PC TAP
Consumer Report

Graphics Software for Scientific Applications
Desktop Printers

Open Forum:
MS Windows DOS Extension
Macintosh 35mm Slides

Report #2
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PC TAP CONSUMER REPORTS

From the Editor's Desk

Welcome to the second publication in our *PC TAP Consumer Reports* series. In this issue we are featuring a report about our recently-completed PC Technology Assessment Program study of graphics software for scientific applications. The purpose of the study was to investigate the suitability of commonly-available graphics packages for displaying scientific data, as opposed to the business information that is often presented in graphics format. The report begins on page 2.

In another report on page 19, the results are presented of a survey conducted at RTP to assess user satisfaction with three popular desktop printers. Chanya Harris, RIC II's WordPerfect specialist, conducted the survey while visiting secretaries and other heavy users of WordPerfect in the Research Triangle Park area. *Open Forum*, beginning on page 24, contains two items. The first is a synopsis of a Microsoft Windows 286 information paper published by the EPA National Data Processing Division's Architectural Management and Planning Branch. The second article, contributed by Theresa Rhyne of RIC II, provides a step-by-step description of a recommended technique for making 35mm slides on Macintosh computers.

The response to the first *PC TAP Consumer Report,* published in August, has been encouraging. We're pleased that readers like our informal format, and that you find the reports readable and informative. In upcoming issues we will be publishing findings from our in-process studies of PC graphics file conversions, color output devices, and desktop scanners. We hope you will continue to enjoy these reports, and that you will find them helpful. Also planned for future *Consumer Reports* is a regular summary of "what's going on around the Agency" in terms of technology assessments that are planned or in progress by groups other than PC TAP.

David A. Taylor
PC TAP Coordinator

PC TAP Consumer Reports do not present formal findings, represent official policy, or make specific recommendations about which products our readers should or should not use. Rather, they are intended as an information exchange through which our readers may share opinions, based on their own experiences, about various items of hardware and software. The last page in this issue has information about how to submit material for publication in *PC TAP Consumer Reports.*

GRAPHICS FOR SCIENTIFIC APPLICATIONS

Introduction

Those who use desktop computers to prepare scientific data for hardcopy publication have long struggled with the limitations imposed by PC-based graphics software. The market has traditionally catered to the requirements of business graphics consumers with software that makes attractive pie, bar, and word charts, but which can't construct the kind of graphics required for scientific data representation. Although the "scientific graphics" software that has been marketed for some time has been largely a collection of band-aided business graphics packages, vendors are beginning to show signs that they are at last hearing the cries of the scientific computing community.

One of the goals of this PC TAP project was to present an objective assessment of software commonly in use throughout the Agency for scientific graphing. We asked participants in our study of PC software for scientific graphics to assess the qualities of a number of such products. An informal survey was conducted among some of the EPA scientific compting community, and the products mentioned most often as either in use or of significant potential interest were selected for evaluation. Our objective was to determine how suitable this group of products is for typical EPA applications, not to perform a detailed investigation into *all* the characteristics and capabilities of each package. Our report, then, reflects the findings of your peers as they applied these software solutions in their particular working environments. Here are the products that were assessed in this study:

- EnerGraphics
- Grapher
- Graph Plus
- Harvard Graphics

- Lotus Freelance Plus
- Lotus Graphwriter II
- Sigma Plot
- SlideWrite Plus

Three additional products--Arts & Letters, TempleGraph, and Xerox Graph--are also undergoing user assessments. However, because these evaluations were begun late in the project, the reports on those packages will be the subject of a followup item in a future *Consumer Report.*

Each study participant was asked to use the software being evaluated to prepare a graphics image typical of those normally used in his organization. A standard evaluation form was provided on which users were asked to record their assessments of the software from a number of perspectives. To ensure the completeness of the evaluation form and the appropriateness of its contents, it was reviewed by a several scientific users who are experienced in the preparation and use of graphs for the analysis and presentation of scientific data. A composite summary of the input from these evaluations is presented in a table on page 16.

Beginning on page four, each of the software products evaluated in this study is described in some detail. In these discussions we have attempted to create a verbal synopsis of the quantitative data extracted from the evaluation forms. Evaluator comments are quoted when they are available and they amplify or clarify the text. Additionally, when related information has been found in trade publications the appropriate citations are provided.

About Graphics Software for Scientific Applications

To the uninitiated it may seem that a PC graphics package should have universal applicability. After all, a graph is a graph, isn't it? However, after closer investigation one learns quickly that the requirements that *scientific* graphics must satisfy are much more elaborate and specific than those for graphs typically prepared for business applications.

Except for sharing the term *graphics* in their labels, scientific graphics and business graphics have little in common. For example, a recent feature in *Infoworld* ("The New Power of Presentation Graphics," Infoworld, April 3, 1989, pp. 55-74) pointed out that text charts account for 70 to 80 percent of the data-generated graph charts in the typical business presentation. On the other hand, in comparison with features like error-bar creation, curve fitting, and missing-value processing, text-handling is a low priority in graphics for scientific applications.

Scientists' requirements for graphics have been summarized as "high-quality output that can be sent as is to a scientific journal for publication. And they need to be able to produce it quickly, make changes in a straightforward manner, examine the results of the changes on-screen, and then print the graph. Another requirement ... is flexibility in determining the appearance of the graph ..." ("Scientific Graphing Software: Not Just a Pretty Picture," *PC Magazine,* March 14, 1989, p. 259). Perhaps the contrast between business and scientific graphics can best be illustrated by listing some of the evaluation criteria used by *PC* and *Infoworld* in their respective studies.

Scientific	Business
Performs arithmetic	Bulleted lists
Calculates standard deviation	Free-form text charts
Maximum points per data set?	Bar charts
Scientific & Greek symbols	Line charts
Line style options	Pie charts
Line thickness options	Area charts
Grid line options	Variety of type fonts
Composite graphs	Shaded fill patterns
Log and log-linear plots	3-D effects
Error bars (x and y axes)	360-degree rotation
Bar graphs w/optional error bars	Predesigned text charts
Polar plotting	Preformatted templates
Curve fitting options	Drawing capabilities

Clearly, although the fundamentals of graphics imaging are involved in both of these areas, we are dealing with a case of apples and oranges when we try to compare them. And while our purpose here is not to compare *business graphics* with *scientific graphics,* one should understand the fundamental difference between the two categories when assessing the suitability of software for one of them. This is especially applicable in our current situation, because while most people have at least a passing acquaintance with business graphics, few are aware of the meticulous, exacting requirements often associated with the graphic depiction of scientific data. But now that we're all adequately grounded in our subject we can begin looking at our software evaluation reports.

Product Reviews

On the following pages, product reviews are presented in alphabetic order by product name.
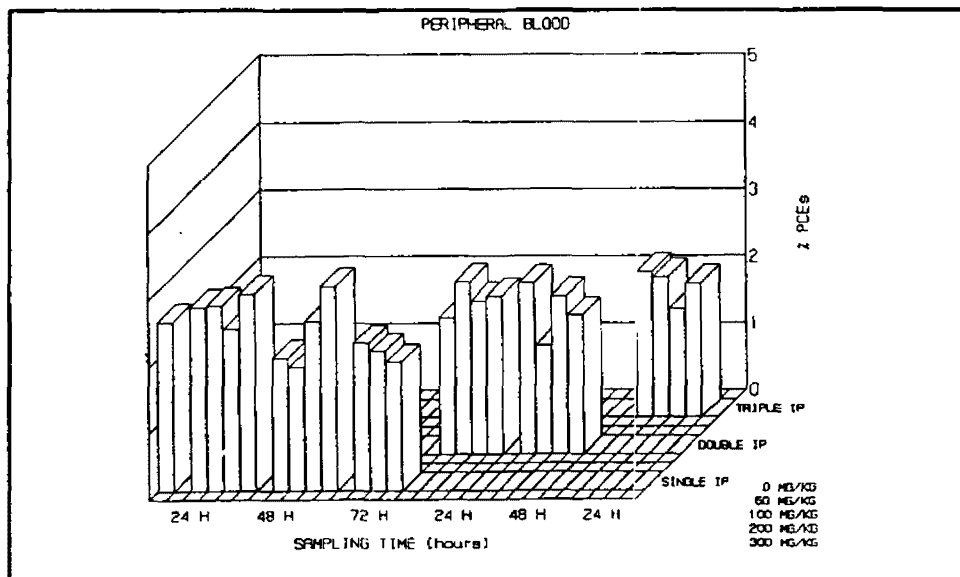
EnerGraphics Overview

EnerGraphics is a general-purpose graphics package. It makes standard pie, bar, line, and text charts, and also has the capability to create statistical and symbol charts and scatter graphs. Special fonts are available to customize charts generated in EnerGraphics, and charts can be imported into the product's DRAWING module where logos and symbols can be added and lines, curves, and graphics can be drawn on the chart. ASCII files can be imported directly into EnerGraphics.

Although this product certainly has the capability to generate certain charts and graphs that would be useful for presenting some scientific data, its orientation strongly favors business/presentation graphics. This is clear from a list of things the user's manual says the product is well suited for: organization charts, flow charts, special logos, floorplan layouts, electrical circuits, mechanical drawings, musical scales, advertising layouts, designing letter fonts, and preparing graphics for desktop publishing applications.

User Assessment of EnerGraphics

Our software evaluator--an experienced, sophisticated PC user--found EnerGraphics version 2.2 fairly intuitive and easy to use. However, the documentation, the tutorial, and the online help features were all found to be average-to-poor in quality and usefulness. Initial creation of a graphic image required some study before success was achieved.

This package provides most of the features generally considered minimal requirements for scientific graphic use, but it doesn't support output in Postscript or matrix camera format. During the assessment, the graphs were printed on the HP Laserjet Series II printer and the HP plotter. Using program defaults, output on these two devices was judged "average," with some changes in shapes and sizes in comparison with the original screen image. Our evaluator felt the quality on the HP Series II was acceptable, but considered the HP plotter output to be below average. The graph below was produced on the HP Laserjet Series II by EnerGraphics.

Several apparent bugs were encountered in the software. For example, the screen went blank and the file was lost if HELP was called while customizing a graph. Also, the EGA driver was unstable, sometimes necessitating a reboot of the PC in order to return to the Automaxx menu when exiting from EnerGraphics.

This product's best feature was reported to be its ability to handle 2 or more items in 3-D. Nevertheless, EnerGraphics was rated unacceptable overall, and our evaluator commented that he "would not recommend this program to anyone ..."

        EnerGraphics, List $395
           Requirements: 512K; DOS 2.0 or later

        Manufacturer: Enertronics Research, Inc.
           5 Station Plaza
           1910 Pine Street
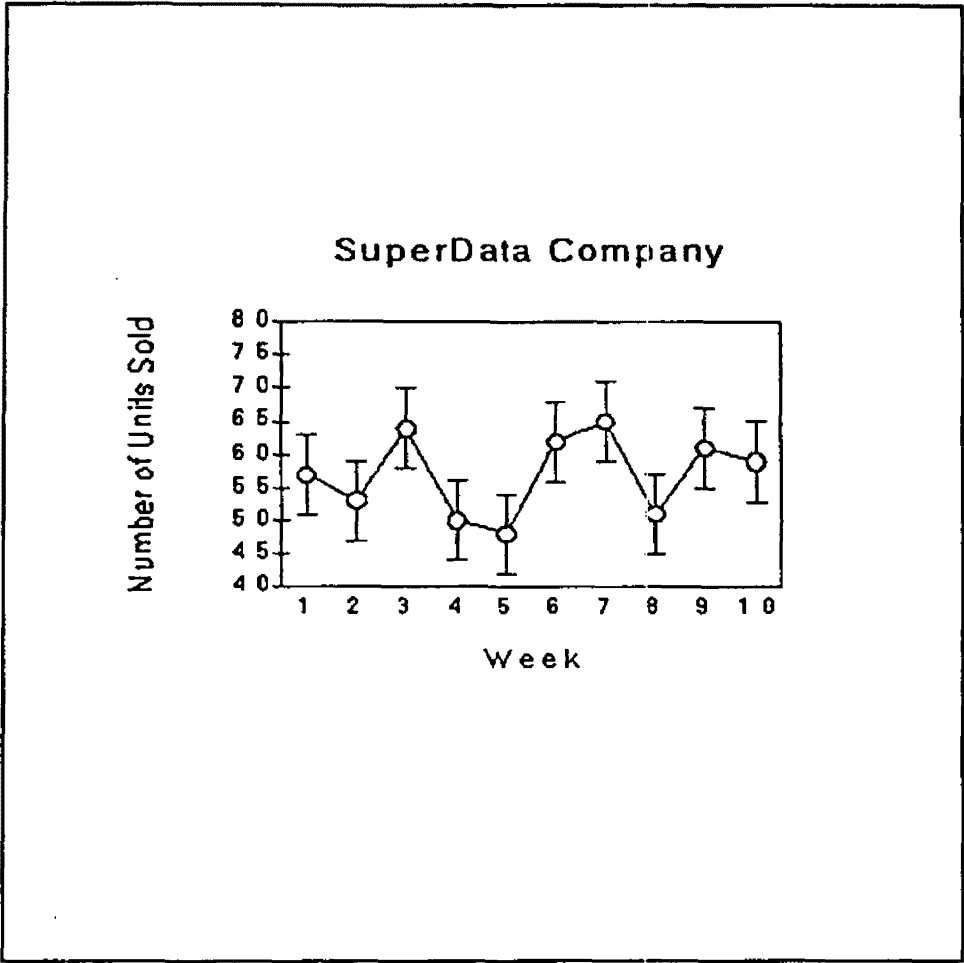   Saint Louis, MO 63103
           (314) 421-4682

Grapher Overview

Golden Software calls this product a "powerful and flexible tool for creating high resolution XY graphs for viewing on screen or output to a printer or plotter." Grapher employs pull-down menus to offer over 100 options for creating XY graphs, but defaults also provide pre-selected options that allow users to create graphs by simply entering their data. The basic package comes with two additional modules called View and Plot. View allows the user to look at disk-resident graphs, and zooming and panning functions are supported. The Plot module produces hard copy output; it can also serve as a standalone program to plot existing graphs from disk files.

One of Grapher's strong points is said to be its flexibility in tailoring the appearance of a graph. Nearly every element of a graph can be edited; the size, shape, orientation, and color of symbols, axes, and labels can be adjusted. The inability to adjust line thickness when outputting to a laser printer or when creating slides, however, limits the potential quality of the results. Other shortcomings of this product include an inability to use calculated standard deviations to plot error bars, and the total absence of bar graphs from its inventory of graph types. Nevertheless, Grapher was selected as an "Editor's Choice" in *PC Magazine's* March 14, 1989 feature on scientific graphing software.

User Assessment of Grapher

Despite media claims to the contrary, our reviewer, a working EPA scientist and acknowledged "PC hacker," found Grapher to be somewhat difficult to use. Needed information was found to be unavailable or hard to find in the "not very helpful" tutorial. Initial creation of a graph was "difficult," as was the generation of a "nice looking plot." The latter problem was attributed to the print program being separate from the plotting program. Plots generated on an HP Laserjet (one is reproduced on the next page) were rated as poor-to-average with some alterations in shapes and sizes and color variations. File importation was rated "cumbersome" (import files must be ASCII text); file export is not supported by Grapher.

5

SuperData Company

Number of Units Sold

8 0
7 6
7 0
6 5
6 0
5 6
5 0
4 5
4 0

1 2 3 4 5 6 7 8 9 1 0

W e e k

On the positive side of the ledger, Grapher's handling of regressions was rated "excellent." The capability to handle multiple regression types was seen as the product's best feature. Another advantage is Grapher's capability to read and graph up to 30,000 data points from each of up to ten data sets.
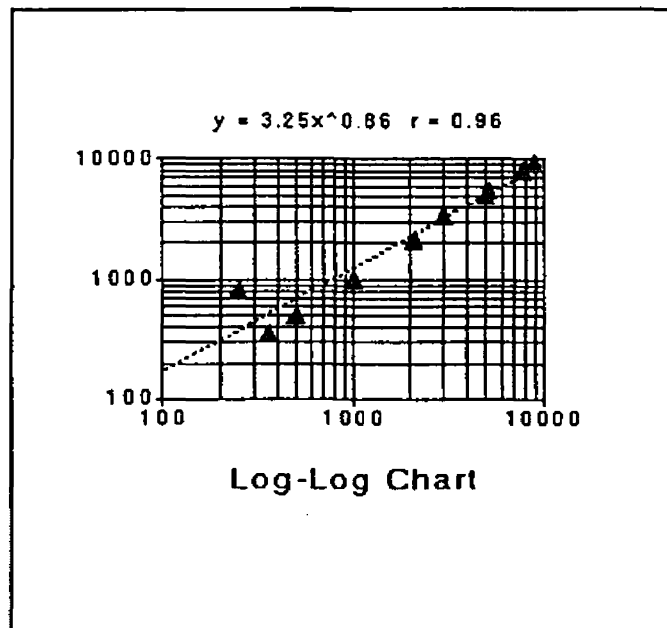
Grapher, List $199
Requirements: 320K; DOS 2.0 or later

Manufacturer: Golden Software Inc.
807 14th Street
P.O. Box 281
Golden, CO 80402
(303) 279-1021 (800) 333-1021

Graph Plus Overview

Micrografx calls Graph Plus "a program designed to let you create professional business and scientific charts." The emphasis, however, is clearly on the business/presentation graphics end of the spectrum. *PC Magazine* included this package among a group of "business-oriented presentation graphics packages (that) claim to have the features that scientists need." The package's reported strengths include attractive output as a result of having access to all the fonts and drawing capabilities of Microsoft Windows, along with great ease of use and editing power.

Graph creation is accomplished by specifying the data to be graphed and the type of graph desired. Graph Plus provides a "worksheet" file into which the user may enter values, or into which existing files may be opened for editing or adding more data. Certain external data files (Graph Plus, VisiCalc, dBASE III, Multiplan, Excel, Lotus 1-2-3, Symphony, and comma-delimited ASCII) can also be imported into a Graph Plus worksheet. However, few graphics images can be imported; only files created in Micrografx Designer or those that can be brought from other Windows applications via the clipboard can be imported.

Available chart types include tables and area, bar, column, line, pie, and scatter charts. Once the user has selected the type of graph to be created, the software displays a "Gallery" dialog box containing examples of the formats in which such graphs can be created, with the default highlighted. When the user selects the type of graph desired, Graph Plus creates it using the previously-specified worksheet data. A Graph Plus sample chart is reproduced below.

$y = 3.25x^{0.86}$ $r = 0.96$

Log-Log Chart

7

User Assessment of Graph Plus

Our Graph Plus reviewer, an experienced programmer and user of graphics software for analysis and presentation of scientific data in his day-to-day work, felt that Graph Plus would be a viable option for someone who is already working in a Windows environment. Although the product was easy to install and become familiar with, overall ease-of-use was rated average-to-poor. Items considered to be below par were those typically of most interest to scientific users: handling of curve smoothing, Greek characters and mathematics notation, error bars, missing values, regressions, and super/subscripts.

Graph Plus's strong points include a short learning curve, maximum control over the image's attributes (height, positioning, fonts, titles/labels, etc.), and the ability to edit all aspects of existing graphs. Hard copy output was reported to be fair, with some variations in shapes and sizes in comparison with the original screen image. Graph Plus also comes with both a Postscript driver and a matrix driver that can be used to build a SCODL file for creating 35mm slides. According to Micrografx, the capability to convert files to PICT format for the Macintosh is in the works.

> Graph Plus, List $495
> > Requirements: 512K; DOS 2.0 or later
> > > Microsoft Windows 2.0 or later
>
> > Manufacturer: Micrografx
> > > 1303 Arapaho Rd.
> > > Richardson, TX 75081
> > > (800) 272-3729

Harvard Graphics Overview

Harvard Graphics is another of the presentation graphics packages that are often considered appropriate for scientific use. While it can produce the usual pie, bar, line, text, and area charts, additional options within the standard menu items provide for the creation of additional types, including dual y-axis, scatter, histogram, and logarithmic charts. A wide variety of optional utility and clip art packages are available, including what *Infoworld* called "a superb map-making program" ("The new power of presentation graphics," *Infoworld*, April 3, 1989, p. 63).

Compared with most of its competitors, Harvard Graphics has been around for some time. As a result, it has a few limitations that have been overcome in some newer products. For example, you can't draw fitted curves, arcs, or freehand shapes; nor can you rotate, flip, or mirror images. When creating new objects, there is a limitation of 16 on-screen colors at the same time. Documentation, while polished, is rather formal in style, a characteristic that may put off some individuals who are used to the more conversational style that is becoming increasingly visible in the marketplace. The product gets mixed reviews with respect to the ease with which it can be learned and used. Users also need to be aware that set-up for this package requires loading of a number of drivers, the presence of which can prevent some other software from executing due to lack of available memory.
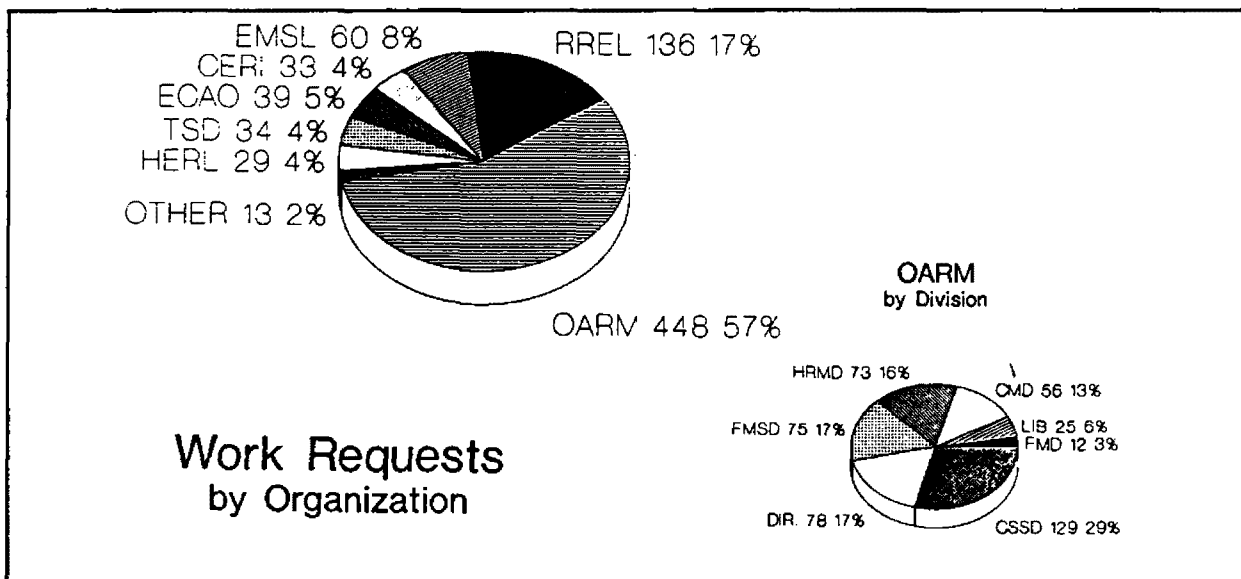
Compensating for Harvard's shortcomings is an impressive list of advantages. It supports a wide variety of output devices, including laser printers, Postscript printers, color printers, plotters, and film recorders. Macros can be written to automate command sequences or to facilitate forms completion. A batch capability allows you to collect a number of files, then route the group to a printer or save it to a disk or directory of your choice.

User Assessment of Harvard Graphics

So far, the evaluators of the software we have discussed have all been working EPA scientists. Harvard Graphics was assessed from a different perspective, that of an information center consultant. The software was found to be easy to install and use, with predictable keystrokes for most functions. Although there is no tutorial with the product, online help was rated "very helpful." "Ease of use" was rated the best feature of this package, along with the capability to quickly generate standard charts while also having fairly sophisticated capabilities to call upon for more complex applications.

Graph creation was rated simple and straightforward, with control over all graph components except the position of the graph on the page. With respect to editing, only the legend size could not be modified. The criteria our scientific community wants in graphing software were all rated average or excellent, except for an important exception: error bar creation is not available. On the other hand, up to 240 data points can be handled

The quality of output produced in a variety of formats was rated average or good in each case. Hard copy obtained on the HP Laserjet, HP 7550 plotter, and HP 7510 slidemaker were said to be very good, while output to the PTI Montage film recorder was rated "excellent." Hard copy output was said to be an exact replica of the screen image. ASCII and Lotus files can be imported into Harvard Graphics; Metafiles can be exported. In response to an evaluation form item asking for the product's shortcomings, our participant offered "A little buggy for output. Weak telephone support." The chart below is a standard Harvard Graphics horizontal bar chart that was stored as a symbol, then broken into individual elements and edited. The result was printed on an HP 7550A at high resolution.

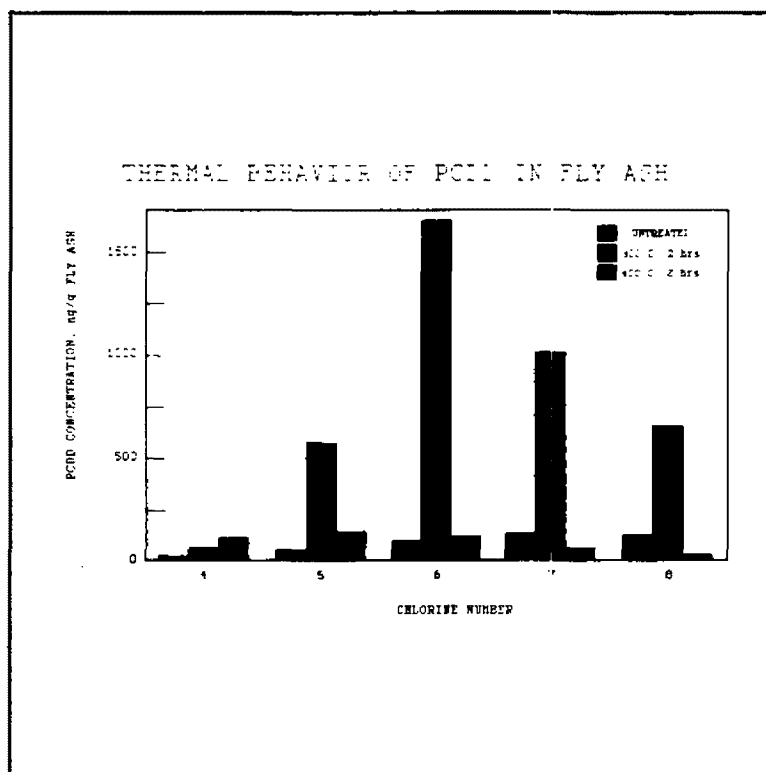Harvard Graphics, List $495
    Requirements: 512K; DOS 2.0 or later

Manufacturer: Software Publishing Corporation
    1901 Landings Drive
    Mountain View, CA 94039
    (415) 962-8910

Lotus Freelance Plus Overview

Although Freelance Plus didn't even make *PC Magazine's* list of "presentation graphics packages with potential for scientific use," this product has received some attention within the EPA scientific community. At the Agency's largest research facility, this package is heavily used to import and polish graphics images created in other, more scientifically-oriented packages like Graphwriter or Sigma Plot. *Infoworld* called Freelance Plus "one of the two best presentation graphics products" (along with Harvard Graphics), and named it an excellent value.

Twelve chart types can be created with Freelance Plus: standard vertical and horizontal bars, stacked vertical and horizontal bars, line, pie, xy scatter, text, area, bar-line, high-low-close-open, and table. More than 40 text-chart templates are available for those who can make do with the professionally-designed defaults. Those who wish to exercise their creative talents will appreciate the extensive editing and drawing capabilities. Objects can be rotated, flipped, mirrored, arrayed, and precisely placed. An extensive symbol library (over 400 items) minimizes the need to draw original figures.

Lotus PIC files and Graphwriter II files, Metafiles, and ASCII files can be imported; exports are in Metafile format only. However, spreadsheet data from a variety of sources can be imported, and data from a Lotus file can be dynamically linked with a Freelance Plus graph so that when the data changes the graph is automatically updated. In *Infoworld's* speed tests of file import capabilities, Freelance Plus imported a Lotus .WK1 file in only 2.1 seconds, the fastest time among ten products tested.

User Assessment of Lotus Freelance Plus

Although online help is available with Freelance Plus, our evaluators found it to be "not very helpful." That wasn't a problem, however, because the manual contains a good tutorial and use of the product is very straightforward and predictable. Ease-of-use and ease-of-learning were both rated "excellent," as was file importing. The inability to export files in multiple formats (although you can create EPS and TIFF files, only Metafiles may be exported) was felt to be a significant shortcoming of this package.

Chart creation was straightforward after some study of the documentation. A suggested technique that some users may find advantageous is to create graphs with other software, then import them into Freelance Plus for final editing and outputting. Imported images were reported to be very faithful to the originals, and they could be edited in all aspects. The capability to create specialized drawings and to enhance existing graphs were reported as the product's best features.

Output from Freelance Plus was rated excellent on the HP 7550A plotter; HP Laserjet, HP Paintjet, Apple Laserwriter, and matrix camera output was considered average. None of the "scientific" functions on our evaluation form were scored, since they are not available with this product.

> Lotus Freelance Plus, List $495
>   Requirements: 512K; DOS 2.1 or later
>
> Manufacturer: Lotus Development Corporation
>   55 Cambridge Parkway
>   Boston, MA 02142
>   (617) 577-8500

Lotus Graphwriter II Overview

Graphwriter II is Lotus Development Corporation's entry into the graphics software world. Although its primary function is to serve as a "linked" graphics connection to Lotus 1-2-3 and Symphony spreadsheets, it can also read data directly from dBASE, .DIF, SYLK, and ASCII files. When Graphwriter II graphs are *linked* to data files, the graphs are automatically updated by the software whenever the linked data files are changed. By executing a single command, the product's "Automated Charting System" enables you to print up to 100 different charts in one run.
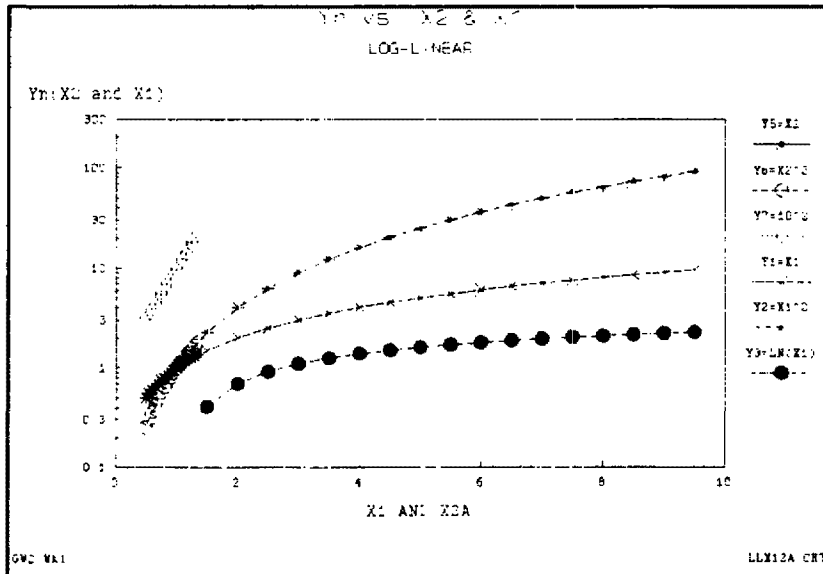
Chart creation is a menu-driven process. When you start up Graphwriter II, the first screen you see displays the main menu of commands across the top of the screen in Lotus 1-2-3 fashion. And, like 1-2-3, you can cursor to the desired command and press the enter key, or you may simply type the first letter of the command name you wish to execute. Selecting "chart type" from the main menu causes a "pop-up" menu containing all 24 available chart types to be displayed. To build a chart, you simply select the type of chart desired, then fill in the blanks on the "forms" Graphwriter II presents to specify additional chart characteristics like titles and labels. Data can be entered on the forms or imported from a spreadsheet or other compatible data file. A preview command allows you to look at your finished chart on the screen before you print it.

To provide a capability to enhance Graphwriter II charts, you can create .DRW files for further refining in Freelance Plus. Charts can also be written as Metafiles for use by other products. A wide variety of output devices as supported.

User Assessment of Lotus Graphwriter II

Our evaluator, a programmer in an EPA lab, reported using Lotus 1-2-3 to edit tables of data which are then input to a Graphwriter a chart (he prefers XY-scatter). These graphs make slides, but for presentation-quality output exporting to Freelance Plus for further editing is recommended. This product was rated fairly easy to use, with an excellent tutorial and online help. The documentation is superb in all respects.

Most of the criteria EPA scientific users want to see in their graphing software were rated "excellent" on the evaluation form, with one important exception: error bar handling was said to be poor. However, up to 500 data points can be accommodated. Graphwriter II's ability to copy data directly from spreadsheets, to have process different X-values for each set of Y-values on the same X-axis, and to export Freelance .DRW files were listed as its best features. The worst shortcoming was found to be that tic-marks are on the inside edges of axes where they obscure data. A remedy for this problem was found, though: bring the graph into Freelance Plus and "flip" the tic marks! This chart is from a Freelance .DRW file created in Graphwriter II using data from a Lotus 1-2-3 spreadsheet:

Initial chart creation with Graphwriter II was reported to be simple and straightforward. There is excellent control over typical components like title size and location, axis labels, colors, fonts, etc., and all components except the overall object size could be edited. A wide variety of output devices are supported, but our evaluator prefers the Apple LaserWriter for fast processing and high-quality hard copies.

Lotus Graphwriter II, List $495
  Requirements: 512K; DOS 2.1

Manufacturer: Lotus Development Corporation
        55 Cambridge Parkway
        Boston, MA 02142
        (617) 577-8500

Sigma Plot Overview

Although Sigma Plot was named an "Editor's Choice" in *PC Magazine's* review of scientific graphing and presentation graphics software, they also called its user interface "awful" (<u>Scientific graphing</u> <u>software: not just a pretty picture</u>, *PC Magazine,* March 14, 1989, p.276). A case in point is the product's inconsistency in menu selection options: depending on the screen, you may (a) select a numbered option; (b) select a letter option; or (c) use a function key to make your selection. Editing of labels was also reported to be laborious.
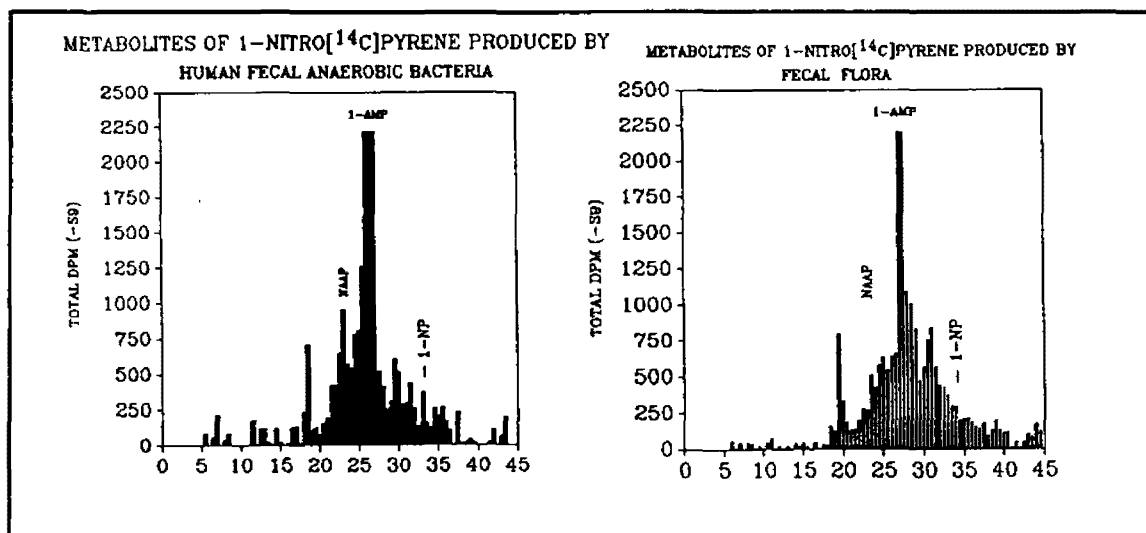
Sigma Plot gets good marks in areas of particular interest to the scientific user community. Error bar treatment is excellent--*PC* says "the best we've seen so far" (p.273). There is also a high degree of user control over the appearance of graphs, including determining line thickness in output sent to a laser printer (remember, lack of this capability was considered a significant shortcoming in Grapher). Plotting to an HP LaserJet was called "painful," with some complex graphs taking as long as two hours to print.

This product supports all of the "scientific" functions listed on our evaluation form, and allows control over all components of automatically-generated charts. All aspects of chart images can be edited. Importing and exporting of ASCII, .DIF, .PIC, .WKS or .WK1, and Metafiles is supported. Sigma Plot charts often are imported into Freelance Plus for further processing.

User Assessment of Sigma Plot

Despite its limitations, one of our users evaluated Sigma Plot very favorably. Where our evaluation form asked for a list of shortcomings, this participant, an EPA research biologist, wrote "There are no shortcomings ..." It was also noted that the product allows maximum creativity on the part of the user. Usage of Sigma Plot was characterized as "fairly intuitive," with an excellent tutorial and online help. Initial graph creation was said to be simple after reading the documentation.

Chart quality was rated "excellent" on the evaluation, an exact replica of the original screen image. It was noted, however, that it "takes awhile" to output a plot on the LaserJet. Faster output is available on the HP 7550A plotter, but quality suffers somewhat in the process. The best features of Sigma Plot were listed as "the ease of plotting standard error bars, performing basic statistics and least square regression analysis." A typical chart created with Sigma Plot appears below.

Just to illustrate once again that beauty is in the eye of the beholder, a second participant who assessed this product was less enthusiastic. This evaluator found the product difficult to use without frequent references to the documentation or help, which were felt to be only "average." To illustrate this point, it was commented that "calculating error bar data is very easy once one figures how to set the data up (this is not explained well in the manual)." This person rated the quality of the final output "good."

> Sigma Plot, List $395
> Requirements: 640K; DOS 2.0 or later
>
> Manufacturer: Jandel Scientific
> 65 Koch Road
> Corte Madera, CA 94925
> (415) 924-8640

SlideWrite Plus Overview

This product has had two significant upgrades over the past two years. The latest release, version 3.0, was used by both of our evaluators. Unlike several other packages in our review group that were designed primarily for presentation graphics applications, SlideWrite Plus appears to have been originally designed for scientific applications. Error bars, curve-fitting, calculation of means and standard deviations, and handling of super/subscripts have been in the repertoire in previous versions. With each upgrade, enhancements have been introduced to provide capabilities usually associated only with presentation graphics packages. As a result, SlideWrite Plus now pops out when computer data bases are searched for "presentation graphics software."
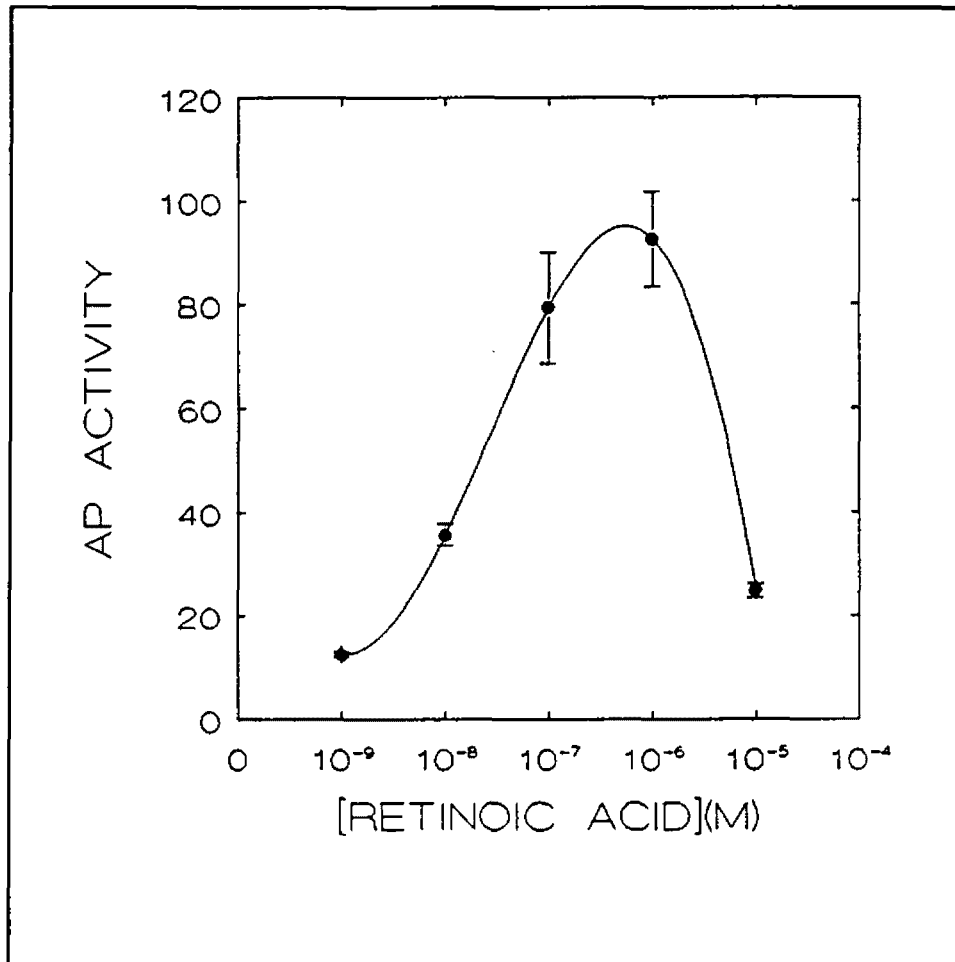
This easy-to-install product provides many powerful features. Support is included for 16 VGA or EGA colors, 46 fonts for HP and PostScript printers, and a powerful drawing module. Twelve graph types, 12 line types, and 7 line sizes are included.

SlideWrite Plus tied for first place, along with Harvard Graphics, in *PC Week's* presentation graphics user poll, the results of which were published in the November 14, 1988 issue. The consensus among the 762 poll respondents was that output quality is the single most important factor in selecting software in this category. SlideWrite Plus received the highest ratings in ease of learning and use, quality of documentation, and vendor support.

User Assessment of SlideWrite Plus

Both of our SlideWrite Plus evaluators said this product was predictable and easy to use. They disagreed on the quality of the tutorial, however; one said "excellent," the other only "average." Under "best features," were listed these items: "wide range of graphing and clip art features; easy file handling; very few limits imposed; and data options--statistics, curvefit, equation." This product does offer all the functions that the EPA scientific user community considers necessary for scientific graphing software, with support for up to 4000 data points and 21 fill patterns. Our evaluators gave "excellent" ratings to curve smoothing, Greek and math characters, Log X and Log Y scales, missing data, regressions, and super & subscripts.

An impressive list of output drivers are supported by SlideWrite Plus, and output quality was rated excellent. All the usual chart types are available except for contour and Gantt, and mixed and 3-D line charts can also be generated. Charts generated with this product could be fully controlled by the users, and all design components could be edited. Both evaluators reported "minor differences" between screen displays and printed output. ASCII, CGM, .WKS or .WK1 files can be both imported and exported; EPS, HPGL, PCX, LL, and SCODL files can be exported. A user-generated SlideWrite Plus chart follows.

SlideWrite Plus, List $445
    Requirements: 360K; DOS 2.0 or later

    Manufacturer: Advanced Graphics Software
             333 W. Maude Avenue, Suite 105
             Sunnyvale, CA 94086
             (408) 749-8620

Summary

If you've read the assessment summaries of all nine products included in our study, at this point you're probably asking yourself "What have I learned from this? . . . Which product or products will do the job for me in graphing scientific data?" The answers to the first of these questions will no doubt vary from person to person, depending upon individual perspective and how much one previously knew about the topic. With respect to the second question, certainly each specific application has requirements and characteristics that might be handled better by one product. But in general, if we stay in the context of *scientific* graphing, there are criteria that a software package should meet; we established that in "About Graphics Software for Scientific Applications" on page 3. Referring back to the features the EPA scientific computing community said they want in graphing software should help us re-focus on specifics, and in so doing help point to answers to the question "Which product or products will do the job for me?" The table below will help in the re-focusing process.

Feature	EnerGraphics	Grapher	GraphPlus	Harvard Graphics	Freelance Plus	Graphwriter Plus	SigmaPlot	Sidewrite Plus
Handles Error Bars	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Performs Regressions	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Supports Log Scales	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Supports Curve Fitting	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Supports Curve Smoothing	No	Yes	Yes	Yes	Yes	No	No	Yes
Has Greek/Math Characters	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Has Super/Subscripts	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Handles Missing Values	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Imports/Exports Files	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Maximum Number of Data Points	250	30,000	Unlmtd	240	N/A	500	128	4,000
Maximum Number of Fill Ptrns	8	N/A	38	12	15	9	3	21
Number of Output Drivers Supported*	3	4	5	8	3	6	5	8

*From this list on our evaluation sheet: Apple Laserwriter, CGM, HPGL, HP Laserjet, HP Plotter, Matrix Camera, Postscript, Metafile.

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DESKTOP PRINTERS

A User Satisfaction Survey

Chanya Harris, RIC II's WordPerfect consultant, has had considerable personal contact with a number of heavy WordPerfect users in RTP recently. This group includes managers, secretaries, and other administrative personnel who do lots of word processing tasks. Since it's likely that these folks also work their printers harder than other users typically do, we asked Chanya to talk to them about what they do and don't like about these devices.

Seventeen users participated in our printer survey. All of these individuals are using either the Hewlett Packard Deskjet or Laserjet Series II printer. They were asked to rate their printers in three categories: (1) print quality; (2) speed; and, (3) ease of use. A five-point scale was employed, with a score of five being the most favorable rating. The survey questionnaire also allowed for application-specific ratings and comments for six applications: WordPerfect 5.0, Lotus 1-2-3, Freelance Plus, Freelance Plus 3.0, dBASE III+, and dBASE IV. Not surprisingly with this population, there were few responses to applications other than word processing so we won't go into detail regarding application-specific issues. The averages for WordPerfect 5.0 (all respondents rated this product) are summarized below.

	Print Quality	Print Speed	Ease of Use
HP Deskjet	4.3	3.0	4.0
HP Laserjet Series II	4.6	3.2	3.8

User comments reflected a high level of overall user satisfaction with both these printers. No mechanical or maintenance-related problems were reported. Reliability and quality are apparently the strong points of the HP desktop printers.

Two complaints surfaced fairly consistently. One complaint, slow printing speed, is evident in the numerical ratings listed above. The second is really a group of complaints that refer to ink-related problems on the Deskjet. These issues range from "ink smears if touched too soon after printing" to "ink smears even when touched the following day." One person would like to see some kind of indication of the amount of ink remaining or a "low ink" warning, so users would know when it's time to replace cartridges instead of being caught off guard. Sounds like a good idea to us.

In conjunction with this study, Chanya conducted speed and print-quality evaluations of the printers available in the RIC II at RTP. In addition to the two printers addressed in the user survey, this group of devices includes the Apple Laserwriter and the HP Deskjet Plus. The results are shown in the charts on pages 20 and 21; the contents of the five test files are reproduced on page 22. The chart on page 23 shows the impact of fonts on times for printing a 6-page document on each printer. The first document, *Testdoc1*, contains all Helvetica text of varying sizes and styles, with some italics and bolding. *Testdoc2* is the same document, but with a mixture of Helvetica heads with Courier body text, and some italics and bolding. *Testdoc3* is the same document with everything converted to the default Courier font.
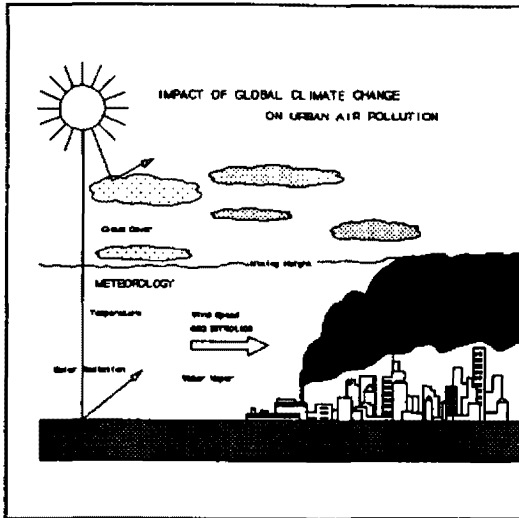
PRINT QUALITY - SUMMARY

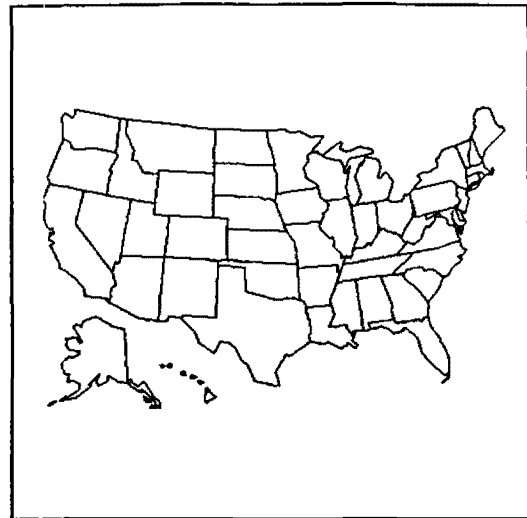|	GRAPHICS LINES 3257 bytes	TEXT BOXES 3567 bytes	LINE DRAW BOXES 5449 bytes	CLIP ART IMAGES 10508 bytes	FREELANCE .GMF FILES 16324 bytes
HP DESKJET					
The HP Deksjet had problems printing different levels of black and gray fill-in. Straight lines were distorted, not smooth. The Deskjet also had problems printing text created in smaller fonts; characters ran together.					
HP DESKJET PLUS					
As with the regular DeskJet, the DeskJet Plus does a less than average job of printing objects with gray fill-in. However, the DeskJet Plus is comparable to the Apple Laserwriter in printing graphics lines. It far exceeds the Series II in that category. Also, the DeskJet Plus had no problem printing line draw boxes. Overall, this is an excellent letter quality printer.					
APPLE LASERWRITER					
The AppleLaserwriter handled objects which required gray fill-in the best. Also, lines which were created using the graphics lines features were smooth without much distortion. Overall, this is an excellent laser printer.					
HP SERIES II					
The HP Series II did not perform as well as the Apple Laserwriter when printing objects with gray fill-in. Also, the lines created with the graphics line function had a small amount of distortion. Overall, an above average laser printer; the quality level is not as high as the AppleLaserwriter.					

PRINTER SPEED - SUMMARY

	GRAPHICS LINES 3257 bytes	TEXT BOXES 3567 bytes	LINE DRAW BOXES 5449 bytes	CLIP ART IMAGES 10508 bytes	FREELANCE .GMF FILES 16324 bytes
HP DESKJET	30.66 minutes	7.31 min.	2.51 min.	5.71 min.	5.83 min.

This printer is extremely slow. It is unable to duplicate levels of
gray shading (most of the shading was too dark). However, the amount of fill
present in the document did not hinder its speed, the complexity of the file
seems more important in determining printer speed. This printer has problems
printing graphics lines.

HP DESKJET PLUS	20.51 min.	3.1 min.	.7 min.	2.9 min.	2.71 min.

Much faster than the regular DeskJet. Complexity seems to be a print speed factor.
The DeskJet Plus is slower when printing graphics lines (especially vertical),
but is faster printing larger, simpler objects and line draw boxes.

APPLE LASERWRITER	0.41 min.	* 1.25 min.	* 2.1 min.	2.18 min.	2.25 min.

The complexity of the file was the deciding factor for printer speed. The clip
art image is 10508 bytes, twice as large as the line draw file, yet the line
draw file took twice as long to print.

HP SERIES II	0.38 min.	* 0.5 min.	* 0.66 min.	1.75 min.	2.58 min.

Documents without much dark shading printed much faster on the Series II,

i.e., graphics lines, text boxes and line draw boxes. However, the Series II

was noticeably slower on clip-art images and Freelance .GMF files.

* These tests were run twice, to verify the difference in printer speeds between
the Apple Laserwriter and the Series II in the text box and line draw box categories.

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Freelance File

IMPACT OF GLOBAL CLIMATE CHANGE
ON URBAN AIR POLLUTION

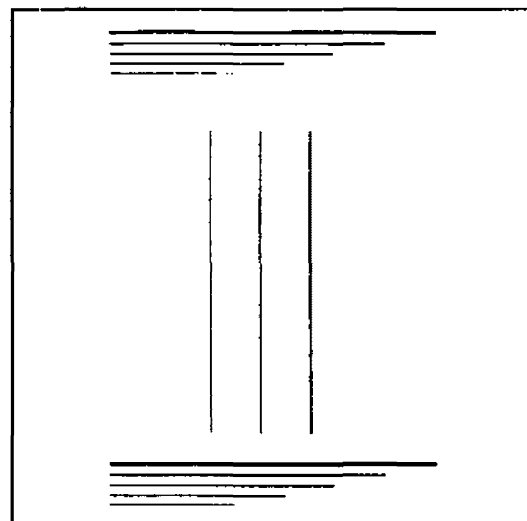METEOROLOGY

Clip Art

Text Box

Screen Capture lets you capture any EGA PC
text or graphics screen image and save it in
a PCX paint file format for use in Harvard
Graphics on-screen slide shows.

Screen Capture lets you capture any EGA PC
text or graphics screen image and save it in
a PCX paint file format for use in Harvard
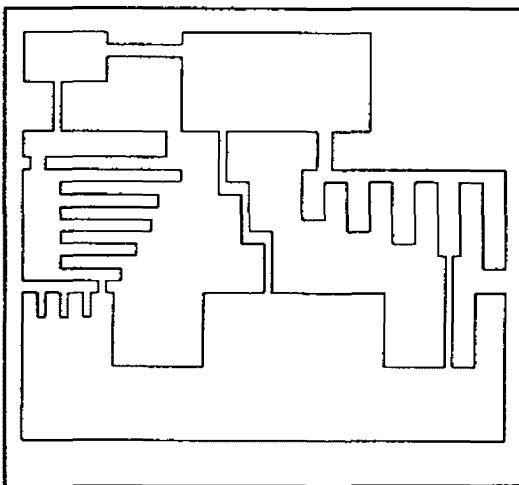Graphics on-screen slide shows.

Screen Capture lets you capture any EGA PC
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Screen Capture lets you capture any EGA PC
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a PCX paint file format for use in Harvard
Graphics on-screen slide shows.

Graphics Lines

Line Draw Boxes

PRINTER TESTS

6 PAGE DOCUMENT

PRINTER SPEED

	Testdoc1	Testdoc2	Testdoc3
	Helvetica	Helvetica & Courier	Courier
HP SERIES II	1.89 min.	1.45 min.	1.23 min.
APPLE LASERWRITER	1.40 min.	1.93 min.	1.46 min.
HP DESKJET	7.50 min.	7.31 min.	6.45 min.
HP DESKJET PLUS	3.52 min.	4.60 min.	4.50 min.

COMMENTS:

- Apple LaserWriter prints the Helvetica font faster than it does Courier

- Quality of text printed on Apple Laserwriter far exceeds HP Series II output

- Differences in print speeds using Helvetica (for all testdocs) are less significant than when printer uses Courier; obviously more memory involved in changing Courier text attributes (bold, underline, etc.)

- Text Adjustment: when changing documents from HP Series II driver to Apple driver (but keeping same typeface), the Apple Laserwriter adjusted the text by choosing a smaller original font size. Example: Let's say I started with testdoc2 on the Series II with Helvetica 12 pt font. When I switched printers to the Apple Laserwriter, and scrolled through the document, I noticed that the fonts were being adjusted to 10 pt, even though the Apple Laserwriter is quite capable of printing in Helvetica 12 pt.

Open Forum

Open Forum provides an opportunity for users to share with others their own innovations, or the results of their own technology assessments. The PC Technology Assessment Program neither verifies nor endorses the contents of *Open Forum* items, but we are pleased to offer them as a service to users.

This item contains a synopsis of a paper published recently by the EPA National Data Processing Division's Architectural Management and Planning Branch. It presents the findings from a technology assessment performed by the Branch.

MICROSOFT WINDOWS:
A DOS ENVIRONMENT ALTERNATIVE
FOR SELECTED USERS

The Microsoft Windows study was undertaken because of interest within EPA in the product, and because Microsoft has announced plans to package MS Windows with MS-DOS in 1990. Windows was evaluated as a possible alternative to the AUTOMAXX menu software for certain EPA users who presently require *context switching*--that is, switching between two or more applications without exiting any of them. The long-term answer to this requirement is OS/2, IBM's operating system of the future. Under OS/2, multitasking allows multiple programs to execute simultaneously. It is expected that use of OS/2 will be an evolutionary process, and little software is currently available that takes advantage of its power. However, although estimates vary of how soon OS/2 use will become widespread, that it will eventually dominate the industry is certain.

Over the past two years, MS Windows has become the most popular DOS extension for making the DOS user interface easy to learn and use, and for overcoming some of DOS' limitations. Windows provides a graphics-based operating environment within which all items, including text, are depicted graphically on the computer monitor. For applications written specifically for MS Windows, it provides a consistent user interface, sharing of text and graphics among applications, and true multi-tasking. Although existing EPA standard applications will not take full advantage of this environment, MS Windows does allow context-switching between them. Furthermore, cut-and-paste of text between concurrent applications is also supported.

During this assessment, WordPerfect and Lotus 1-2-3 were tested under MS Windows 286 on an AT compatible with 2M bytes of expanded memory, a mouse, and an EGA display. Both applications performed satisfactorily, but there was less available memory than when running under DOS alone. Originally context switching was slow, nearly as slow as exiting and re-entering applications in the AUTOMAXX DOS environment. However, after some experimenting and consultation with Microsoft technical support, significant improvement was realized. Context switching between Lotus 1-2-3 and WordPerfect, which initially took about 18 seconds, was taking only 2.5 seconds after the fix. Other tests included running two Lotus spreadsheets at the same time, and cutting and pasting text between Lotus and WordPerfect.

To achieve this performance, several problems had to be overcome. First, context switching between a Lotus spreadsheet and a WordPerfect document sometimes resulted in the error message "COM PORT IN USE, CANNOT SWITCH BETWEEN APPLICATIONS." A system boot was

generally necessary to abort the COM port. This problem was resolved by arbitrarily changing the order of the "DEVICE =" statements in the CONFIG.SYS file. The increases in context-switching speed were accomplished with two other changes. First, the parameter "/e" was added to the "SWAPDISK =" statement in the WIN.INI file, forcing MS Windows to save the inactive application to expanded memory before using the hard disk. Next, it was found that the size of the SMARTDRIVE ram disk, which is a part of MS Windows, had an effect on switching time. After some experimentation, 512K was found to be the optimal size.

Clearly there are advantages in the MS Windows environment for users who require context switching: running multiple applications concurrently, and switching between them without loosing one's place in either application and without having to reload data. Additionally, one can become acclimated to an OS/2-like environment and to the use of a mouse while continuing to use current, familiar software. On the other hand, most users would have to buy a memory expansion card, additional memory, a mouse, and the MS Windows software for their current machine in order to implement this capability.

It is expected that EPA's strategic plans will include the powerful multitasking environment that OS/2 will provide. Meanwhile, the recommendation for most EPA users is that they continue with DOS 3.3 and AUTOMAXX, and that they migrate to OS/2 when applications that will run in that environment are readily available. However, for users who *must* have context-switching now, MS Windows is an available and viable alternative.

§ § §

This item was contributed by Theresa Rhyne, an Information Center Consultant and Macintosh expert at the RIC II in Research Triangle Park. It describes a method for producing 35mm slides on the Apple Macintosh computer. You can reach Theresa at (919) 541-0207 or FTS 629-0207, or by EMAIL at T.RHYNE.

MACINTOSH GRAPHICS FOR 35mm SLIDE PRODUCTION

Here are some suggestions for creating 35mm slides in the Macintosh environment. Producing detailed graphics like those usually required for presentation slides requires plenty of computing power. Thus, it is recommended that a Macintosh with at least 2 megabytes of memory be used for composing slides. Use of a computer with minimal memory will result in an excruciatingly slow processing pace. If color is desired, a Macintosh II or SE with a color monitor is recommended.

A number of software products that create bit-mapped graphic images are available for the Macintosh. A *bit-mapped* image is composed of dots of light on a computer screen. To present the image, each light dot is either *on* (black/colors) or *off* (white). The rough edges of bit-mapped images can be smoothed and contoured by using one of another group of products called *drawing* software. Two good products for creating illustrations on the MAC are Claris' *MacPaint,* which operates only in black and white, and *Pixel Paint* from SuperMac Technologies, which supports

painting in color. For flow charts or schematics, try Claris' *MacDraw*, Deneba Software's *Canvas*, or *Freehand* from Aldus Corporation.

After graphic images have been created in one of the painting or drawing packages, they are moved to desktop presentation software where text may be added and the final slide images can be prepared. Presentation software does for slides, overheads, and computer screen presentations what desktop publishing software does for material destined for printing on paper: it facilitates layout and design. In order to move the graphics files, they must be in PICT format. Painting software automatically creates PICT format files, but those created by drawing packages will have to be converted before they are moved to presentation software. Examples of presentation software include Computer Associates' Cricket Presents, Microsoft's Power Point, and Persuasion from Aldus Corporation.

The final step in slide production is to transfer the finished slide images to film recorder software where they can be shot onto a roll of 35mm film. The film recorder software is the interface between the Macintosh and the camera. Matrix Instruments produces both software *(Conductor)* and a camera for shooting Macintosh files onto 35mm film. The final result is sure to enhance any meeting or presentation.

§ § §

How to Submit Items for *Open Forum*

In keeping with the PC Technology Assessment Program's objective to have the user community actively involved in TAP projects, users are encouraged to submit items for inclusion in future *PC TAP Consumer Reports*. If you have independently investigated the capabilities of a software product or a hardware component, we would like to hear from you. We'd also like you to share with others your solutions to any problems you may have encountered with a particular application or device, and about tricks, shortcuts, or unique applications you have devised. Although we can't promise to publish every contribution, we will evaluate them all in terms of their potential interest to our readers and their conformance to the spirit and intent of PC TAP.

There are no additional rules for *Open Forum* contributions, but here are some guidelines:

1. Contributions must be typed. Our first preference is that they be submitted on a floppy disk in WordPerfect format. If that isn't possible, the next best method is to EMAIL the text to DAVE.TAYLOR, EPA3099. The least preferable method, but still acceptable, is to mail a typewritten article to TAP at the address on the cover of this publication.

2. The length of your contribution will be determined somewhat by its complexity. However, keep in mind that we're primarily interested in the purpose of your study project and how pleased you were with the results, not in the nitty-gritty details of how you did it. We will publish your name, address, and phone number for those who want more details. Two to three pages is probably a reasonable maximum length. On the other hand, a paragraph containing a nugget that may be useful to others would be equally welcome.

3. All material submitted by users is subject to our editing, and you will not be given an opportunity to review the final manuscript before publication. Sorry, you'll just have to trust us. If we have questions or don't understand any part of your text, we'll contact you for clarification.

We hope you enjoy *PC TAP Consumer Reports,* and we look forward to hearing from individuals who have insights or discoveries to share with others. Thanks for your interest and your participation in the PC Technology Assessment Program.