial System's
"Personal Information Object" strategy for giving you
access to information like you've never had it before.