IBM

Telecommunications Marketing Center
Raleigh, N.C.

Communications
Systems
Bulletin

3270 PRODUCT EXCELLENCE...1985

3270 PRODUCT EXCELLENCE...1985

Raleigh Market Support Center - Workstations

As with most documents of this type, many people have contributed their thoughts and experience. In particular Competitive Marketing Programs, NAD, and IBM Canada Western Region have made significant contributions to the marketing strategy underlying this presentation. Since competitive products are constantly changing, Competitive Marketing, or the COMP file on HONE, should be accessed to obtain the most recent status of "3270 compatible" products.

OBJECTIVE:

This presentation is designed to market the strengths of the 3270 family as it contributes to end user satisfaction and productivity; to emphasize the interdependencies of SNA, the 3274 and attached devices; and to show how implementation of the full SNA 3270 product line will optimize overall cost and performance.

PRESENTERS:

Marketing representatives, system engineers, and communication and workstation specialists (communications specialist skills not required).

AUDIENCE:

Customer MIS director and staff. The presentation materials are structured to allow the presenters to tailor them to their specific audience and needs. Three suggested agendas for a short (45 min), medium (1-2 hours) and long sessions (3-4 hours) are provided.

NOTE:

1) This presentation has been updated to reflect current product offering and strategies as of June 18, 1985.

2) The foils are NOT IBM Confidential; the Script is classified as IBM CONFIDENTIAL.

TABLE OF CONTENTS

SUGGESTED PRESENTATIONS

The audience will determine the content and duration of your presentation.

Typically, the 3270 Product Excellence is the kickoff presentation. Use this to establish the architecture and quality of the IBM product line. Key points to address are: the "sum is greater than the total of the parts", IBM's corporate commitment to "being the low cost quality producer" and that the 3274 has and will continue to grow as the customers' needs change. Make certain to choose the workstation foils and highlight the points of most importance to your customers!

The workstation investment presentation shows why workstations are a key part of the total solution. Key to the investment is the understanding that the **SMALLEST PART** of the total investment is the workstation itself when compared to the cost of the user. Stress the erogonomics of the IBM products you are recommending to your customers.

The detailed 3274 presentation covers the important technical issues that the customer technical advisors will want to understand in order to recommend the **BEST TOTAL SOLUTION** to their management. An ideal time to present this would be prior to a Workstation procurement. Stress the key areas of HOST network problem reporting, response time statistics and the excellent IBM Service organization.

Short, medium and long versions of customizing this presentation are outlined below. Double "X"s represent added emphasis in a given area.

AUDIENCE		TOPICS 3270 PRODUCT EXCELLENCE	3274 DETAILED PRESENTATION	WORKSTATION INVESTMENT
MIS DIRECTOR	S	X		X
	M	X	X	X
	L	XX	X	X
USER EXEC	S	X		XX
	M	X		XX
	L	X	X	XX
TP PLANNER	S			
SYS PROG	M	X	XX	
	L	XX	XX	X

The following three pages are meant to get the presenter into the Workstation environment.

PRIMARY MESSAGES

The business world is becoming increasingly dependent upon data processing communications. As this dependence grows, the ability of networks to grow and adapt to technological advances should be a primary selection criterion. IBM's communications products are designed to facilitate growth and adapt to change, while maintaining compatibility with already installed equipment. **These benefits are derived from a systems design which distributes function across the various elements of the network as appropriate.** Key elements include the IBM 3725, IBM modems, the IBM 3274, and the IBM 3270 family of displays and printers. Each element works with the others to minimize overall network costs and maximize user productivity and satisfaction. The whole is greater than the sum of the parts; eliminating any of the network elements substantially reduces the potential overall benefit.

The IBM 3274 is a cornerstone of the system. By virtue of its microcoded operating system and its location at the user end of the network, the 3274 is ideally located to improve:

Workstation usability

Access to network services

Network performance

Network Manageability

Ability to grow without disruption

As we advance in the world of Office Automation, Electronic Mail, and Personal Computers, the flexibility to add function and attach widely differing terminal configurations to a single cluster controller will be critically important. The IBM 3274 has demonstrated its ability to accommodate new and varied function. Its importance as a basis for future growth cannot be overstated.

COMPETITIVE MARKETING

The 3270 product line has been so successful that it has attracted a number of "IBM 3270 Compatible" vendors. Many of these vendors offer workstations which attach directly to IBM controllers. Others require their own controllers. When marketing against "3270 compatible" products, it is important to know how "compatible" the competitive product really is. For example, a product line which requires proprietary controllers must be micro-coded by its manufacturer to emulate the IBM 3274. Typically, this emulation is a subset of the function provided by the IBM 3274. "SNA Compatibility" may simply mean coexistence on an SDLC link. "PC Attachment" may be nothing more than 3278 Emulation by a Personal Computer. "3270 compatibility" may really mean basic function, which does not include Extended Data Stream capabilities like eight-color, multiple logical units, efficient PC to host file transfer and vector or programmed symbol graphics.

Unfortunately, it is impossible to provide a list of IBM "exclusives" because, in almost every case, a given IBM 3270 feature is offered by at least one competitive vendor. However, there is no competitive product that provides the complete spectrum of functions, features, quality and reputation for service provided by IBM.

Throughout this presentation, you will find "Notes to the Presenter" which highlight IBM strengths. Few of these strengths can be considered IBM exclusives today; over time, it is reasonable to assume that competitive products will incorporate many of these features. It should be stressed that **the architecture is the key IBM exclusive.** Since IBM is the architect, it is reasonable to assume that IBM will continue to lead other vendors in implementing new features. For the latest information on other vendor announcements, consult COMP on HONE.

CONTROL UNIT COMPETITION. Stress IBM's ability to provide added function by simply updating 3274 diskettes. Since the IBM 3274 micro-processor is a proprietary device, other vendors cannot use IBM-coded diskettes to provide comparable function. Other vendors do offer microcoded controllers, but only IBM controllers can execute IBM-written microcode. One specific feature...Extended Data Stream...is especially significant because, without it, attached workstations are limited to the 3277 subset function. As of this writing, no known competitive controllers have demonstrated full support for this important foundation for technological growth. This presentation highlights the value of the Extended Data Stream feature.

WORKSTATION COMPETITION. When competing with terminals that attach directly to IBM 3274 controllers, stress the ergonomic benefits of IBM keyboards; the excellent quality of the IBM CRT image; EIGHT colors; graphics; and large screens. Very few vendors offer all of these capabilities. Another strong IBM advantage in the workstation area is the low cost of maintenance (implying a high quality, highly reliable product) and the traditionally high residual value of IBM 3270 displays.

Note to Presenter: A Module entitled "The Workstation Investment" has been   included   in this REVISED PRESENTATION FOR USE IN APPROPRIATE SITUATIONS.

It may be of value to describe the process by which new 3270/SNA products are defined within IBM. An Architecture Review Board meets regularly (currently monthly) to consider proposed 3270/SNA extensions and new products. Because this review board is aware of SNA and 3270-attachable products under consideration for future announcement, appropriate measures are taken to avoid design conflicts and provide for future requirements.

Non-IBM vendors do not have the benefit of knowing IBM's product plans; nor do they participate in the Architecture Reviews. Hence, certain OEM features may preclude implementation of new IBM features in their "IBM compatible" products. A recent example of this is the use of the Operator Information Area at the bottom of the screen. The Architecture Review Board ensures compatible use of this area across all IBM workstations.   Currently, some non-IBM vendors have difficulty implementing the very popular Entry Assist capability because of their non-architected use of the Operator Information Area. Similarly, certain keys are required to enable the new features, like Response Time Monitor. Vendors who do not provide those keys, or who have assigned other   meanings to   them may find it   difficult to   implement subsequently-announced IBM 3274 capabilities.

(V-1) IBM 3270 "THE STANDARD OF THE INDUSTRY"

Since its introduction in 1971, the 3270 has become the standard communications product of the industry. Based on its reputation for quality, ease of use, and flexibility this status is well-deserved. This presentation will highlight the reasons for the excellent reputation of the 3270 family, and discuss the architecture that makes it possible.

(V-2) IT GETS BETTER AND BETTER AND BETTER!

The 3270 was initially announced in 1971. At that time, the primary communications control technique was Binary-Synchronous, and the communication media was telephone wires. Line speeds were typically 1200 bits per second and networks were much smaller than they are today.

In 1974, new models of the 3270 controller...3271 Models 11 and 12... were announced. These models were designed to work with the new SDLC line control facilities. Because the original 3271 logic was hard-wired, hardware changes were required when users converted from BSC to SDLC.

In 1977, micro-coded 3274 models (1A, 1B, and 1C) were introduced. Because the logic was no longer hard-wired, new capabilities like SNA support were possible; however, this announcement was far more significant than it initially appeared. Programmable intelligence in the 3274 was the foundation for a series of announcements that are still evolving.

In 1979, IBM announced the 3274-51C for smaller remote clusters. Also announced at this time was an Extended Data Stream capability for the new 3279 color graphics display. However, the Extended Data Stream was not provided just to allow color and graphics. Extended Data Stream was really the foundation for a much more significant announcement which was not to come until 1983...Intelligent Work Station support. (more later).

A year later, November, 1980, the 3274 models 21 and 31 were announced, with 64k and 128k of memory, respectively.

The next 3274 microcode announcement was called Entry Assist. This micro-coded feature adds typewriter-like functions such as tab stops, margins, audible end of line signal, and word wrap to workstations attached to the 3274. This was the first announcement in which the power of the 3274 really became visible to the end-user. An important aspect of this announcement is that like many other 3270 functions, this new function **could be added to terminals that were acquired six years earlier.**

Intelligent Work Station support, or PC connectivity, was announced in March of 1983. The important aspect of this announcement is not simply PC emulation of a 3270 display. The importance of this announcement is support for the **intelligence** in the Intelligent Workstation.

To support the increased requirements for network management, the 3274 was enhanced with the Response Time Monitor (RTM) feature to allow

9

collection of individual user statistics. Customer Network Control Centers were able to extract RTM data at the host with the announcement of Network Logical Data Manager Release 3 (NLDM). Errors are reported to the host console to flag problem situation facilitating prompt resolution. The benefits of these new features have increased end user satisfaction through higher availability and more consistent response time.

(V-3) WHY?

What has made this growth and customer acceptance possible? The 3270 family is based upon a design, or architecture, which ensures its ability to grow and change as technology evolves. Components of this architecture include host programming support, (DB/DC and SNA products), the 3270 products themselves, and a total system which integrates application software, communication protocols, controllers, workstations, and the end-user into a single synergistic network.

Full implementation of this end-to-end architecture results in a system which can accommodate the growth and change that are inherent in the dynamic world of telecommunications. In addition, the architecture includes automated network management capabilities.

Why did the 3270 family become the standard of the industry? Because it satisfied customer requirements while protecting their investment in its technology.

(V-4) WORKSTATION GROWTH.

In 1978, a study by the US Bureau of Labor Statistics predicted that by the end of the decade there would be roughly 30 million workstations installed. That's equivalent to one workstation for every two white collar workers.

Note to Presenter: More recent studies, such as International Data Corp 1984 in **Forbes** magazine forecasts even more aggressively with nearly 1:1 workstation to office workers by 1987 or 60 million workstations. No matter which forecast you feel more representative, the rate of change and sheer magnitude of the workstation population must be a key planning factor of every organization.

What is causing this growth? Productivity gains for the traditional DB/DC user continue to justify additional workstations. However, the advent of software with which business professionals can access automated analysis tools; artists can prepare color graphics presentations with on-line displays; secretaries can use interactive text/office systems; and executive workstations are linked to telephone systems for automated messaging/calendering, etc; and **all systems need interconnection and occasional host access...** all contribute to Workstation growth and help substantiate the forecasts.

In order to prepare for this explosive growth, it is of critical
importance that customers begin to install a system which is designed to
accommodate it. The 3270 family of products in an SNA network is such a
system.

(V-5) 3270 WORKSTATION FAMILY.

A major reason for the success of the 3270 family is the wide range of
workstation offerings available for attachment to the IBM 3274
departmental controller. Like an artist who needs a variety of colors
on his pallet to be successful in the creation of a satisfactory
painting, the designer of a departmental system of workstations needs a
variety of device functions to satisfy all users at a reasonable overall
cost. Starting with the economical 3178 and large screen displays for
conventional on-line DB/DC applications; the 3180-1 for programmable
keyboard and modifiable screen sizes; continuing through the 3179/G
Color graphics device used by business analysts; the popular PC with
Displaywrite 3 software for office/text efficiency; and the exciting new
3270-Personal Computer family of workstations; all of these workstations
and more are attachable to an IBM 3270 SNA network.

Printer options, attachable to the same departmental controller include
inexpensive matrix printers, color graphics printers, high speed line
printers, correspondence quality office printers, and the new All Points
Addressable publications-quality 4250 printer. The new 3179/G Color
permits attachment of a printer to an individual workstation for end
user convenience and productivity.

This full pallet of workstation offerings means that as your workstation
needs increase and change, the 3270 family can accommodate that change
without disrupting existing users, and without impacting your investment
in communications equipment. As all the forecasted workstations come
online, the concept of a departmental hub becomes increasingly
important. The attachability options of the 3270 family make it
possible to support this variety of user functions with one standard
controller, one standard technology, proven reliability, and the
management tools needed to control such a vital network.

(V-6) NETWORK COMPONENTS

The network consists of several components:

> 1. The central hardware and software, which controls the transfer
> of data between application programming and communications media.
> This is where performance enhancement, growth flexibility, and user
> satisfaction really begin. Many of these benefits are only
> possible when both ends of the communications link (host-3705/3275
> and 3274) have complementary logic. This is one-half of the
> performance and growth capability.

11

2. The communications link.

3. IBM 3274 Controller. Because of its location at the user end of the line, and because of its microcoded intelligence, the 3274 is the "other half" of the performance and growth facility.

4. The workstation is the final link in the chain, completing the IBM 3270 family.

Each component plays an important role in providing optimum service to the user. Each component participates in the total end-to-end architecture.

End-to-end architecture is an important concept to understand because the 3270 family is a **total system**. Each component carries its share of the total responsibility to provide the best possible, most cost-effective communication system. The replacement of any network component with one that does not participate fully in the architecture can substantially reduce overall system benefits.

Printers illustrate the impact of a non-participating device on overall system performance. Consider the effect of adding a line printer to a communications controller which also services a cluster of interactive workstations. Non-SNA printers can saturate the communication line while printing, and impact the response time experienced by interactive users. IBM printers attached to the controller are designed to **share** rather than **monopolize** communication resources. Not all "plug-compatible" printers include this capability. We will discuss other examples of end-to-end architecture in this presentation to illustrate the concept that the "whole is greater than the sum of the parts".

(V-7) CENTRAL COMPLEX

Let's examine the network, component by component, starting with the central processing complex. Included here are the data files, application software, and...of primary importance to this part of our discussion...the communications software which allows sharing of the central complex among hundreds (perhaps thousands) of concurrent users.

(V-8) 3270 NETWORK

The 3274 controller can run either BSC or SDLC software. For purposes of our discussion today we will focus on the benefits of SNA.

What are the major SNA benefits? First of all, **performance enhancement and consistency.** Efficient use of basic SDLC facilities can substantially improve overall system performance through better utilization of the communication line. Examples of SNA-implemented techniques to improve line utilization include: interleaved transmission from multiple control units on the same line; full duplex transmission; pacing and SNA Character String; and reduced line utilization during error detection/correction.

A second major SNA function provides for **multi-system networking.** Under SNA control, a workstation can access programs and data on any processor in the network...not just the one to which it is directly connected. This reduces the need for multiple workstations at one location and minimizes wiring costs. Using IBM multi-system networking facilities, (exclusive to full SNA networks) **any** workstation in the network can be given access to **any** application.

A third major benefit of SNA networks is broadly called **Network Management.** Today's networks are analogous to a parts inventory. The value of automated techniques for managing large inventories has long been accepted. Similar arguments can be used to justify automated techniques for the control of networks with thousands of devices, features, locations, problems, change orders, etc.

As important as network inventory management is, problem determination/anticipation tools are of even greater importance because of their direct impact on user satisfaction and productivity. Using SNA-only IBM Network Management software, operators of "Help Desks" (Network Control Centers) can request error statistics that are automatically captured by the IBM 3274. Random, transient failures are recorded to help in the analysis and prediction of impending network problems. An Alert function is also provided to call immediate attention to certain classes of device/line errors. These two very important facilities (Alert and Request for Maintenance Statistics) combine functions in the central processor and the IBM 3274, and are only available in full SNA networks.

Note to Presenter: The purpose of this discussion is to clarify the distinction between SDLC and SNA, and to illustrate some of the functions not provided by many so-called SNA-compatible products.

Many non-IBM vendors provide a subset of SNA features. However, the content of that subset varies from vendor to vendor, and from month to month. It is difficult to determine whether a given "SNA-compatible" product supports a given function, or whether it simply "tolerates" it. Support for a specific function can only be proven through actual measurement. As an example, many non-IBM printers claim SNA compatibility, including the ability to print SNA Character Strings. However, the ability to print at rated speed can only be detected by actual performance measurement. Customers evaluating "SNA-compatible" devices may wish to obtain commitments from prospective vendors concerning the following features:

- Variable frame size
- Modulo 7 error checking
- Interleaved full duplex transmission
- Pacing
- SNA character string performance
- Compression/encryption
- Response Time Monitor
- REQMS

13

- ALERT
- Extended Data Stream
- Host CNM Product Support - NPDA, NCCF, NLDM, NPA
- Modifiable Keyboard support
- Transmission speed to 64KBS
- Vector Graphics

Customers must fully understand these SNA features to appreciate the impact of their omission.

(V-9) RESPONSE TIME IMPROVEMENT...CONSISTENCY

This chart, based on a SNAP/SHOT simulation, illustrates the improvement in performance that SNA can provide. Using a typical IMS transaction as an example, (CICS transactions are similar) the response time improvement is clearly demonstrated, even with low line utilization. As the number of clusters (utilization) increases, non-SNA Response Time degrades significantly. With six active clusters, non-SNA protocol becomes saturated and response time increases to seven seconds, or more. However, at the same utilization, SNA response times have remained well below five seconds.

Another factor illustrated by this chart is the consistency provided by SNA (illustrated by the relatively flat slope of the SNA line under varying loading conditions). Many studies show that consistency is as important to user productivity as short response times.

Translating this into DP dollars, SNA can accommodate network growth without requiring installation of faster, more expensive communication facilities. Although full SNA capability may cost a little more initially, the long-term cost should be much less.

(V-10) RESPONSE TIME IMPROVEMENT...CONTROL

We have seen that SNA techniques can minimize the overall impact of additional users on response time. But what happens when the data processing requirements of the users differ from one another? We have discussed the performance impact of printing on an otherwise interactive network. The problem with printing is the potentially large data streams that a print job can create. These long data streams can monopolize the communication line and prevent efficient sharing. An SNA capability known as Pacing is designed to minimize the impact of one user upon another.

Another source of large data streams is graphics. When color graphics are transmitted, data streams of 15,000 characters are not unusual. It takes a lot of data to represent the various irregular shapes, colors, and shading patterns of a pie chart, for example. Without proper controls these graphics data streams can saturate communication facilities.

14

With the Extended Data Stream capability of the 3274 and host Graphical Data Display Manager Release 4 (Vector Graphics), it is possible to execute graphics programs with reduced host computer cycles and less impact on the communication lines.

The chart also shows the impact of large data streams (program symbol graphics) on response times for interactive users. The SNA inquiry and BSC inquiry curves are similar to those on the previous chart. Note the impact of graphics on BSC response time. Also note the impact of graphics on SNA response times. **Without** the use of SNA controls, inquiry response times are severely impacted by the graphics activity. **With SNA controls,** although there is some impact, response times are still acceptable.

Once again, the initial cost of a full SNA network may be greater than the cost of a non-SNA "equivalent". However, as the number of users grows, that initial added cost will be well justified. Consider also the data streams which"offices of the future" will require. As we begin to transmit image data, voice data, and file transfer data to intelligent work stations, the ability to control the allocation of expensive communication resources will become increasingly important. SNA systems include that capability today.

(V-11) SNA SUMMARY

Because of its magnitude, and because many customers now appreciate its importance and benefits, we have spent very little time on SNA. However, SNA is the foundation for many of the 3270 advantages. Host SNA programming works in conjunction with microcode in the 3274 and the workstations to help users maximize the return on their network investment. Three major SNA benefits were discussed: performance enhancement, multi-system networking, and network management.

Note to Presenter: It is an objective of this document to present the 3270 family at a level appropriate to MIS Directors and other non-technical decision-makers. However, SNA is so fundamental to the excellence of the 3270 that a brief review is in order. Where more detail is appropriate, Communications Marketing Bulletins are available on each of the three major SNA benefits.

(V-12) 3270 WORKSTATIONS

Let us now turn our attention to the other end of the communications network and talk about the 3270 workstations. The workstation is the device which represents the system to the user. A frequently-failing, hard-to-use, difficult-to-read device can destroy all the goodwill, satisfaction, and productivity that the central processing system is designed to provide.

We will now discuss features common to all IBM 3270 workstations, and ways these features ontribute to user productivity and satisfaction.

(V-13) USER SATISFACTION/PRODUCTIVITY

The primary goal of the total system is usually expressed in terms of the productivity and satisfaction of the end-user. Proper "human engineering" can go a long way toward the achievement of that goal.

The "footprint", or desk space that the workstation occupies, can contribute to the user's immediate reaction to the device. IBM's current line of display products represents a major step forward in reducing the size, weight, heat generation, and noise level of similar products. For example, compared with the IBM 3278, the 3178 reduces space requirements by 38%. Weight, power, and heat requirements are reduced by two-thirds. In addition, adjustments for height, tilt, and swivel are provided to allow the user to adjust the workstation to the most comfortable position.

The keyboard is the link between the system and the person who uses it. That is why a comfortable, high-quality, dependable keyboard is an essential ingredient in any data processing system. IBM keyboards include important comfort and convenience features identified by human factors laboratories throughout the world. They have been successfully tested and proven to meet ergonomic requirements such as low profile, nonglare keytops, pleasing color and gentle slope. Users of this keyboard will recognize its consistent touch-like that of the IBM Selectric Typewriters, the standard of typing excellence. Each key's curved shape, easy access, and convenient positioning give the keyboard its superior touch. In addition, each key provides both tactile feedback and an audible click, helping reduce errors because users can sense what they type. New keyboards have standard typewriter/data entry layouts plus numeric keypads to improve the speed of numeric-only data entry. Many of the new keyboards offer the ability to "remap" or modify the keyboards to be specific layout preference, eliminating many previous costly "RPQ keyboard" requirements. Productivity is also enhanced by features like record/playback where specific frequently used keyboard sequences can be programmed once and "replayed" with a single keystroke on the 3180.

Image quality is another factor which can make a real difference in the satisfaction and productivity of the end-user. IBM's new displays represent the latest in CRT technology, using high quality phosphors which are capable of consistent, high resolution characters from top to bottom, and from side to side of the screen. Because of this high phosphor quality, IBM displays use a very small dot size with more dots per character...hence, a sharper character. Contrast is enhanced through a special phosphor treatment which contributes to clearer, sharper, better-defined characters on the screen.

Reflections and glare are additional design considerations. The ability to tilt and rotate the display can help minimize the effect of ambient light providing terminal users with viewing comfort. TVs, movies, and periodicals all benefit from the use of color. Color is also becoming widely used in newspapers as the cost of color printing technology comes down. Similar benefits are available from workstations with color capability. Not only do users prefer to work with color displays, but studies show that color used for highlighting can reduce errors and make

16

users more productive by highlighting important details and by categorizing data for easier analysis.

Good human engineering can certainly add to user productivity. However, optimized footprint, keyboard, and image quality (including reflection reduction) can also make a significant difference in the comfort and morale of users whose job requires frequent or constant use of a workstation. Good ergonomics can greatly reduce the eyestrain, backache, headache problems, etc., commonly attributed to "VDT users" by the trade press.

Screen size is another user productivity factor. The basic 3278-type display has 24 rows of 80 columns for a maximum of 1920 characters. Other models of the 3278 allow for 34 rows and 43 rows of 80 characters (2560 and 3440 characters, respectively) or 27 rows of 132 characters. The 3180 is the first IBM terminal to support all the standard screen sizes (3278 models 2, 3, 4, and 5). The new 3179/G models provide the screen sizes found in the 3279 models 2 and 3 graphics displays in a single workstation.

In 1979, IBM announced the ability to accommodate screen sizes up to a maximum of 16K characters. Although we have yet to announce a product with that capacity, the 3290 has almost 10,000 characters. It also has in-head scrollable memory, which can provide sub-second response times for applications that manipulate data too big for a physical screen.

The technology for low-price larger screen sizes is now here. The productivity gains are easy to, demonstrate. It is reasonable to assume that the demand for these products will continue to increase.

Note to Presenter: It should be pointed out that environmental conditions such as ambient light, furniture height, noise, etc. also have significant impact on user productivity. The best possible keyboard design cannot make up for a desk that is too high, or a chair that is too low. No CRT can provide a satisfactory image if placed in direct sunlight, etc. In other words, the environment (which is not under IBM's control) can be a major factor in the area of user satisfaction and productivity.

(V-14) RELIABILITY/AVAILABILITY

As workstations become a major part of office solutions, and workers become dependent upon them, hardware reliability will become even more critical than it is today. Over the years, IBM workstations have developed an excellent reputation for quality and availability. Although we do not publish Mean Time Between Failure estimates, customers find that 3278/3279 failure rates are measured in terms of years (for example, one failure every four years). This experience is not surprising as high reliability has always been a major design criterion for IBM products.

Several years ago, we adopted "IBM Corporate Standard 105c", which requires in effect, that the reliability of a new product must exceed that of its predecessor product. The curve on this chart represents the

failure rate of a typical new product over its life cycle. As a mature product, the number of errors should be considerably less than the early error rate. This is because early "bugs" and minor design flaws are corrected by engineering changes over the product's lifetime. Corporate Standard 105c, therefore, says that the error rate for new workstations must **start** at a lower point than the predecessor product's mature error rate. The 3178, for example, had to demonstrate a **better** failure rate (prior to announcement) than that of the 3278 after four years of design improvements. In addition to **predecessor products,** IBM Corporate Standard 105c also relates new IBM products to competitive products.

What this means to the user is a highly dependable workstation, designed to be used regularly, day after day, as a primary productivity tool, without downtime and interruptions for maintenance.

Of course, a variety of maintenance options are available. Because of IBM's high standards for quality and dependability, you will find that these maintenance options are offered at a remarkably low price. Maintenance options range from carry-in repair to on-site unit exchange. Customers will want to examine failure rates carefully before selecting the appropriate option.

Note to Presenter: If specific workstations/printers are being proposed, this is a good place to include details of their features and benefits.

(V-15) WORKSTATIONS SUMMARY

From a user point of view, the workstation is the most important element in the entire system. IBM terminals and printers are known for their quality and reliability. The IBM 3178 is the first of a new generation of workstations with significant advances in human engineering. IBM offers the widest range of price/performance offerings available, from the fixed-function, low-priced 3178 to the high-function intelligent workstation 3270-PC. Printer options range from the 120 character-per-second 3287 to the 600 line-per-minute 3262, with a wide range of speeds and functions (like color, graphics and Personal Computers) in between. The new "317X" devices, (3178, 3179, 3179G, and 3180) have all introduced better price/performance, ergonomics and quality than their previous 327X models.

(V-16) 3274 CONTROLLER

We now turn our attention to the heart of the network, the 3274 controller. Because of its location in the network, the 3274 is ideally suited to play the role of "user's representative" to the system. In effect, the 3274 is the departmental hub of the network. Until recently, the 3274 has been thought of as a multiplexer, or line concentrator, whose primary purpose was to connect workstations to the network. This perception was caused by the fact that most of the 3274 microcode was used for SNA functions which were hidden from the user.

We shall see that this perception of the 3274 was far from correct. In actuality, the 3274 is a powerful mini-computer with a flexible communications-oriented, microcoded operating system. This flexibility provides the basis for accommodating increased function while maintaining compatibility with existing network components. It also provides the intelligence to work with host SNA programming to enhance overall network performance and management control capabilities.

(V-17) 3274 CONTROLLER 1983 ENHANCEMENTS

In March, 1983, IBM announced new models of the IBM 3274 (model 41,61) with additional memory; a processor with twice the speed of its predecessor which could support twice the terminal load; and a new dual-sided diskette with double the amount of disk storage. A Terminal Multiplexer option was announced to reduce the wiring cost of downstream workstations and printers. Configurations were standardized with either 16 or 32 ports. And because of standardization, the cost was able to be reduced.

Included in this announcement was new microcode which would allow attachment of intelligent, distributed function devices like the 3290 and the 3270-PC. We will discuss this announcement in greater detail.

In November of 1983, memory options on the 3274 were once again expanded (320K maximum) to accommodate X.25 Data Transmission Services.

In late 1983, the Response Time Monitor (RTM) feature was announced to allow for the gathering and reporting of individual terminal performance statistics.

In 1984, the Network Logical Data Manager (NLDM) Version 3 product increased the network handshaking of the 3274 by displaying ALERT error information and maintenance statistics to the network manager as it happens. NLDM Release 3 also provides the ability to gather remote RTM statistics from the host console.

In 1984 IBM also announced a **NO CHARGE** option for the 3274 Controller known as Dual Logic "Hot Key" support. This enables the terminal user to have two host sessions on a fixed function display.

Note to Presenter: Nothing is really free. The RPQ X80002 requires additional memory (64K) to run. This could easily be justified in an environment where multiple logon/logoffs are required.

During 1984 additional terminal devices such as the 3270PC G/GX and the 3295 were supported though no charge enhancements to the 3274 microcode. This again shows the ability of the SNA architecture and the 3274 Controller to evolve as the user needs change.

Note to Presenter: This chart should be used to highlight the fact that despite its maturity, the original 3270 architecture is flexible enough to permit sustained, compatible growth; and that enhancements to the product line continue at a rapid rate.

(V-18) IBM 3299 TERMINAL MULTIPLEXER

Also announced in March 1983 was the IBM 3299: a coax fan-out unit which connects the 3274 to the workstations. Up to eight devices can share one coaxial cable between the 3299 and a new adapter on the 3274 control unit. This has two distinct advantages:

  1) Reduction in labor and installation costs. The elimination of just one cable can often justify the cost of the 3299; and the 3299 can replace up to seven cables.

  2) Increased distance between Control Unit and workstation. The 3299 may be located approximately 5000 feet from the control unit and attached terminals be located an additional 5000 feet (1500) meters) from the 3299. In many campus-like environments such as universities, airports, and shopping malls, this can mean the extension of channel-attach response times to users who previously were limited to communications line response times.

Note to Presenter: The 3299 differs from most competitive devices in that a pair of multiplexers is not required. The 3299 at the terminal is connected via coax to an adapter card in the 3274. This adapter card is a optional feature on the new model controllers (41, 61).

(V-19) WHY INTELLIGENT CONTROLLER?

As we have seen, 3274 microcode was originally provided to accommodate the logic requirements of SDLC and local device control. However, once modifiable microcode became available, other uses were quickly added.

These uses can be grouped into two categories: added function and improved network management capability. Let us first look at the additional function that is incorporated within the 3274 controller.

ADDED FUNCTION:

  COMPRESSION. This function, like most of the others, is made possible by the distribution of complementary intelligence between the host SNA software and the 3274 microcode. Data Compression provides a technique for reducing communication line utilization by decreasing the volume of data transmitted. Logic at the host end removes duplicate characters; logic in the 3274 restores the data to its original appearance. This is one way that SNA and the 3274 help to keep the cost of communication links down.

  EXTENDED DATA STREAM. The original design allowed only 3270 display data to be transmitted. The advent of Extended Highlighting (underscore, reverse video, and blinking), eight colors and graphics led to the need for a relaxation of the original restrictions. Another element of the original design limited the amount of data

20

transferred to that which could be displayed or printed (at that time 2K bytes). Recognizing that larger screen sizes were needed and technologically feasible, the architecture was changed to accommodate screen sizes up to 16k. This change, which actually laid the groundwork for 3290 and Intelligent Workstation Attach, was called Extended Data Stream. With the announcement of larger screens and intelligent workstations, the value of Extended Data Stream becomes much more obvious.

Note to Presenter: Extended Data Stream has (at this writing) been supported by only a few of the "3270-compatible" vendors. This severely limits their ability to provide support for graphics, large screens, Multiple Logical Units, Intelligent Workstations, etc. Customers should carefully evaluate this important feature before selecting a "3274-compatible" device.

**** FOR CURRENT COMPETITIVE INFORMATION PLEASE REFER TO THE ****
**** COMP DATABASE ON HONE AND/OR CALL COMPETITIVE MARKETING ****

LARGE SCREEN. Over the years, the 24x80 character screen has become an industry standard. Shipment of "large screen" displays began in 1978, with the advent of the 3278 models 3, 4, and 5 (32x80, 43x80, and 27x132 respectively). However, because large-screen benefits were not possible without programming changes, volume shipments did not begin until 1981. However, since that time, the growth rate in large-screen shipments has been dramatic. With the announcement of the variable screen size ability of the 3180, this growth in large screen usage has continued.

ENTRY ASSIST. Intended for terminal users whose data is primarily textual (as opposed to formatted data entry), the Entry Assist feature provides a number of useability functions not previously available on display-type workstations. Included are document formatting facilities like left and right margin, tab stops, wordwrap and audible end of line alarm. Also included with this no-charge feature is a cursor "Row/Column" position indicator.

MULTIPLE HOST SESSION SUPPORT. Customer reports of user productivity gains with concurrent host session have been estimated up to 25-30% in insurance applications. Multiple host session support is available on the 3270-PC family as well as the 3290 Plasma display.

The IBM 3290 gas plasma display introduces a different approach to large screen usage. With this exciting new technology, we can display up to 62 lines of 160 characters ... more than an entire printed page. Because of this extremely large display capability, it is also feasible to segment the screen into smaller partitions, or "windows" so that a single workstation can actually access up to four mainframe applications concurrently. **It is important to note that this capability could only be added because of the flexibility of the 3274 and the Extended Data Stream.**

KEYSTROKING. 3270 family "fixed function" terminals use the IBM 3274 to interpret key strokes. Thus, when an operator depresses a

key on the 3178 keyboard, for example, that key depression is interpreted by 3274 microcode and translated into an appropriate character for display and subsequent transmission to the main frame. Centralizing this function in the control unit has two distinct advantages: 1) decreased terminal cost, and 2) flexibility to re-define keystrokes for individual customer requirements. For example, the very popular IBM 3178 model C3 differs from the model C2 only in the symbols painted on the keytops and the 3274 microcode which interprets the keystrokes.

INTELLIGENT WORKSTATION SUPPORT. We have been discussing the attachment of "fixed function" workstations to the 3274 controller. However, there is a growing demand for attaching intelligent terminals to the same cluster controller. Let us now discuss the 3270 Personal Computer (3270-PC).

(V-20) IBM 3270-PERSONAL COMPUTER (3270PC)

A significant extension to the 3270 architecture was required to provide **proper** support for an "intelligent workstation". The exciting new PC technology combines the power of main frame interactivity and the advantages of local personal computing into a single workstation. Many users want to attach a PC to a 3274 cluster so that it can be used part-time as a host interactive workstation. However, to maximize the productivity of such an attachment, the system should acknowledge the intelligence in the workstation and not simply use that intelligence to emulate a "fixed function" terminal.

(V-21) 3274 CONTROL UNIT TERMINAL INTERFACE (CUT)

To understand the significance of this difference, let's first examine the way the 3274 supports "fixed function" terminals like the 3178.

We have discussed the way the 3274 translates keystrokes into appropriate characters for display on the CRT. Other functions performed by the 3274 include the necessary SNA/SDLC protocol and Network Management functions between Host and Controller; translation of 3270 character-coded data streams into the appropriate screen buffer locations; and handshaking between controller and workstation to ensure error-free communication between these devices. (For the more technically oriented, this logical path through the microcode is called the Control Unit Terminal Interface...previously known as DCA.)

(V-22) 3274 DISTRIBUTED FUNCTION TERMINAL INTERFACE (DFT)

An architectural extension, achieved by changes in 3274 microcode, provides a different logic path for intelligent workstations like the 3270-PC and the 3290.

For example, the 3290 has the intelligence to do its own keystroke interpretation. It has the ability to be segmented into multiple logical units, providing access to multiple applications from a single workstation and a single cable. It can also contain up to 24K data bytes, scrollable by the operator. Its intelligence is actually stored in the 3274 and down-loaded to the 3290 when powered on. Extensions to the 3274 microcode facilitate these changes.

The IBM Personal Computer is another "intelligent" workstation. The user of a PC may initially purchase that device strictly for stand-alone functions. However, in many instances, that same user soon realizes that much of the data required for the stand-alone application is already available in machine-readable form in the main-frame data base. From a technical standpoint, this requirement for file transfer is significantly different from that for "fixed function" terminal emulation.

The obvious requirement is for the 3274 controller to support fixed function displays like the 3178, while providing added function for intelligent workstations like the 3290 and 3270-PC; and to maintain its role as a departmental hub by supporting both device types concurrently.

There are two ways to connect the 3270-PC to the controller:

A) **Emulate 3278/9 fixed function devices.** While this technique is relatively easy for a programmable device like the 3270-PC, it limits the 3270-PC to 3278/9 functions. Since 3270 Emulation (or Data Stream Compatibility) really turns the 3270-PC into a "fixed function" 3278, only the transfer of character-coded data is allowed. Unfortunately, files typically contain non-character-coded data (binary/packed decimal). Therefore, to ensure that all data transferred thru the 3274 is acceptable, 3270 emulation uses a "two-for-one" representation for data transmission. Using this "two-for-one" technique, each data byte is converted into two valid 3270 characters prior to transmission, and then converted back to one character upon receipt.

Note to Presenter: This technique, using 3274 DCA microcode (CUT MODE), can significantly reduce overall network performance.

B) Define new microcode that will **treat the 3270-PC as an intelligent device** and transmit its file data in original form. This is obviously a much better performer as far as the 3270-PC user is concrned; it greatly reduces the impact of file transfer on all other users of the communication link, and it opens new opportunities for shared interactive applications.

23

Either way will work. Obviously, the second technique (the 3270-PC implementation) is more efficient and cost effective. The IBM 3274 made the first important step in preparing for this requirement with the announcement of the Extended Data Stream capability in 1979. The March '83 announcement completed the changes necessary to support intelligent devices in an intelligent manner.

Note to Presenter: As of this writing, IBM is the only vendor with the capability to support distributed intelligence in this more efficient manner. Providing the Intelligent Workstation Support microcode was a significant programming effort for IBM, not including the Extended Data Stream pre-requisite, which had been completed in 1979. **Proper support** for the **intelligence** in intelligent workstations is an important function, currently available only from the IBM 3274. "IBM compatible" vendors should be questioned closely about their support for intelligent devices. "PC attachment" may only mean 3270 Emulation.)

(V-23) WHY INTELLIGENT CONTROLLER?

IMPROVED NETWORK MANAGEMENT CAPABILITY. We have discussed some of th IBM 3274 microcode functions that could be called "user functions". These functions can be readily observed in terms of user productivity and ease of use. Other 3274 functions, while of equal importance are not so apparent to the user (until problems occur within the network). These "Network Management" functions are generally intended to facilitate management of a large network of devices, all of which contend for limited communication link resources, and all of which are sensitive to line errors and performance bottlenecks.

NETWORK LOGICAL DATA MANAGER. The Network Logical Data Manager Releas 3 (NLDM R3) has exclusive new high function network reporting and management capabilities.

RESPONSE TIME MONITOR. The objective of this microcoded feature is to measure.. and record for subsequent analysis... the response times experienced at each terminal. These measurements are tabulated statistically in 3274 microcode, and then accessed in two ways: 1) through special reports at designated workstations; 2) through host programming, using SNA protocol. The data provided includes a statistical distribution of the response times experienced by each terminal.

Note to Presenter: Other vendors offer a subset of this function. Typical competitive offerings accumulate minimum, maximum and average times. Stress the IBM 3274 method of accumulating five user-defined Response Time counters for each workstation.)

ALERT...REQUEST FOR MAINTENANCE STATISTICS. These two features provide information about the condition of the network and are useful for problem anticipation, determination, and correction. The Alert feature, working in conjunction with host SNA programming (NPDA), provides error

information to the network manager as the error occurs. Request for Maintenance Statistics is a facility used by the network manager to retrieve the contents of IBM 3274 statistical counters. These counters contain a record of recent errors and failure rates. This information can be used to detect trends and anticipate error conditions that may ultimately lead to communication failures.

These four features ... NLDM, Response Time Monitor, Alert, and Request for Maintenance Statistics, implemented in 3274 microcode ... provide significant additional function which, although transparent to the workstation user, is of critical importance in maintaining overall system service quality.

DISKETTE COPY-CENTRAL MAINTENANCE. With all the function in microcode, the user needs a technique for the efficient distribution of updated diskettes. This is provided for by a special model of the IBM 3274 Model 51c, which has a second diskette drive and special software designed to allow centralized creation and distribution of microcode changes. This facility is available as a 3274 RPQ (#8K1071).

(V-24) 3274 SUMMARY

Because of its importance, we have stressed the functions of the 3274...functions which work in conjunction with complementary host SNA programming to enhance performance and to provide automated network management capabilities. We have talked about the role the 3274 plays in providing for attachment of the widest range of workstations available, while balancing the workload among these devices to ensure proper performance. We have seen how the design of the 3274 allows for the accommodation of new technology, and how it can enhance the productivity of the end-user.

The 3274 is truly the heart of the network...a major reason for the 3270's reputation as the "standard of the industry".

(V-25) EACH ELEMENT HAS A CRITICAL ROLE

We have concentrated on a total end-to-end architecture which consists of three main elements:

1) The central computing complex with its SNA software.

2) The 3274 Controller, with its complementary micro-code.

3) A wide range of workstations and printers, optimized for use within an IBM 3274/SNA environment.

This chart emphasizes the high degree of interdependence between the host, the 3274, and the terminal devices. For example, Extended Data Stream, SNA Character Stream and Response Time Monitor are only useful

if implemented by **all three components** (Host, 3274, and Device). Alert, Maintenance Statistics, Encryption, and Compression require participation from both the 3274 and the SNA software. Entry Assist and customer definable keystroking require complementary function in both the 3274 and the workstation. Support for intelligent workstations requires functions in all three elements.

The 3274 controller is of critical importance because of its central location in the network and because of the flexibility provided by its easily-modified microcode. Note that the 3274 has a role to play in each of the functions listed on this chart.

Note to Presenter: Non-IBM alternatives are available for each element. However, the important question is: "How complete is the function provided by the alternative product?" It should now be apparent that each element has a critical role to play if the full potential of the SNA/3270 network is to be realized. The substitution of an element that participates less than 100% can substantially reduce overall benefits. In other words, "the whole of the system is greater than the sum of the elements."

(V-26) IBM 3270 PRODUCT LEADERSHIP

What we have seen is that the three areas - central site and communications, the 3274 Controller and the workstations - are linked together to provide a comprehensive network solution for your business communication needs. IBM believes that generic to all end users are the expectations of: reliable service, fast problem determination and consistently good response time. We believe we are providing leadership in the following critical areas:

CENTRAL SITE AND COMMUNICATIONS.

Host based Response Time Monitor is a feature of NLDM that allows host interrogation of the 3274 to retrieve user specific statistical information.

The **ALERT** feature, working in conjunction with host SNA programming support like the Network Problem Determination Aid (NPDA) provides error information to the network manager **AS IT HAPPENS.**

The **High Performance Communication Adapter** provides communication line attachment capabilities up to 56KB for high speed data transfer requirements.

The **X.25** enables the attachment of the 3274 to X.25 communications services for Data transfer.

In the area of security, **Encryption/Decryption** can be provided in host software to secure sensitive data.

3274 CONTROLLER.

26

Distributed Function Terminal Support is a feature of the 3274 that can increase user productivity by allowing multiple **CONCURRENT** host sessions.

The 3270 **Extended Data Stream** is SNA architected. It includes the 3270 Data Stream for compatibility, presentation space definition and attribute definition. This feature allows for the use of **Vector Graphics** data streams to reduce the host and line requirements when graphics are used.

Intended for terminal users whose data is primarily textual, the **Entry Assist** feature provides a number of features such as left and right margin, word wrap, tab stops, and cursor row/column indicator. Another no charge feature for the 3274 controller known as **DUAL LOGIC** allows it to support TWO concurrent host sessions on a single 3270 display.

WORKSTATIONS. The 3270 Workstation family of products provides a **FULL** Line of Local and Remote workstation products - a workstation to suit the needs of any end user.

The **Application Program Interface (API)** is a unique software offering from IBM which allows the cooperative processing of Personal Computer and host data in a single workstation.   The 3270-PC is the sole product in the marketplace today that exploits this proprietary IBM software.

(V-27) SUMMARY

We have been discussing the end-to-end architecture that is the foundation for the SNA/3270 system. Although the total architecture includes application programming and the actual workstation user, we have concentrated on the three parts of the architecture provided by IBM: the SNA software, the 3274 microcode, and the workstations. This architecture provides tools to make the most of user productivity today, and the flexibility to satisfy tomorrow's needs.

For today's requirements the IBM 3270 family includes the widest variety of workstation options... supporting the needs of every departmental user...from clerk to business professional. Also included are the tools and techniques needed to balance this wide range of functional and technical requirements. IBM workstations are designed to optimize the user's productivity through high quality keyboards and displays, with special emphasis on human engineering and reliability.

But the 3270 family is also the basis for satisfying tomorrow's requirements. We are already experiencing the beginnings of the phenomenal growth that will place a computer workstation wherever we find an office telephone today. The IBM 3274 provides the necessary base for adding function to the network: from simple data entry through data base inquiry and update; business analysis with hard copy graphics; combination text and graphics; to advanced functions like host/loc, l PC interaction, voice, and image processing.

Productivity for today; flexibility for tomorrow's increasingly complex requirements; traditional IBM support and service...these are the reasons the SNA/3270 family has earned its reputation as "the standard of the industry".

APPENDIX

This presentation is designed to be given by a non-specialist to a non-technical audience. Consequently, technical detail and terminology have been avoided wherever possible.

It is recognized that on occasion this presentation will be given to a technical audience. In this case, additional details may be required. The previous 3270 Product Excellence presentation included considerable technical detail and was intended to be tailored to the audience by selective removal of the more technical topics. This presentation is structured on the opposite philosophy: For additional technical details the SNA reader is referred to the original 3270 Product Excellence presentation by Susan Taylor and Gary Craig (ZZ05-0237).

(V-3274-1) PERFORMANCE PREDICTION

Guesswork can be expensive when configuring large data processing networks, particularly when communications media are included. Most communication configurations can only be selected after exhaustive analysis and, too often, expensive trial and error experiences.

IBM customers have access to valuable simulation tools which can minimize the expense of trial and error implementations:

> FIVE3270 is a tool that can be used in the IBM Branch Office to study the performance implications of various network alternatives. Using a minimum of inputs, an IBM SE can use FIVE3270 to help customers predict potential network performance.

> SNAPSHOT is another performance modelling tool which uses a discreet system simulator to model total system performance including the host application code, the operating system and communication code, and the network components. Using SNAPSHOT, IBM customers can easily model a variety of performance alternatives to determine the most cost-efficient configuration.

The value of performance analysis tools cannot be over-emphasized. Networks of the size forecast by the Bureau of Labor Statistics will be difficult to analyze without some sort of modelling tool. IBM customers access these tools at no extra charge through their local account team.

(V-3274-2) DATA COMPRESSION/ENCRYPTION

Data Compression and Encryption are excellent examples of the division of functional responsibility between the central complex and the 3274 controller. For either of these facilities to be effective, logic must be programmed into each network element.

Data Compression reduces communication link utilization for large data streams (such as those produced by graphics) by replacing repetitive character streams transmitted by the central processor with a redundancy count, followed by the character to be repeated. Upon receipt, the 3274 reconstructs the original data stream before building the screen image in the display buffer. This technique is especially valuable when graphics data is transmitted over relatively low speed communications lines. Since a typical Programmed Symbol data stream may contain 10,000 or more characters (many of which are simply background colors or shading patterns) compression of redundant characters can make a significant difference; not only for the graphics user, but also for other interactive users attached to the same communication facilities.

Data Compaction is a related, but different scheme which uses logic in both the host and the 3274 to "compact" frequently repeated data strings by substituting previously-agreed-upon bit configurations.

Each feature requires logic at both ends of the communication link. Each provides an excellent illustration of the importance of Extended Data Stream capability (without which neither of these capabilities is possible) and the requirement for complementary intelligence in the host and controller. Few, if any, "3274 compatible" vendors provide these capabilities in their controllers. Thus, although SNA/SDLC may be installed in the host system, these facilities will only be available if complementary logic is provided in the controller.

Note that both techniques address the same performance problem: the communication link bottleneck.

Encryption is another scheme for substituting one character string for another. In this case the purpose is to prevent unauthorized access to the transmitted data. The expected proliferation of office workstations also signals an increase in the amount of sensitive business data available to users who can gain access to computer networks. Recent unauthorized computer penetrations by teen-age "hackers" have received widespread publicity. One way to stop these penetrations is to encode the data transmitted from the central site in such a way that only users attached to the departmental 3274 controllers can decode it. The SNA/3274 Encryption feature provides an extremely secure method of transmitting data. Based on the National Bureau of Standards data encryption standard, this feature uses a 56-bit key.

(V-3274-3) EXTENDED DATA STREAM

The original 3270 data stream was a character-coded data stream, limited in the number of characters that could be sent. In effect the original design assumed that the device at the terminal end was a 3277 display buffer. Therefore, only valid display characters and 3277 display orders (such as Set Buffer Address) were allowed. For the same reason, 2k bytes was the maximum amount of data that could be transferred to the 3274. The advent of the 3278/9 brought about the requirement for extending data stream content and removing the character-code restriction and allowing for devices with larger in-head buffers.

Structured Fields. Another advantage of extending the data stream was the ability to include "structured fields". Structured fields allow for new types of data and control information through transmission of device independent structures. Examples include Partition functions (required for in-head scrolling capabilities such as the 3290, 3180 etc.); SNA Character String (SCS) and the Query function (used by products like the 3290 to notify host programming of user-defined configuration changes). In general, the Structured Fields capability provides an open-ended architecture for the support of new devices which have more function than the original 3277.

Non-character-coded data also allowed for extended attributes like eight color, extended highlighting (reverse video, underscore and blinking) and Programmed Symbols.

31

Data File Transfer makes the attachment of Personal Computers not only feasible, but practical. Without Extended Data Stream, data must be translated from bytes to "nibbles", a name coined to represent the two-for-one scheme required to allow any combination of eight bits to be coded as valid character codes. ("Nibbles" are created by taking four bits of a character, and combining them with four predefined bits to arrive at a valid eight bit combination. The remaining four bits are then similarly combined with all one-bits to make a second "nibble"). Thus, data transmission **without Extended Data Stream capabilities** is twice as expensive, in terms of line utilization. Applications which exploit the synergism of a PC connected to a large central system require efficient data transmission capabilities. Remember that very few competitive vendors have demonstrated this capability. Personal Computer attachments which do not allow Extended Data Stream transmission provide little more function than 3270 emulation.

In the area of graphics, the use of the Extended Data Stream permits applications such as Graphics Data Display Manager Release 4 (GDDM R4) to work in conjunction with new **Vector Graphics** devices such as the 3179/G, 3270-PC/G and GX to reduce the host processing cycles and the line traffic typically found when displaying graphics.

(V-3274-4) 3270 SCREEN SIZE/MEMORY

Earlier in the presentation we discussed the changes in 3270 architecture that allowed for screen sizes larger than 4K characters; we also discussed the concept of in-head memory capabilities. We pointed out that a part of the Extended Data Stream announcement was the support for such devices.

Since the time of that announcement, the demand for large screen sizes as begun to accelerate. At first, that demand was a very small percentage of the total 3270 shipments. Starting in 1981, however, the demand for these larger screen sizes began to increase rapidly. Why? Because application changes had to be completed before users could exploit the benefits of these larger screens. Today's applications are being designed to display more data...perhaps an entire order, in an order entry application, where previously only the header and a few line items were feasible; or an entire page of text in a word processing application; or a graphic chart with better resolution; or several applications on the screen concurrently, as in the case of the 3290.

These examples illustrate the **application** advantage of the larger screen sizes. There is also a **performance** advantage of the larger screens because, with larger screens, operators require fewer host interactions; thus network sharing becomes more efficient.

The 1979 architectural change also allowed for in-head memory. Two terminals which support this extension are the 3180 (which has 7K of in-head memory) and the 3290 (which has 24K of memory.) Like the large screens, in-head memory requires application design/programming changes. CICS/VS partitioning support can be used to send data records larger than the display capacity of the head. Hardware functions can then be used to "scroll" up and down through these data records without host

32

interaction. This not only helps overall network performance; it also permits very good response times for scroll functions because communication line delays are eliminated. With today's emphasis on sub-second response time, in-head memory should be viewed as an inexpensive way to make substantial performance improvements for certain applications.

(V-3274-5) ENTRY ASSIST

This feature is designed to assist the 3270 display operator whose application requirements include unformatted text entry (as opposed to the formatted screen applications typical of CICS and IMS). Entry Assist is particularly useful with editors like XEDIT, where the user is using a display in a manner similar to a typewriter. Using this feature, the operator can activate a scale line display which allows the setting of right and left margins, tab stops, and an end of line audible signal. The word wrap facility automatically moves a word to the next line when it is too long to fit. This permits true "heads-down" typing applications on the 3178, 3278, 3279, and 3290. Other capabilities offered by the Entry Assist feature include word-oriented cursor movement and delete functions, typematic character delete, and an on-demand row/column indicator, which displays the current cursor location.

(V-3274-6) ENTRY ASSIST FUNCTIONAL BENEFITS

We have seen how Entry Assist can facilitate the "heads down" entry of data. The important thing to understand is that Entry Assist is not a substitute for word processing products, such as Displaywrite 3, or DOSF The Entry Assist function merely provides on-the-screen formatting capabilities. This means that it works with any editor because the functions provided are transparent to the host...they simply make the typing job easier at the terminal. Of course this also means that host interactions, such as tabbing, are required less frequently.

Note to Presenter: The Entry Assist function is a very good example of how 3274 microcoded intelligence can be used to make the operator's job easier. Non-programmable "3274-compatible" **controllers** will find it very difficult to provide this function. Furthermore, many "3278-compatible" **displays** attached to IBM 3274's have difficulty providing this function because of conflicts in the use of the Operator Information Area and the special keys on the keyboard. Other manufacturers who have made non-architected use of the Operator Information Area and/or these special keys cannot provide Entry Assist function even when their displays are attached to IBM 3274 controllers.

(V-3274-7) MULTIPLE LOGICAL UNITS

As workstations become an increasingly important part of the day-to-day work routine of the business professional, the need for added function often brings about the requirement for a second and sometimes third workstation. Sometimes this happens because of software

33

limitations...for example, the user has requirements for access to both CICS and IMS on-line systems concurrently; programmers wish to view compiler diagnostics while concurrently modifying the source programs; Network Control Center operators need to see application screens and NPDA screens at the same time. It is not uncommon today to see multiple displays at one operator's location. This, of course, is expensive and wasteful of resources. Not only are terminals duplicated, multiple control unit positions and multiple coax cables are also required.

Multiple Logical Unit support provides the ability for one **physical** terminal to support multiple **logical** terminals, using one control unit position, and one cable.

Multiple Logical Unit support is a function provided by 3274 Intelligent Workstation Support (TCA) microcode and as of this writing is **only available from IBM.** Effectively, microcode in the controller, working with logic in the workstation (3290 or 3270-PC), passes communication traffic for any one of up to five logical units in that workstation across one coax cable linking the control unit and the workstation. Note that Bi-Synch implementations are limited by the BSC addressing scheme. Thus, although multiple sessions are supported by Bi-Synch 3274's, the number of logical units supported by a Bi-synch controller is less than the number supported by an SNA controller.

The multiple session concept was originally announced for the IBM 3290; however, it is also the basis for the windowing of the 3270-PC. Unlike large screens and partitioning, Multiple Logical Unit support requires no system re-design or re-programming. The productivity benefits and potential hardware savings (terminal and coax cable) only require a properly configured 3274 (192K, config D) and the appropriate workstations (3270-PC or 3290).

(V-3274-8) THE RESPONSE TIME MONITOR

The objective of the 3274 Response Time Monitor (RTM) feature is to measure and accumulate transaction times so that performance problems may be more readily understood and corrected.

RESPONSE TIME MONITOR FUNCTION. For each display station attached to the 3274 there are five counters with user-defined response time interval assignments. For example, the counters might be set up as follows: response time interval assignments. For example, the

counter number	1	2	3	4	5
time interval(sec)	0-1	1-3	3-5	5-8	over 8

As transactions are processed by the host, response times are measured in the 3274 and the appropriate counter is incremented. These counters may subsequently be interrogated to obtain a distribution of response times over the measurement period. RTM information may be subsequently directed to authorized display station operators, host-resident network management applications, or both. All 3178, 3179, 3180, 3278, and 3279 display stations are supported when attached to 3274 Control Unit models

31A, C, and D; 41A, C, and D; 51C; and 61C. RTM functions(last transaction indicator, RTM Log) can be selected from one of three customization options:

 Host only
 Port 0 only
 All displays

Printers are considered output devices and are therefore not supported.

THE RESPONSE TIME MONITOR FEATURE. RTM consists of additional 3274 microcode and a 25 millisecond timer card which is used to measure response time. Response times are recorded to the nearest .1 of a second, and may be viewed by authorized display station operators connected to the 3274; and or from the host. Host support for RTM is provided by Network Logical Data Manager (NLDM). Using this product, the network operator can set RTM parameters, retrieve RTM logs and store the data contained in them, and reset the RTM parameters. Additionally, NLDM will graphically portray response time statistics, and log data for subsequent SMF analysis and reporting. NLDM requires the facilities of SNA. The following three pages show examples of data presented at the host by NLDM. (These are from an excellent presentation titled "Network Logical Data Manager Release 3" written by David H. Thoenen and Nancy Molloy of the Raleigh Marketing Support Center, IBM form number ZZ05-0260). These reports display in Color to highlight areas requiring operator attention.

RESPONSE TIME MEASUREMENT. Once enabled by 3274 customization, response times are automatically recorded in the 3274; operator action cannot disable this function. The time interval to be measured begins with operator depression of an AID key (ENTER, PA, PF, etc) or other operator action (selector-pen-immediate detect, mag stripe reader). The end of the interval is designated during 3274 customization. It can be any one of the following:

    FIRST CHARACTER. The response time interval ends when the first output character is received.

    KEYBOARD USEABLE. The interval ends when the keyboard is unlocked. (WCC or EAU command in output data.)

    CD/EB. The interval ends upon receipt of Change Direction(CD), or End Bracket(EB) indicators. This is roughly equivalent to "time to last character". This measurement is only valid in SNA environments.

RESPONSE TIME DISPLAY. Two kinds of RTM information are available: Last Transaction Time, which is displayed on the screen after every transaction, and RTM logs, which contain the contents of the counters for all ports.

VIEWING RTM DATA - LAST TRANSACTION TIME. This is the most recent response time for a specific port. An indicator, located in the operator information area at the bottom of the screen, displays minutes and seconds (mm:ss), or seconds and tenths of seconds(ss.s). Note that this function uses the operator information area and is therefore not available on 3277's. It is activated by pressing the ALT and ERASE EOF keys on authorized display stations and is updated after every transaction.

(V-3274-9a) RESPONSE TIME SUMMARY DISPLAY

The major portion of the Response Time Summary Display is the graphical presentation of the percentage of transactions which meet the criteria of each of he response time range counters. In this example, seventeen percent of the transactions completed in less than one second, twenty-three percent responded between one and two seconds, and so forth.

The time interval for which the summaries were calculated is displayed at the top of the panel, and may be changed by the operator for recalculation. This example summarizes response time for terminal TEXTAB14 access to performance class CICS22A over the time interval beginning September 1 at 10:00 AM and ending at 11:10 AM.

The panel also displays the total number of transactions for this performance class within the time interval, the response time of the last transaction entered, and the average response time for the interval.

Finally, in the upper right hand corner, actual performance is compared to the performance objective. In this case, the objective was to respond to eighty percent of all transactions within five seconds. The objective was not met, as only seventy-five percent of the transactions completed within the time objective.

Now let's take a look at the Response Time by Collection Period Display.

(V-3274-9b) RESPONSE TIME BY COLLECTION PERIOD

The format of this display is similar to that seen on the previous foil. However, the data displayed represents not a summary, but rather the detailed data returned from the 3274 at the end of a single collection period.

In the case of the Response Time by Collection Period Display, as only the data from a single collection period is processed, all data pertains to a single session. Hence, the session partner, or specific application, is identified on the panel. In this example, terminal TEXTAB14 was in session with primary logical unit CICS22. Note that this differs from the previous display, the Response Time Summary Display, where the data related to a performance class rather than a specific application.

36

This display is particularly useful in the diagnostic area. In response to a user response time complaint, the help desk or network operator could display this panel for the current instant in time. NLDM automatically retrieves the most recent data from the 3274 which would include the last transaction processed at the user's workstation.

The final panel is the Response Time Trend Display.

(V-3274-9c) RESPONSE TIME TREND DISPLAY

This display relates a terminal's response time to a performance class over time. Each bar represents one collection period and indicates the percentage of transactions meeting the response time objective of the performance class. The time objective is displayed at the top of the screen. The line crossing the graph at the eighty percent level displays the percentage of transactions objective.

At the bottom of the graph, the date stamp indicates the start of a new session. The time stamps indicate the end time of the collection period represented by the bar. When multiple pages are required to display all data requested, the operator pages through the data by depressing the enter key.

To review, the NLDM user may view 3274 response time data from three perspectives. Management may wish to view summary data, or analyze trend data. Operators may use trend data as well as data by collection period to react to response time problems. In addition, the NLDM support for writing of the data to the SMF log also permits other analytical approaches using an application such as the Service Level Reporter for detailed statistical analysis.

COMMONLY ASKED RESPONSE TIME MONITOR QUESTIONS

What level of 3274 microcode is required?

Support is provided by Configuration C level 47, and Configuration D level 61. Other Configurations (A, B, P, and T) are not supported.

Is RTM field installable?

Yes. The Response Time Monitor, feature number 6101, should be ordered via MES procedures and the appropriate level of microcode should be installed on the controller.

How are users authorized to view/reset RTM data?

3274 customization parameters are used. Specific ports may be authorized to reset or view the Last Transaction Time indicator or the RTM Logs.

Does the RTM feature support Bi-Sync?

RTM functions at the 3274 are independent of communications software. However, host support functions require SNA. Thus, a BSC 3274 can be customized to maintain the Response Time Log and provide Last Transaction Time data to local display stations; however, host software support will only be available for SNA networks. (See Ivory letter for Statement of Intent).

Will RTM work with non-IBM displays/controllers?

Clearly, the burden of proof is on the other vendor. However, since RTM is dependent upon 3274 microcode and a new timer card, non-IBM **controllers** would have to provide similar functions. OEM **displays** would have to provide for the display of Last Transaction data in the operator information area. Products which use this area for other data (eg. cursor row/column) may have a conflict.

Does implementation of RTM impact performance?

Keystroking is not affected by the RTM feature. Displaying Last Transaction data may increase response time by a negligible amount.

Can RTM co-exist with 3274 RPQ's, such as numeric keypad and Entry Assist?

Yes. However, if implemented on Models 31/51 of the Control Units, the storage tables in the Sales Manual should be consulted to insure sufficient storage.

(V-3274-10) COMMUNICATION ERROR DATA

Because of its location at the user end of the communication line, the 3274 is well positioned to collect and provide information about the connection, device errors, etc. With previous versions of the microcode, some data was provided upon request using a special SNA function (REQMS). Upon receiving notification of a communications problem (often from an irate user) an NPDA operator could request this data and analyze it for problem determination and resolution. The obvious problem with this approach was that user notification and operator action were required to collect error data.

The newly announced Alert capability is a 3274 microcode feature that provides information as it happens, with detail at the device level. For example, if a display operator receives an nnnne message in the Operator Information Area, that "nnn" code will also be forwarded, via ALERT, to NPDA.

NPDA version 3.0 collects this data and applies a process known as "filtering" to determine which information is important enough to retain on its data bases and/or pass along to the network operator.

(V-3274-11) DATA TRANSMITTED INCLUDES

The 3274 will attempt to send alerts for all errors that have not affected the integrity of the host adapter, the 3274 engine, storage, or microcode. Alert information includes:

Alert type: Permanent; Temporary; Operator Input; etc.

General Cause: Hardware or Microcode; Communications; Operator; etc.

Specific Cause: Main Storage; Keyboard; Comm adapter; Coax cable; etc.

Description/user action code: Customizing error; Device error(color convergence or battery); Crypto Adapter error; Operator-originated alert screen; etc.

Detail text: Port Number; LU Number; Device Id; etc.

Note to Presenter: This foil gives an indication of the type of data that can be forwarded to the operator dynamically. Note that an operator at the user end of the communication link can also initiate a unique Alert to signal the Network Operator.

```
****************************************************************
*THE FOLLOWING SECTION ON ALERTS IS PROVIDED AS ADDITIONAL*
*BACKGROUND INFORMATION FOR THE PRESENTER.                *
****************************************************************
```

WHAT IS AN ALERT?

The term "ALERT" is used by both NPDA and the 3274 microcode feature.

NPDA ALERTS are "high priority events that usually warrant immediate attention". NPDA alerts may result from a variety of conditions, one of which is a 3274 alert.

3274 ALERTS are IBM-defined conditions, such as "Coaxial Cable error", "Device error", or "Communications Line Adapter error", detected by the 3274 and forwarded to NPDA for resolution. One additional 3274 alert is operator initiated...providing a means by which authorized display stations can pass such things as telephone number and text to the NPDA operator. In general, 3274 alerts are conditions generated by the 3274 Control Unit and attached devices.

All conditions that result in 3274 error codes (such as the nnn codes that appear in the operator information area) will be forwarded to NPDA. NPDA filtering can be used to determine which 3274 alerts, as well as other NPDA-generated alerts, to pass along to the network operator.

SUPPORTED MACHINES

Alert is an SNA-only function, provided in the 3274 by microcode Configuration C (level 47) and D (level 61). It is available for local 3274 models 1A, 31A, and 41A; and for SDLC models 1C, 31C, 41C, 51C, and 61C. No hardware changes are required. However, on 3274's with the Response Time Monitor (RTM) timer card feature installed, the alert function is enhanced to permit detection of noisy coaxial cables and microcode-detected catastrophic control unit errors. (More about this below).

WHAT ARE OPERATOR ORIGINATED ALERTS?

Via customizing parameters, display operators may be authorized to request a "fill-in-the-blanks" alert screen. Using 3274 Test mode and the alert screen, the operator can communicate, via the alert mechanism, with the NPDA operator. Included in the alert screen are:

A two-character (1-20) user action-code, which identifies the alert to NPDA.

A 120 character text field which may contain free-form text from the display station operator.

Three eight-character qualifiers which may be used to pass detail text codes, such as port number, LU number, device ID, 8421 indicators, etc.

3274 CUSTOMIZATION

Customizing is required to activate the alert function. The parameters are:
-No alerts (RECFMS 01, 02, 03, and 05 only).
-No operator generated alerts.
-Operator-generated alerts on port 0 only.
-Operator-generated alerts on all ports.

What impact will the alert function have on 3274 performance? The alert function will have negligible impact on 3274 performance.

What if the 3274, itself, fails? If the RTM timer card is installed (3274 models 31, 41, 51, 61), and a microcode-detected catastrophic error occurs in the Control Unit, a subsequent IML will cause the 3274 to generate an alert unless the 3274 has been powered off. This alert will be based on information recorded at the time of failure in a 16-bit Problem Determination register on the RTM timer card which is **not** reset

when the control unit is IML'ed. The RTM timer also provides a technique for detecting excessive coax error rates. In the event that the coax errors exceed the pre-defined rate of 16 per half hour, per active device, the 3274 will generate an alert. Note that since the RTM feature is not available on 3274 models 1A and 1C, these enhancements to the Alert feature are not available on those models.

(V-3274-12) 3274 CENTRALIZED DISKETTE MAINTENANCE

Because of the role the 3274 plays in adding function to the network, changes to the microcode are inevitable. To minimize the effort required of remote users, IBM provides, on an RPQ basis (RPQ8K1071/8K1072), the ability to centralize microcode diskette maintenance and distribution. Available on a 3274-51c only, this RPQ provides procedures for altering, rapid copying, and distributing customized 3274 diskettes between a central site and remote locations.

Specifically, this RPQ provides the following:

1. Auxiliary Diskette Drive. This drive, in addition to the standard/integrated drive, enables the 3274-51C to operate with two diskettes, simultaneously, for the purpose of copying 3274 microcode from one diskette to another. Copies can be written onto either blank or previously used diskettes that are loaded in the auxiliary diskette drive.

2. Diskette processing utility. This utility, supplied on an individual diskette, provides three independent procedures for processing 3274 diskettes. The user starts the desired procedure by loading the utility diskette into the integrated diskette drive and using the appropriate 3274 initial machine load (IML) alternative. After the IML, the user must remove the utility diskette. The three procedures are:

A. Variable copy. This procedure copies a customized 3274 system diskette after first allowing the substitution of some information on the diskette, including: 3274 model designation, extended function store, printer authorization matrix, physical unit id, SDLC address, BSC address, and control unit address.

B. Fixed copy. This procedure automatically copies the entire contents of any 3274 diskette, loaded in the integrated diskette drive, onto a diskette loaded in the auxiliary diskette drive. The result of this procedure is an identical diskette. This procedure may be used to rapidly create backup diskettes for customized 3274 diskettes.

C. Diskette formatting. This procedure automatically formats any diskette, either blank or previously formatted, for use as a 3274 diskette.

3. Fifty diskettes. These diskettes, formatted for use as 3274 diskettes are otherwise blank.

4. Diskette identification labels. At least one hundred self-adhesive labels.

5. Re-usable mailing container. Twenty five reusable mailing containers, capable of holding up to ten diskettes each.

6. Microcode update distribution. As microcode updates are released for any 3274 configuration support, IBM will distribute one set of the diskettes to each 3274-51C having this RPQ and the affected configuration support installed. Such distribution will make the latest microcode level immediately available to the network manager at the RPQ location.

(V-3274-13)   3274 CONTROLLER EVOLUTION SUMMARY

This is an optimal foil that can be used to summarize the evolution of the 3274 product. The framework of the SNA architecture has provided the ability to incorporate increasingly sophisticated application requirements. The customer's investments in workstations are protected. As new functions are announced, the 3274 controller (for a fee) can be field upgraded in most cases.

Note to Presenter: The primary controllers of 1985 are the 41 and 61 models. The microprocessor is twice as fast as in older models, base memory is 256K, all terminals are fully supported by the Configuration D standard microcode to name but a few reasons. Pay particular attention to upgrading older models as the upgrade cost will warrant examination!!

WORKSTATION SECTION

The foils in this section are included so that the presenter can highlight specific workstations during the generalized workstation discussion. No script is provided for the individual workstations.

(V-W/S-1) WORKSTATION MAINTENANCE

One of the key areas in addressing competition in Workstations is the IBM Service Organization. Given the customer has been made aware of the Corporate Standard 105C, they know the reliability characteristics of IBM Products. One should stress that reliability has a real cost. Take the example of a large company with 1200 3270 users a a payroll cost of $25 Million. A 1 (ONE) % downtime costs that company $ 250,000. IBM's products have an excellent track record for quality. For service, the IBM Service organization is the best in the industry and is spread across the country. Of course a variety of maintenance options are available. Because of IBM's high standards for quality and dependability, maintenance is offered at a remarkably low price. One new option is the Central Site Maintenance offering which can lead to reduced maintenance charges for your customer.

Note to Presenter: Some IBM Locations have Service contract specialists whose sole job is to review IBM Maintenance offerings with your customers.

Current maintenance offerings from IBM are:

IBM On-Site Repair (IOR)- IBM will repair the failing machine and verify its operation at your location. IBM On-Site Repair Service is available only in areas designated by IBM.

IBM On-Site Exchange (IOE)- IBM will 1) deliver the exchange machine to your location, 2) disconnect the failing machine, 3)connect the exchange machine, 4) verify its operation, and 5) remove the failing machine from your location. IOE is available only in areas designated by IBM

Customer On Site Exchange (COE)- IBM will deliver the exchange machine to your location where you are responsible to disconnect, attach and reconnect the machine. The customer is responsible for returning the failing unit to IBM at IBM's expense. Customer Carry in Exchange (CCE)- The customer is responsible for delivery of the machine to an IBM Service Center or other designated IBM location, pickup the exchange unit, install and verify its operation. Customer Carry in Repair (CCR)- The customer will carry the machine into an IBM Service Center location, and when the machine is repaired pick it up, install and verify its operation.

(W-1) CHANGE AND PRODUCTIVITY

There is a tremendous changes going on in the workstation marketplace and the overall directions IBM is taking in answering the needs of this marketplace as it builds workstations now and in the the near future. A good understanding of this dynamic environment will assist you to make your workstation investment decision with confidence.

More change is anticipated in the workstation marketplace in the next five years than has been seen in the last twenty-five. One major source of change is the outlook of the user community. Workstations, which were once looked upon as clerical devices, are now generally accepted among professionals. This "Office Automation" for professionals, who numbered some fifty three million in 1980 in the U.S., is creating increased interest in workstations by our customers. Part of this acceptance has come from improved price/performance in workstation technology and better, easier to use software. Part of this acceptance has also come from increased computer literacy in the most recent generation of college graduates. And certainly, the genuine push for productivity and quality improvements have provided a fertile environment in which to nurture change.

The phenomenal workstation growth in the '80's is fueled by tremendous advances in technology and significant changes in the automation of end user applications. The workstation truly is the productivity tool of the information revolution.

(W-2) ENVIRONMENT

The fundamental underlying forces for change are no mystery. On one hand, there is rapidly increasing demands for profitability in an increasingly complex, competitive world market. On the other hand there has been a scorecard of minuscule office productivity gains of 1.25% on the average in the last decade; contrasted with a set of powerful economic trends toward lower cost technology and higher employee expense. Yes, there is a "clearly perceived, better way". Individuals are finding their own solutions...and purchasing workstations in record numbers. It's no wonder that many chief executives have adopted the strategic goal of providing salaried employees with more automation to perform their jobs and improve their productivity.

(W-3) WORKSTATION ECONOMICS

A quick look at workstation economics reveals why many businesses are eager to jump on the workstation bandwagon. Let's say that a white collar worker is paid over $200 per day (*1) and a clerical worker is paid $85 per day (*2). No one questions why these people are provided with a telephone, which today cost $.80 (PBX, line and phone cost of $800 - (*3). For only $1.00 per day that same white collar worker can

have a 3178 display (*4). And if personal computing is desired, only $2-$10 per day investment is needed. (*5).

Simple arithmetic yields a productivity gain requirement of 2%-12% for clerical workers, and 1%-5% for a professional to justify the expense of an intelligent workstation. Few people who have ever had even a casual use of a workstation have any doubt that such small gains in productivity aren't easily attainable.

This is a very simple example meant only to show the relative economics favoring automation, and the relatively small delta for an intelligent device versus a standard display when put in the perspective of the cost of the employee.

Certainly, a customer should use his "own" numbers and make his analysis as sophisticated as he wished, by adding control unit, line, and host charge-back costs.

*1   Assuming a $35,000 yearly salary plus 15% benefits at 200
      working days/year.

*2   Assuming a $15.000 yearly salary plus 15% benefits, also a 200
      200 working days/year.

*3   DATAMATION, August 1982.

*4   VPA price of $1000 over a 5-year life, 200day/year usage

*5   VPA price of $2000-10000 for the intelligent workstation (PC1
      through advanced 3270-PC), 200 days/year usage period.

(W-4) INVESTMENT DECISION

Note to the Presenter: This is not meant to be a complete financial presentation. It is to put the cost of the workstation relative to the cost of the person in perspective.

Obviously, these are not the complete costs incurred, (ie. there are controller and line costs, perhaps over time, Info Center costs.) We invite your customer to use their own numbers and incorporate all relevant financial considerations (ie. tax credits and depreciation).

Another consideration for the terminal investment decision is to consider the cost of the hardware relative to your most important resource--PEOPLE.

For example -- Consider a terminal costing $2500 for an employee earning $35,000 (not including benefits) over a period of 5 years. The total cost of the investment decision is $177,500. The cost of the terminal compared to the total investment is only 1.5%.

Consider the following when making your workstation investment decision:

(1) 1.5% of the investment to get a minimum of 1.5% savings is a fairly low risk investment.

(2) The residual value of IBM equipment, over time, should exceed the plug compatible equipment due to its design, technology, and support. The benefit to the customer is lower financing costs and a (potentially) higher recapture value at asset disposal time.

   (The presenter should cite relevant examples. ie. In Jan,1985, 6 years after its announcement, the 3278(2) had a market price of approximately 20% of its original price.)

   This indicates that there is a strong residual value for IBM's products.

(3) The benefits of end-user productivity gains over the period of the investment. For example, if an end-user (ie. earning $35,000/yr.) can achieve 7% productivity improvement over 12 months, the cost of the $2500 workstation will be recovered in about one year. (7% of $35,000 = $2450)

   Other benefits include the quality of decision making, employee morale, organizational excellence, time value of information, simplified communication, flexibility in work location and schedule, better control, and better time management.

Note to the Presenter: Studies done in IBM Canada showed that with the
implementation of workstations (using PROFS) the following productivity
gains were realized....
              Managers   + 7%
              Professionals   +10%
              Administration   +15%

From the following chart you will also see that 7% is not unreasonable.

(W-5) PROFESSIONAL PRODUCTIVITY

Not only do we know that different users have varying requirements, we
also know that their productivity increase is the sum of the incremental
gains made from the use of these various applications. (This is an
example of one company's "guesstimates" for their business professional
users).

Users generally start with one application and add others over time.
First comes spreadsheet and financial analysis, then graphics. Or the
requirement for electronic mail from simple text applications.

In IBM, professionals whose first experience with a workstation was
sending PROFS notes, soon found themselves creating simple, more formal
documents.   Few, if any, companies have conducted any productivity
studies.   Seldom is the same work performed in an automated office
environment, much less is it organized or executed in similar enough
ways to meaningfully measure the gains.   Users "perceive" gains made in
reduced "information float" or time necessary to communicate, ability to
analyze information to make more enlightened business decisions, ability
to handle increased workload more efficiently, reduced "paperwork," and
so forth.   These benefits are difficult to measure but generally clearly
perceived by users. Few users of office automation tools, where proper
user training and support exist, are willing to part with them after
using them.

(W-6) END-USER REQUIREMENTS

In summary the following conclusions can be reached:

(1) There is a wide variety of end users.

(2) These end users have a wide variety of applications. This causes
    a wide variety of product solutions (both hardware and software)
    to fit these different needs.

(3) A "one workstation does all things for all people" is therefore
    a myth. A highly modular workstation built on a UNIVERSAL
    architecture represents the most cost effective solution for the
    future.

You need to understand the requirements of your end users and satisfy
them with a data processing direction that enhances their productivity.
The importance of not only identifying today's requirements but also

tomorrows direction cannot be stessed enough. IBM is committed to the product development, manufacturing, support and service.

We need to start building a "framework for the future" today on IBM architecture.

PRESENTATION FOILS

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IBM 3270

"THE STANDARD OF THE INDUSTRY"

IBM 3270

IT GETS BETTER

& BETTER

& BETTER

- 3295
- 3270 PC/G, GX, AT
- 3180
- 3179, 3179/G
- 3270PC, AT
- PC/370
- PC
- 4250
- 3290
- 3289
- 3178
- 3262
- DISPLAY WRITER
- 3287
- COLOR GRAPHICS
- EXTENDED DATA STREAM
- MICROCODE
- 3274
- ANNOUNCE

1971   1980
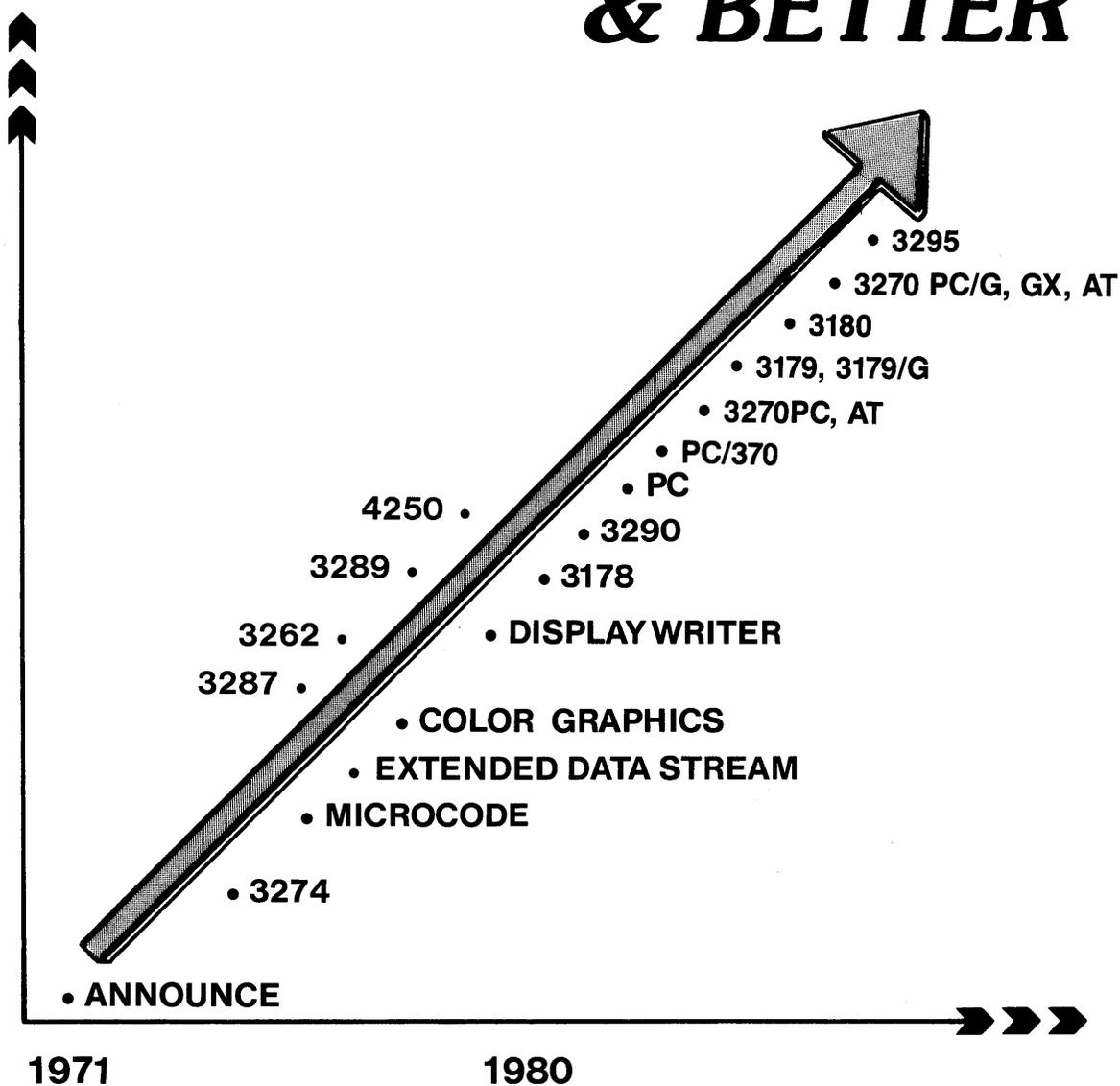
WHY ?

ARCHITECTED SOLUTION

- **Host Programming Support**
- **3270 Data Streams**
- **SNA End-to-End Network**
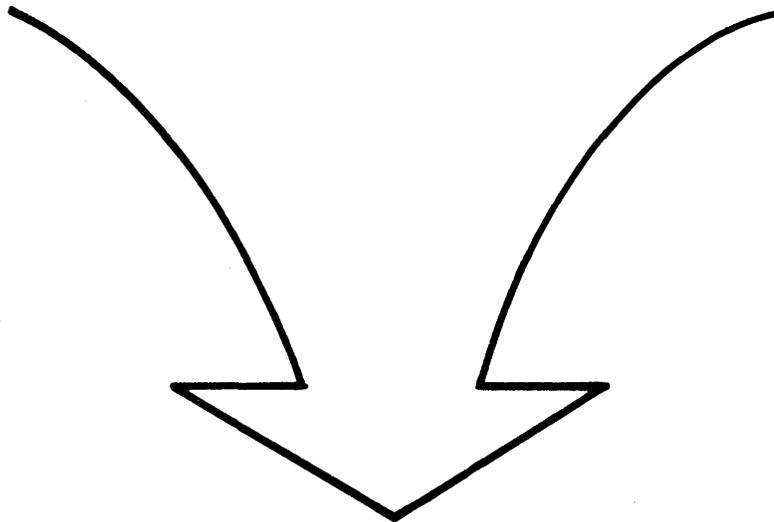
• ACCOMMODATES GROWTH & CHANGE

• PROVIDES MANAGEMENT STRUCTURE

WORKSTATION GROWTH

INSTALLED WORKSTATIONS
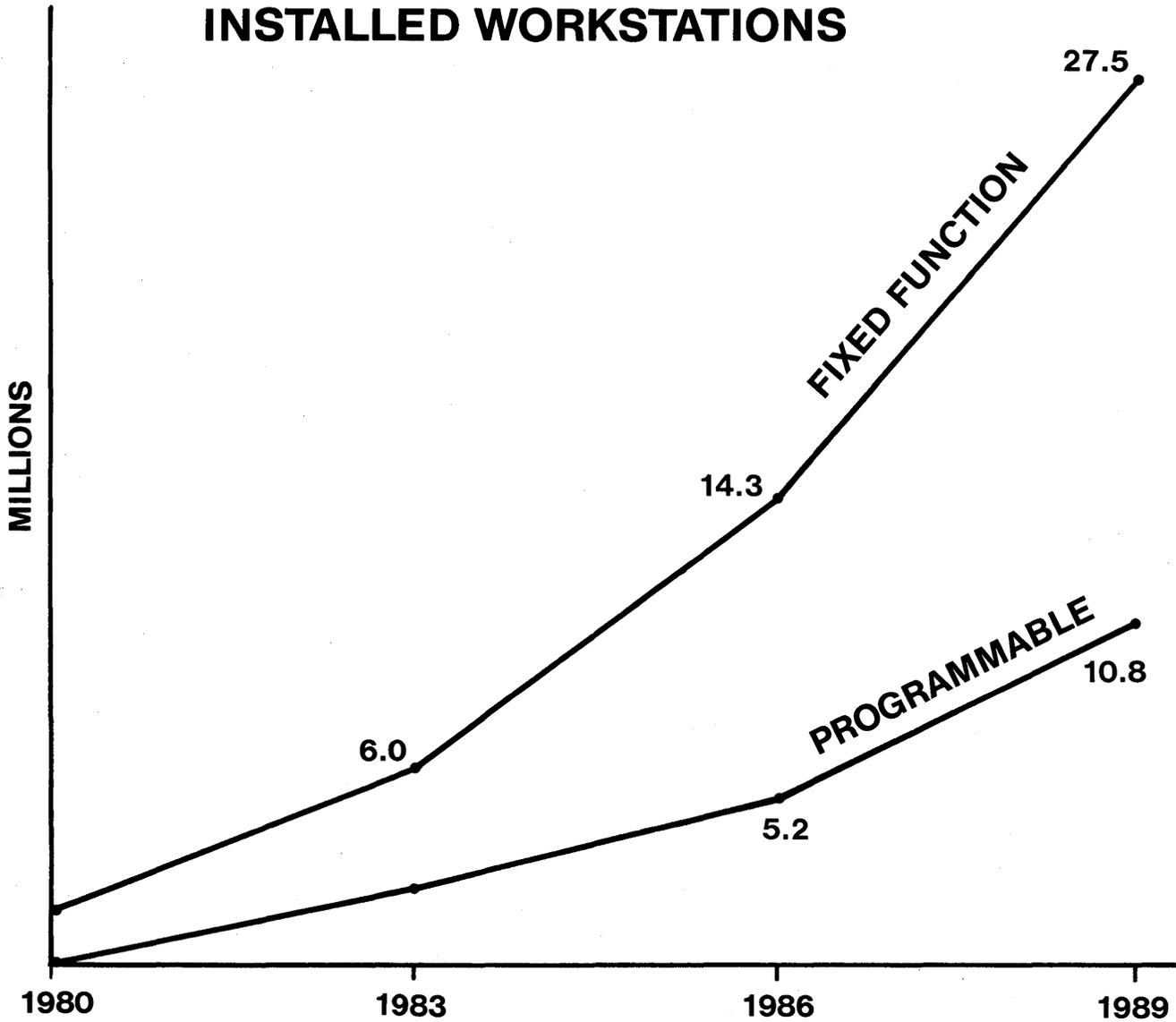
Source: Bureau of Labor Statistics
        Corporate Marketing Research

3270 WORKSTATION FAMILY

3278

3290

DISPLAYWRITER

3279

3180

3274

PC

PC-3278/9

3178

3179
3179/G

3299

PC/370

3287

3270 PC/GX
AT

3270 PC/G
AT

3270-PC
AT

4250

5210

3262

3268

3289
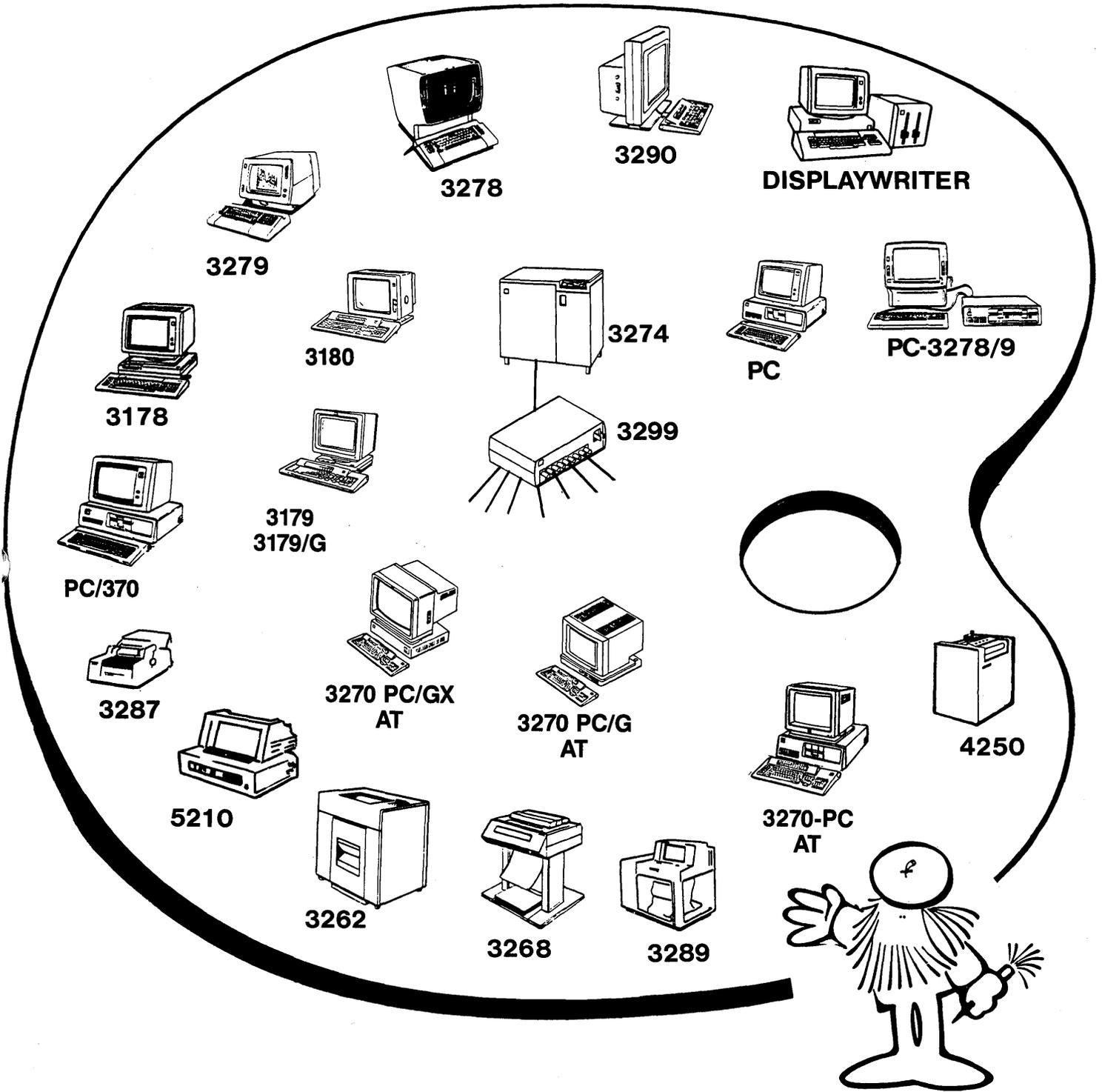
THE RIGHT PRODUCT FOR EVERY USER

NETWORK COMPONENTS

Host System
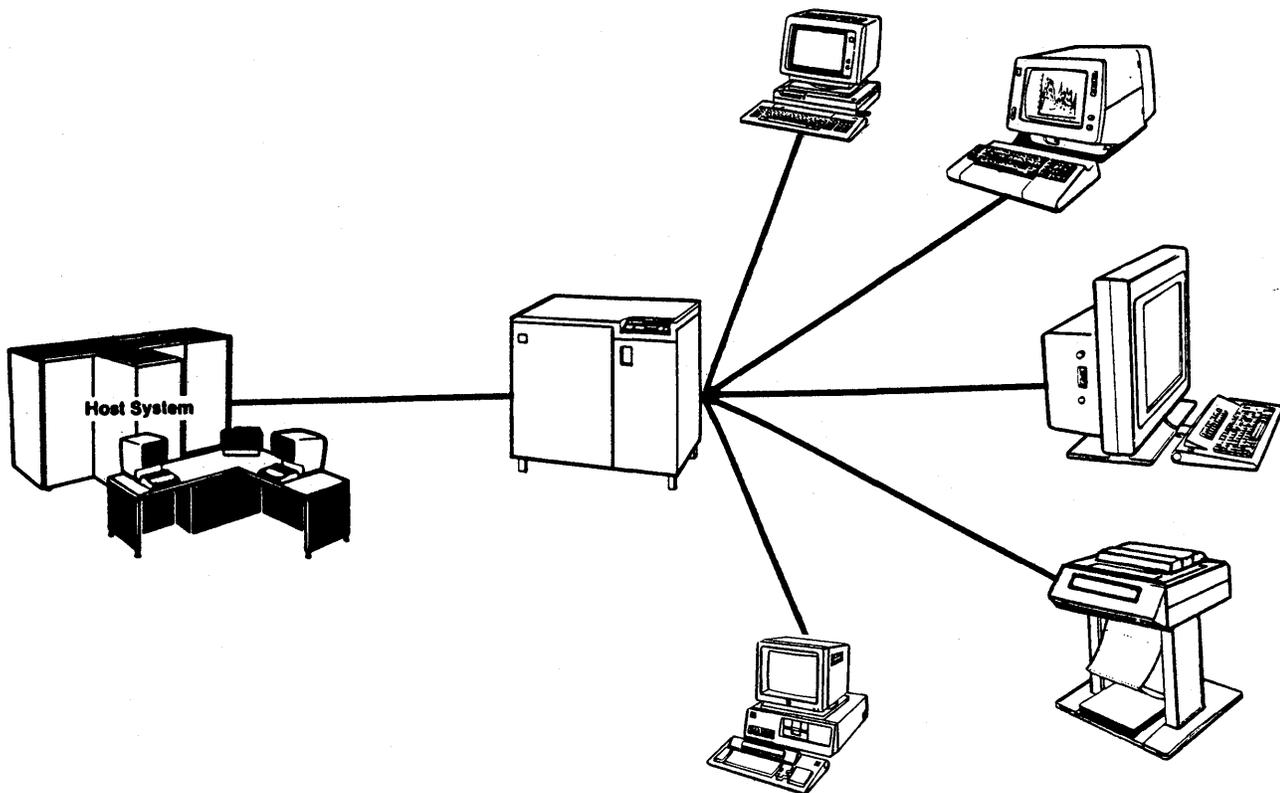
THE WHOLE IS GREATER
THAN THE SUM OF THE PARTS

CENTRAL COMPLEX
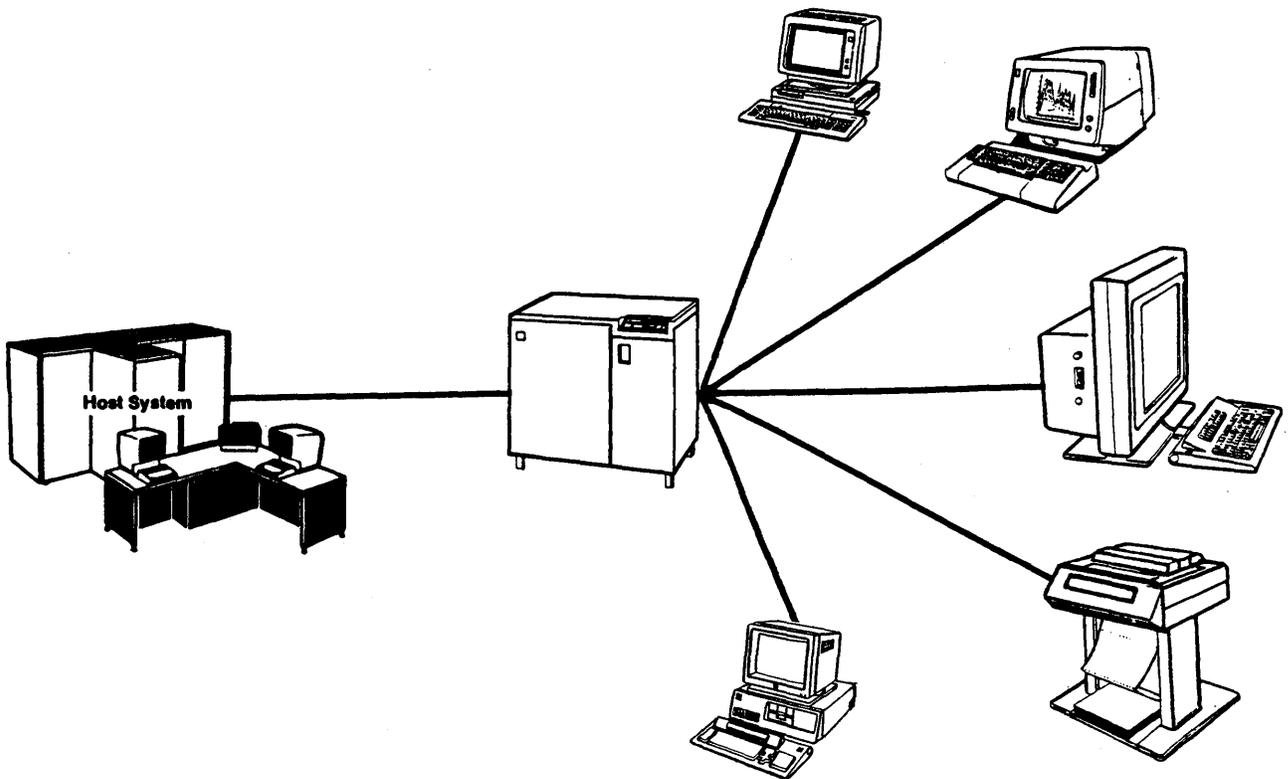
OBJECTIVES:

- Access to Data Bases/Programs/Network
- Maximize Total System Performance
- Provide Automated Control Capabilities

3270 NETWORK

OPTIONS:

- Bi-Synch
- SDLC
- Full SNA

SNA PROVIDES THE RICHEST FUNCTION

- Better Communication Line Utilization
- Access to Any Application on Network
- Automated Network Management
- Problem Determination/Anticipation

SNA "COMPATIBILITY"

RESPONSE TIME IMPROVEMENT
CONSISTENCY
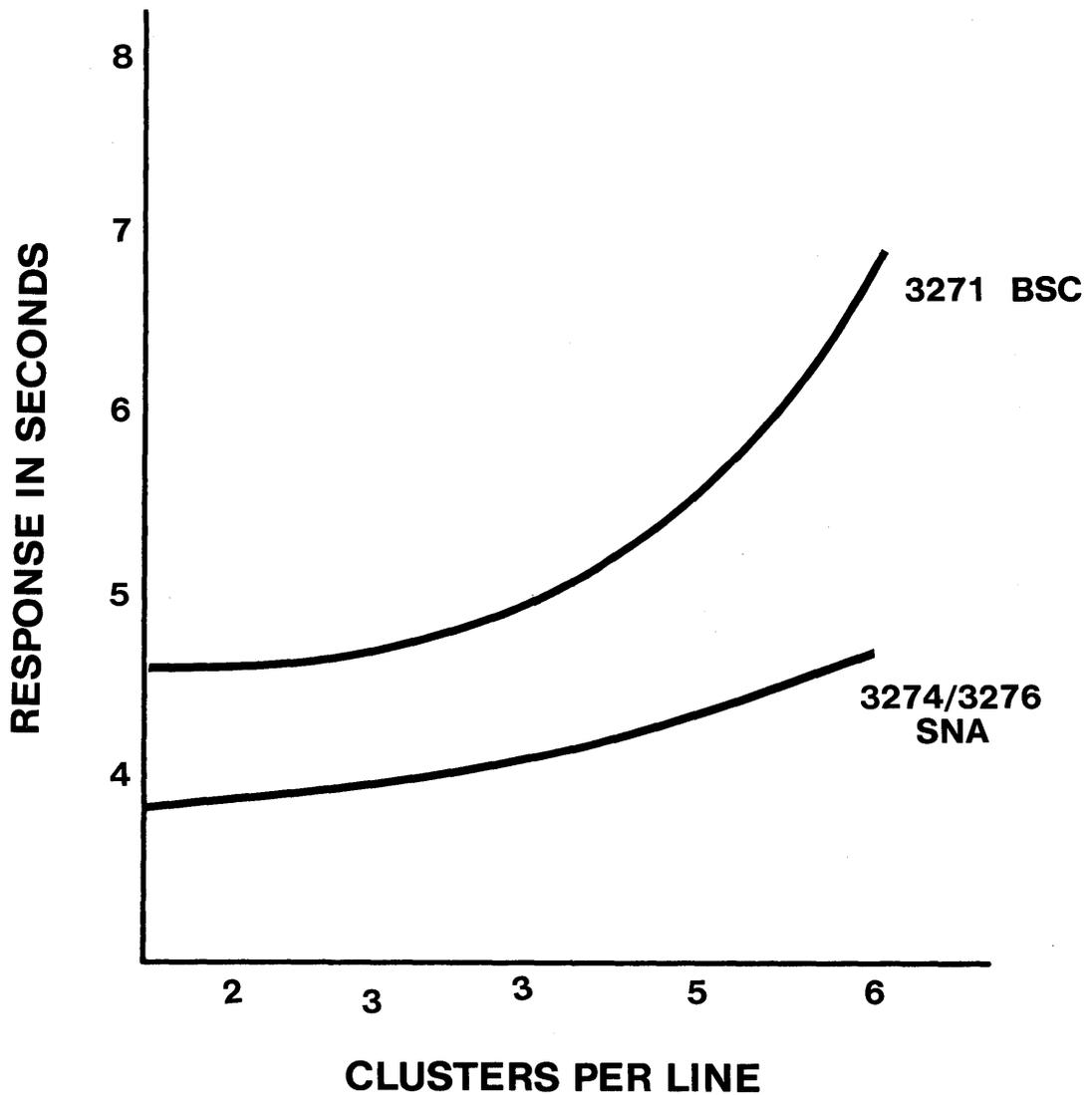
- Consistency Means User Productivity
- Long Term . . . SNA Costs Much Less

V-9

RESPONSE TIME IMPROVEMENT
CONTROL
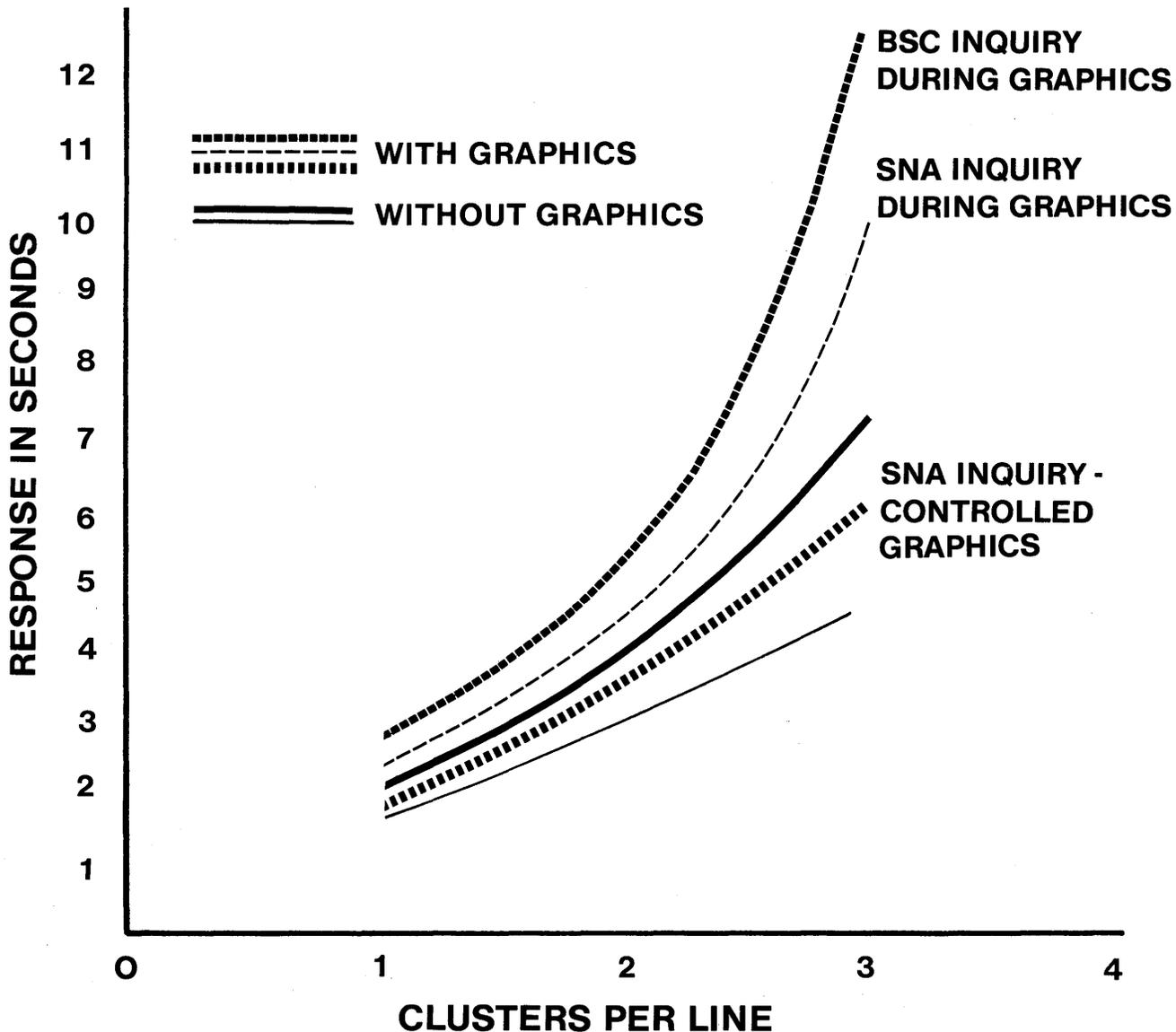
- **SNA Controls Mean . . .**
  - **–Acceptable Response Time for Today**
  - **–Growth Potential for "Office of the Future"**

V-10

WHY SNA?
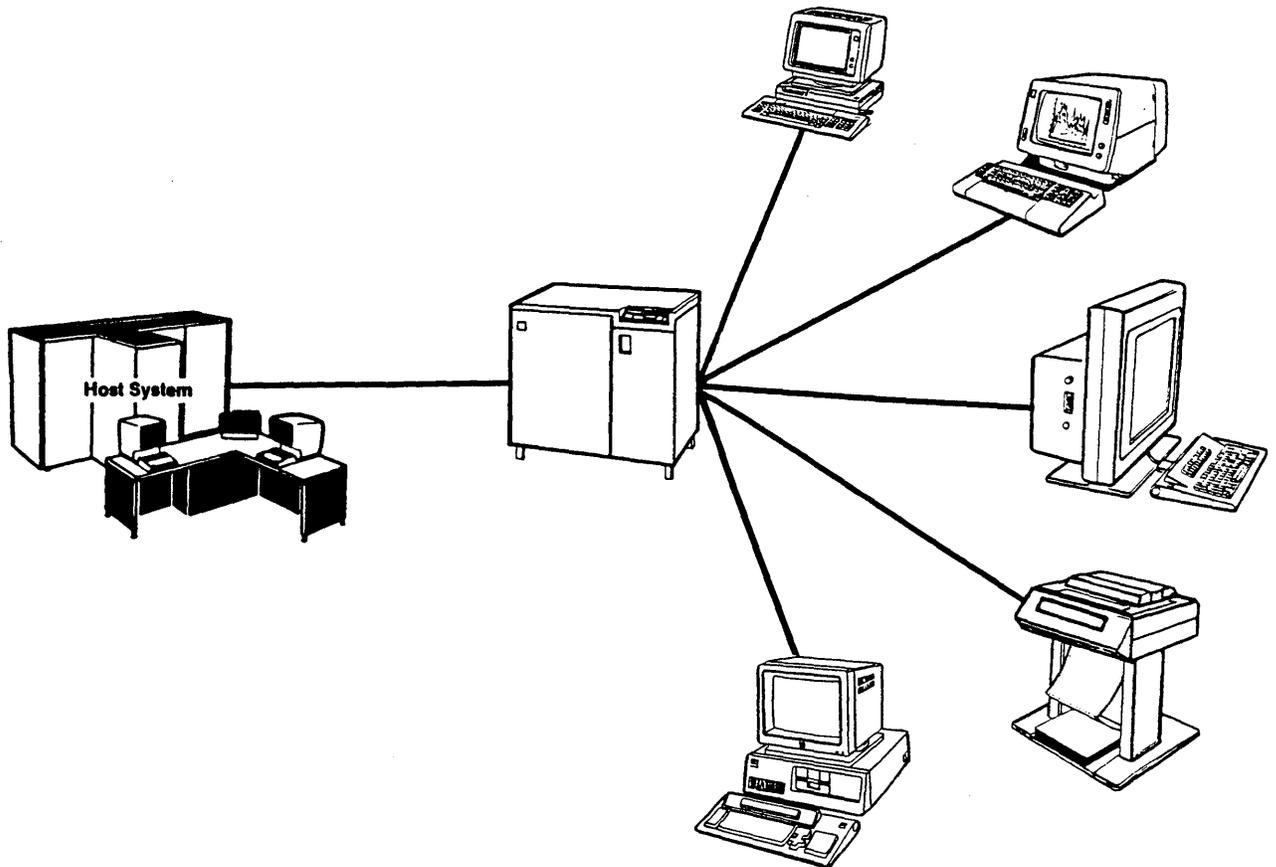
- **IMPROVED PERFORMANCE**
- **FULL APPLICATION ACCESS**
- **AUTOMATED NETWORK MANAGEMENT**

3270 WORKSTATIONS
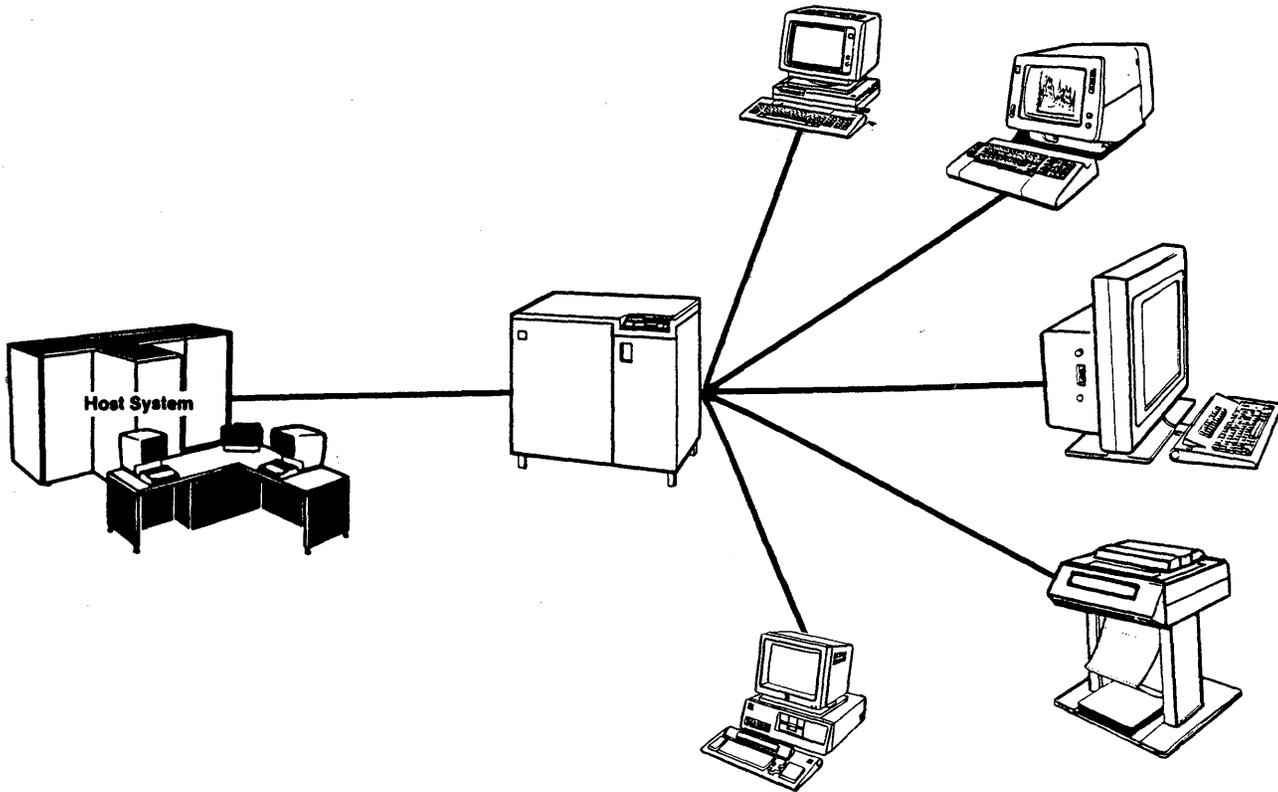
OBJECTIVES:
- **User Satisfaction**
- **Productivity**
- **Reliability/Availability**

USER SATISFACTION/PRODUCTIVITY

HUMAN FACTORS (ERGONOMICS)

FOOTPRINT
- Size/Shape
- Height/Tilt/Swivel

KEYBOARD "FEEL"
- Slope
- Touch
- Tactile Feedback
- Keyboard Arrangement

IMAGE QUALITY
- Character Size/Matrix
- Contrast
- Reflection
- Color
- Screen Size

RELIABILITY/AVAILABILITY

IBM CORPORATE STANDARD 105-C
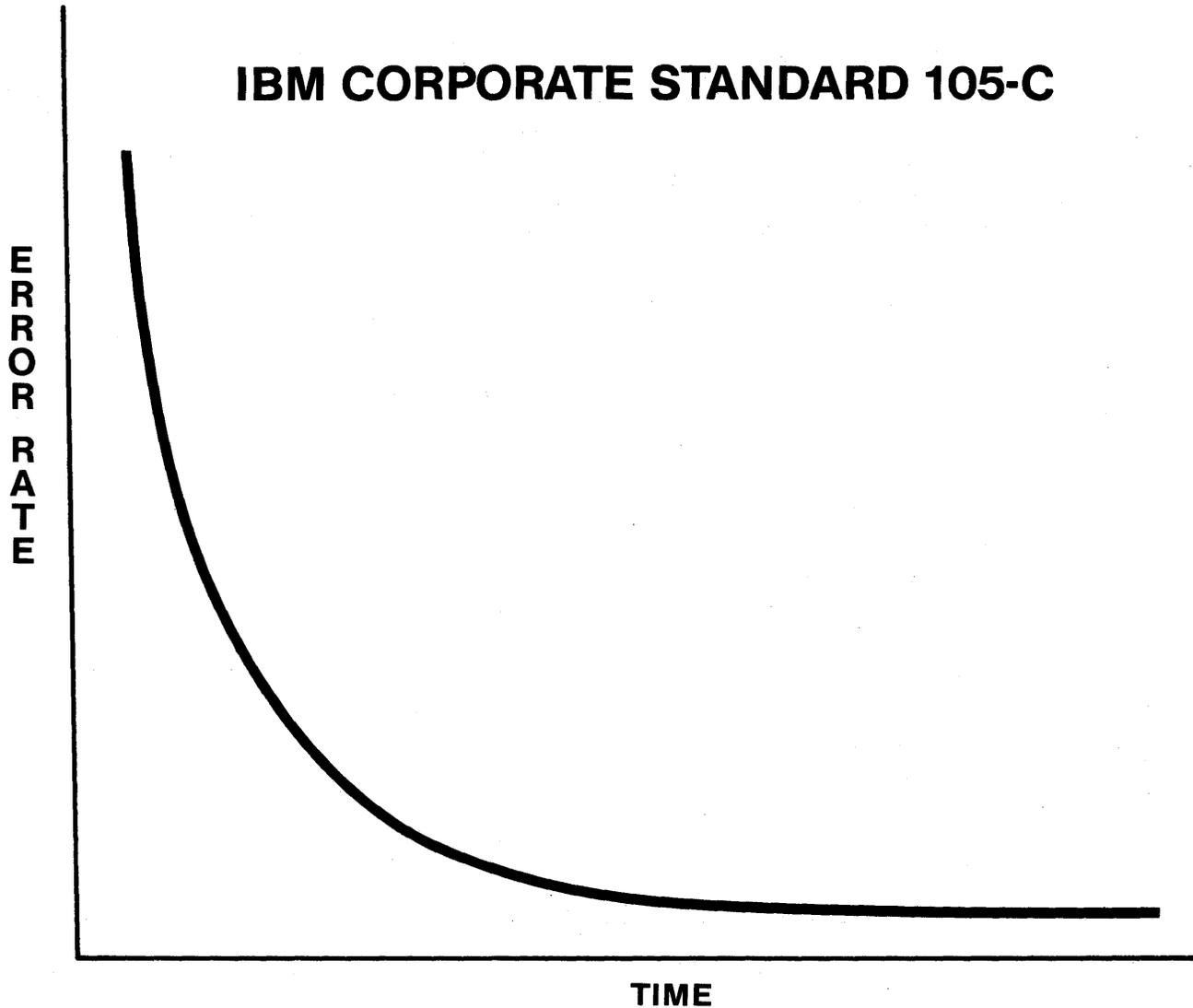
- Reliability
- Workstation Availability
- Maintenance Options

V-14

WHY IBM WORKSTATIONS?
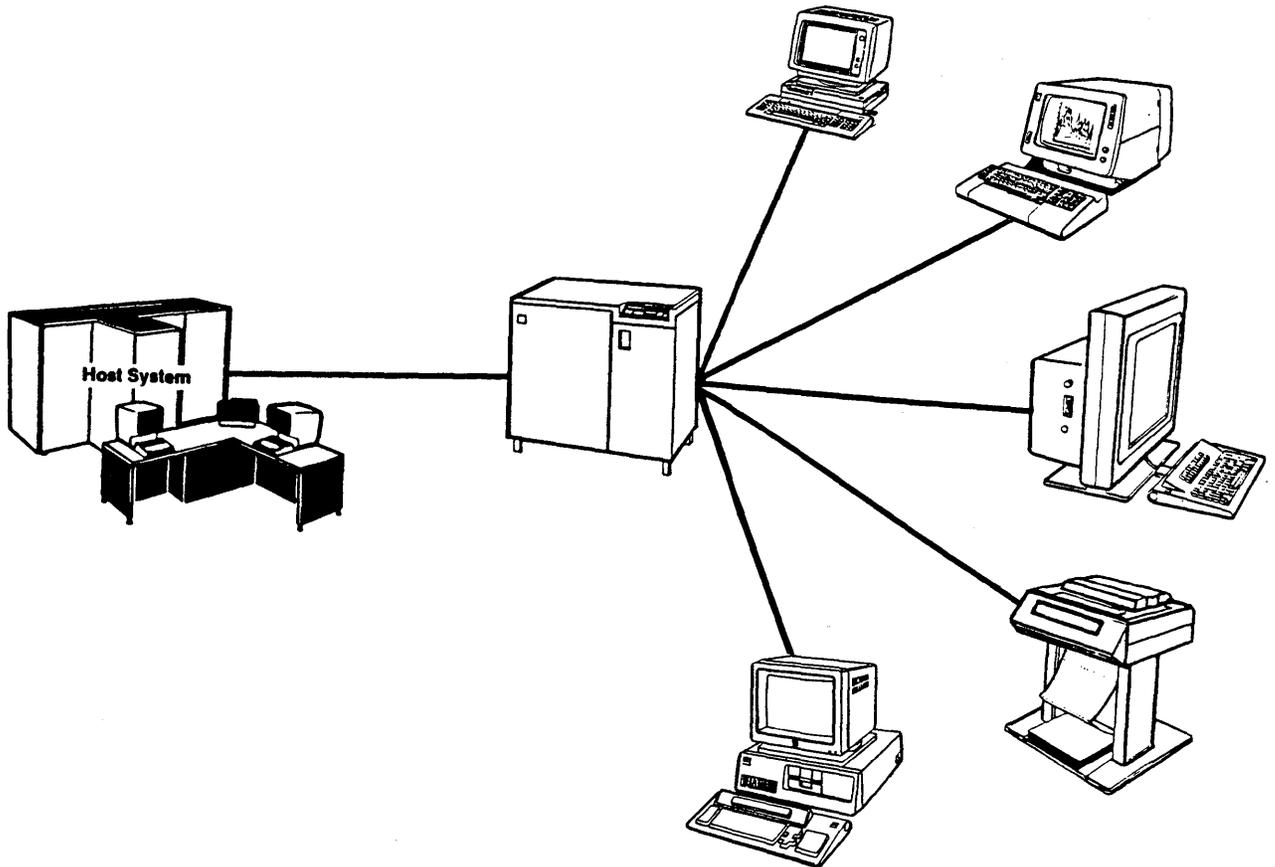
- **RELIABILITY/QUALITY**
- **HUMAN ENGINEERING**
- **PRICE/PERFORMANCE**
- **INVESTMENT PROTECTION**

V-15

3274 CONTROLLER

"HUB SERVER"

Powerful Communications Microprocessor
Communications - Oriented Operating System
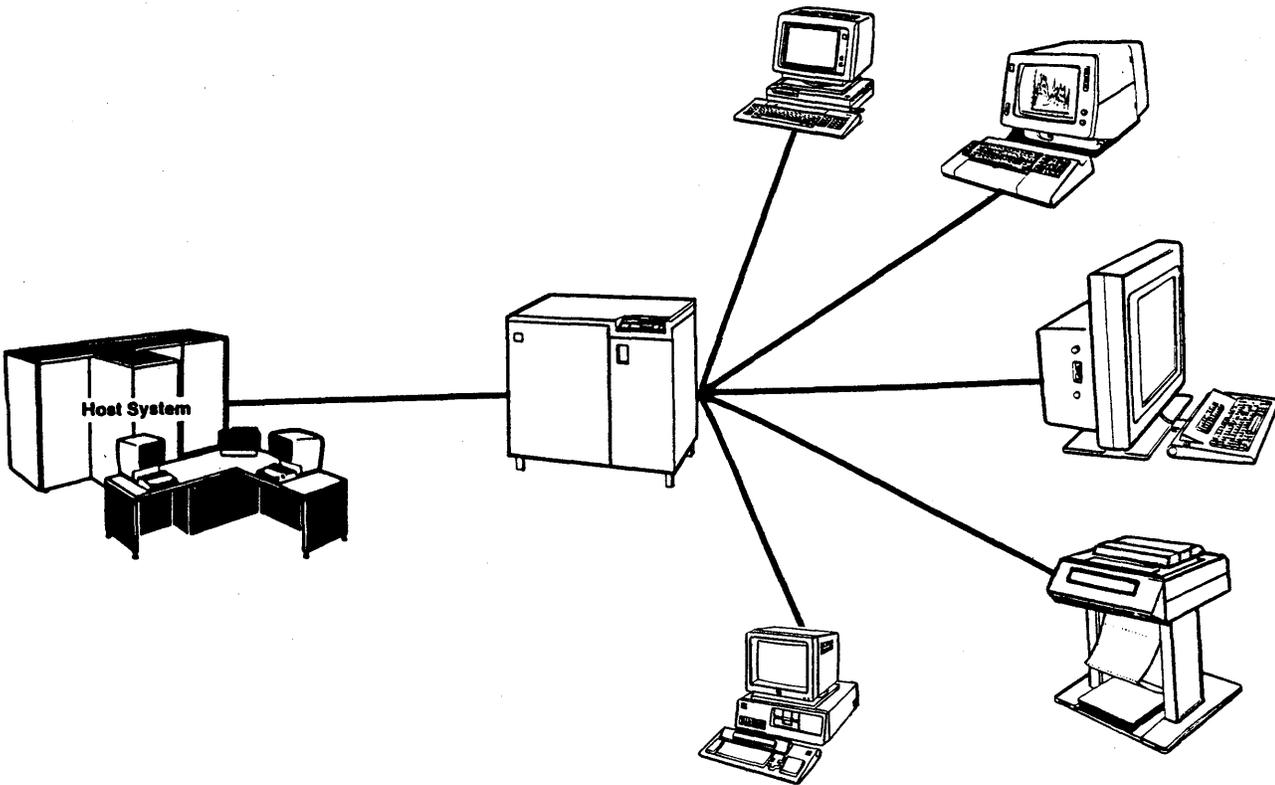
OBJECTIVES
- **Increase Function, Maintain Compatibility**
- **Maximize Total System Performance**
- **Provide Automated Control Facilities**

3274 CONTROLLER ENHANCEMENTS

1983

- MORE MEMORY, FASTER ENGINE
- STANDARD CONFIGURATIONS (16/32 PORTS)
- ENTRY ASSIST
- PROGRAMMABLE WORKSTATION SUPPORT
- TERMINAL MULTIPLEXOR
- X.25 DATA TRANSMISSION SERVICES
- RESPONSE TIME MONITOR, ALERTS

1984

- DUAL LOGIC "HOT KEY" SUPPORT
- ADDITIONAL DEVICE SUPPORT

1985

- VECTOR GRAPHICS

IBM 3299 TERMINAL MULTIPLEXER
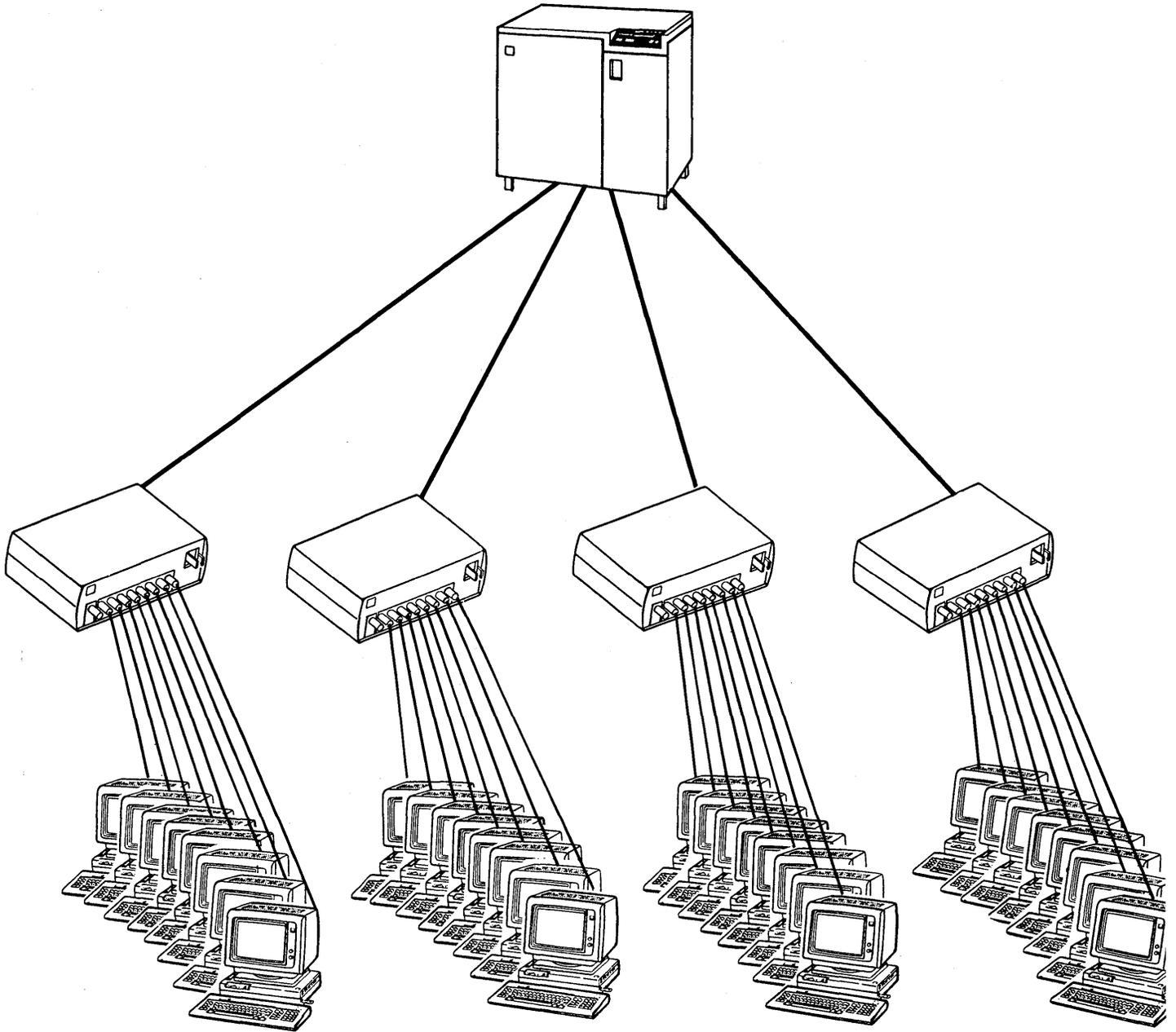
- **Reduced Installation Costs**
- **Improved Response Time**

WHY INTELLIGENT CONTROLLER?
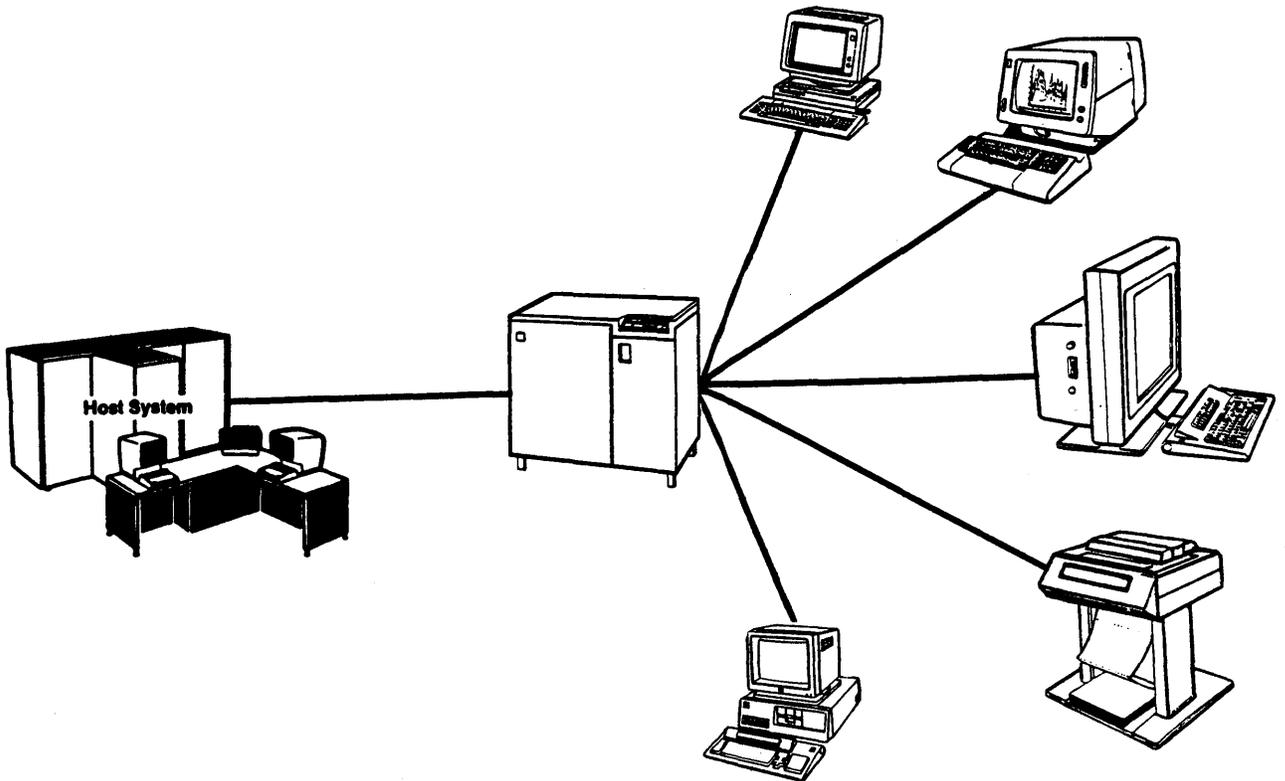
- **SDLC LINE MANAGER**
- **DEVICE I/O SCHEDULER**
- **FUNCTION SUPPORT**

 —Compression
 —Extended Data Stream
 —Large Screen
 —Entry Assist
 —Multiple Host Session Support
 —Keystroking
 —Programmable Workstation Attachment

V-19

IBM 3270 PC ATTACHMENT
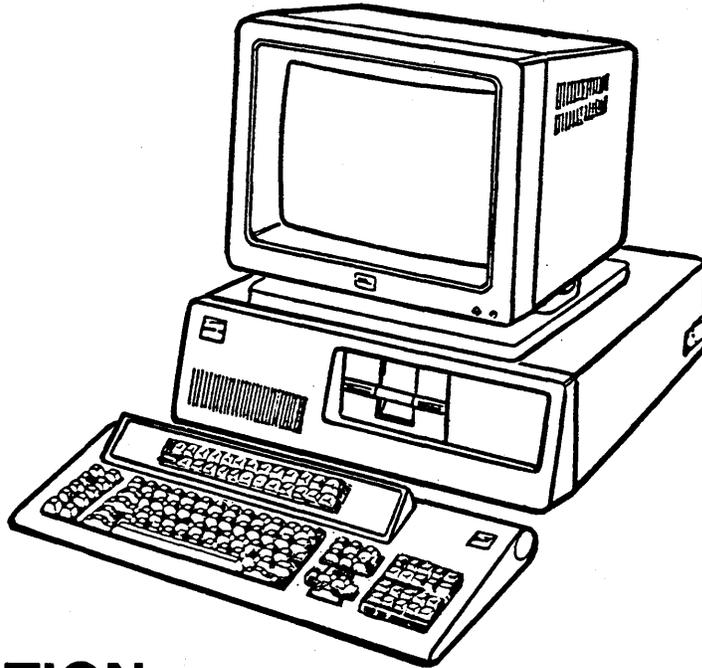
NEW FUNCTION

- **CONCURRENT SESSIONS**
  - **—Existing Host Programs**
  - **—Existing PC Programs**

- **FILE TRANSFER**

- **APPLICATION PROGRAM INTERFACE**

V-20

CONTROL UNIT TERMINAL INTERFACE

FIXED FUNCTION DISPLAY

HOST

FIXED

3274
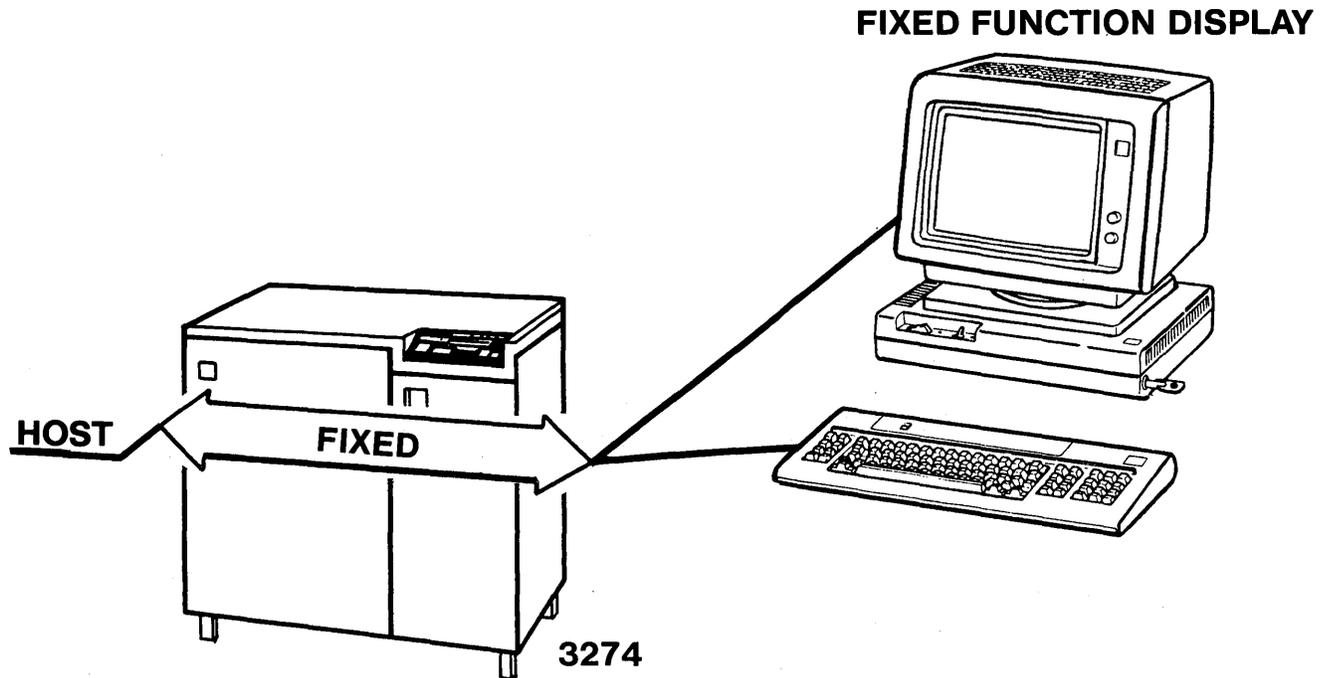
- **KEYSTROKING**
- **SNA/SDLC**
- **PERFORMANCE CONTROL**
- **NETWORK MANAGEMENT**

DISTRIBUTED FUNCTION TERMINAL INTERFACE

FIXED FUNCTION DISPLAY

INTELLIGENT DISPLAY

HOST

FIXED

INTELLIGENT

3274
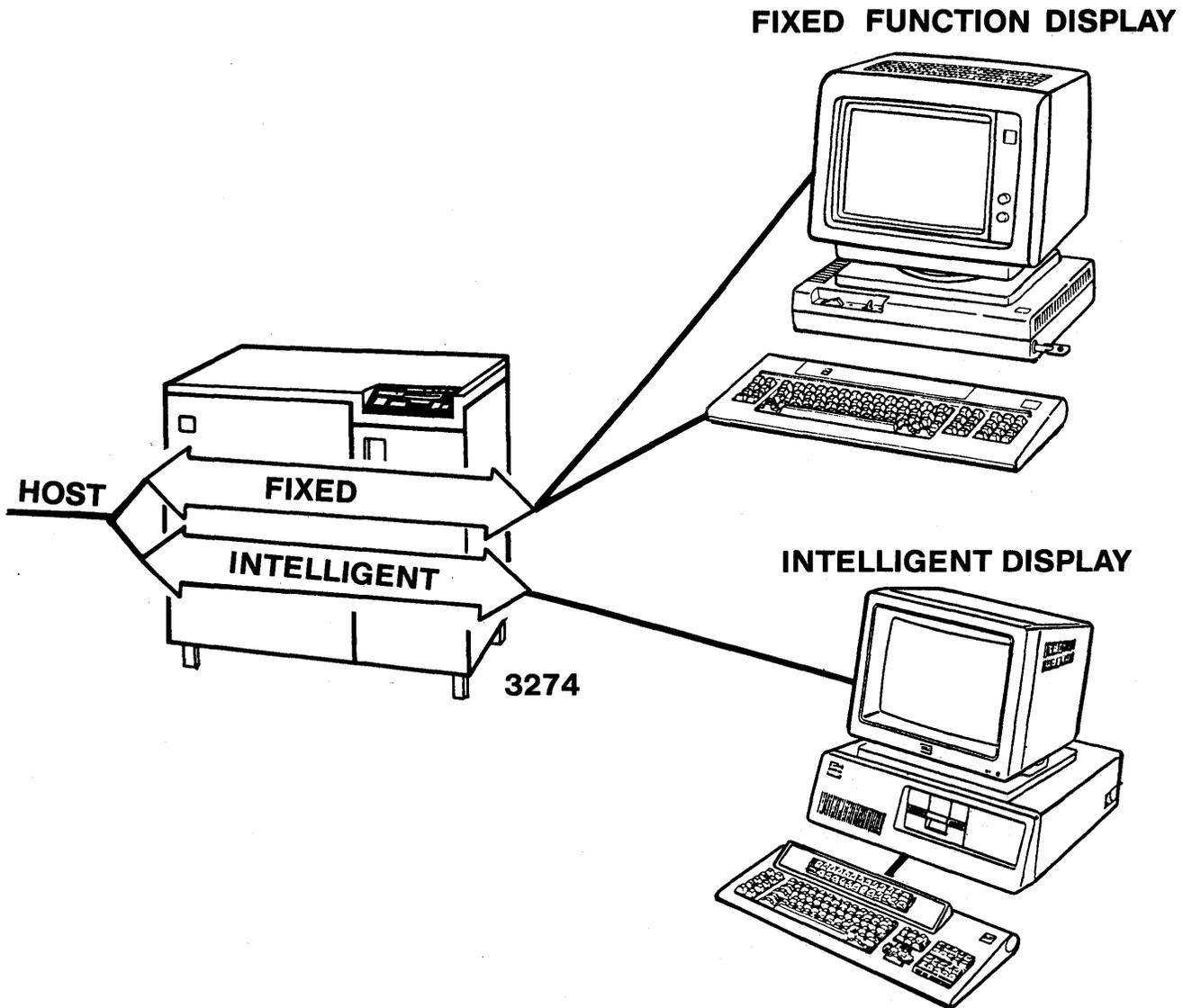
- **MICROCODE LOAD**
- **MULTIPLE LOGICAL UNITS**
- **FILE TRANSFER**

WHY INTELLIGENT CONTROLLER?
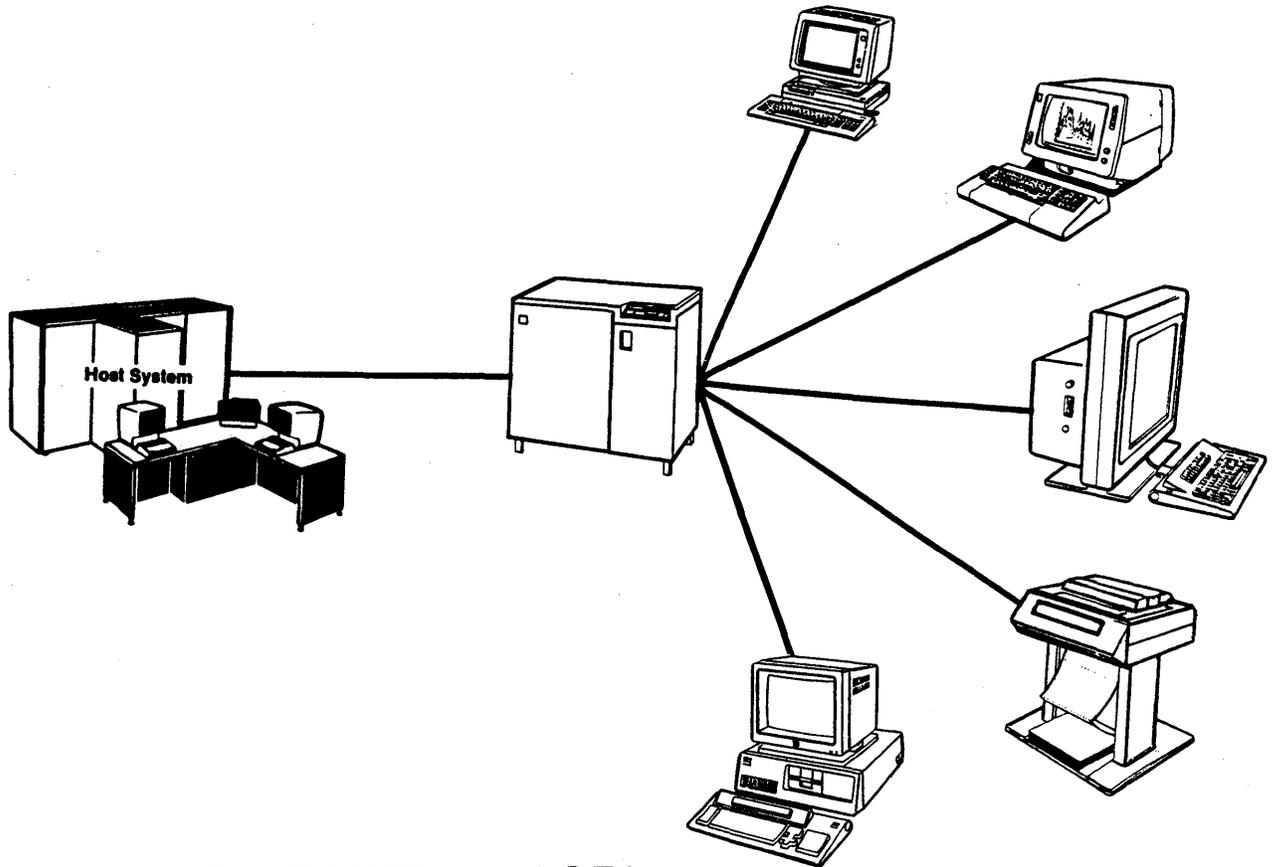
- **SDLC LINE MANAGER**

- **DEVICE I/O SCHEDULER**

- **FUNCTION SUPPORT**

- **NETWORK MANAGER**
  - **—Response Time Monitor**
  - **—Alert**
  - **—Request Maintenance Statistics**

- **DISKETTE COPY - CENTRAL MAINTENANCE**

V-23

WHY IBM 3274?
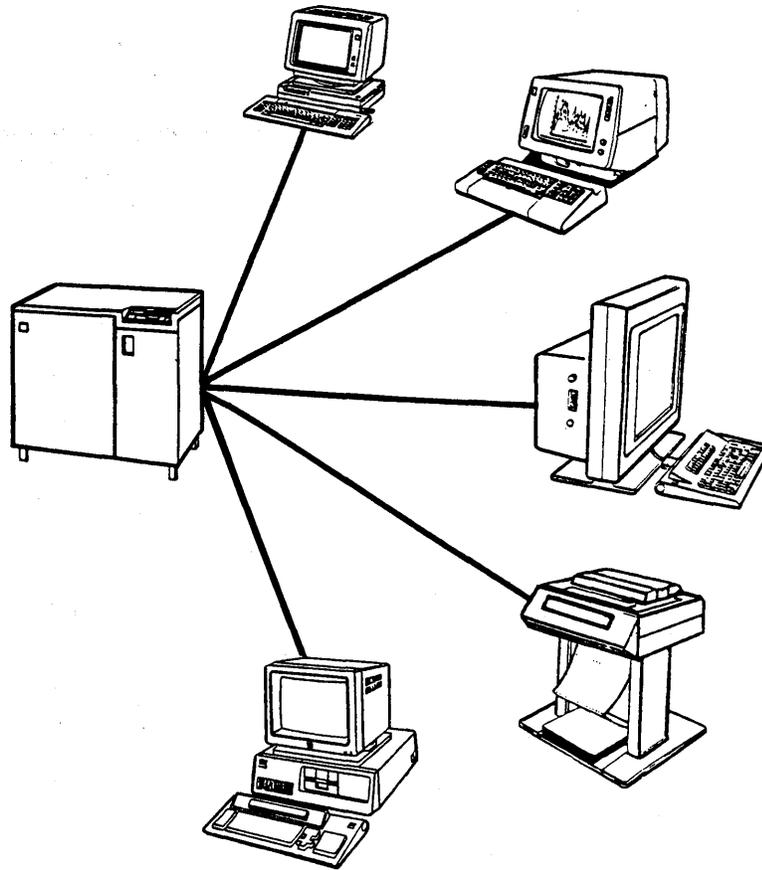
- **COMPLEMENTS HOST SNA . . .**

  –Performance
  –Network Management

- **WIDE RANGE OF WORKSTATION . . .**

  –Function
  –Price/Performance

- **INVESTMENT PROTECTION**

EACH ELEMENT HAS A CRITICAL ROLE

CONTROL UNIT TERMINAL INTERFACE	HOST	3274	DEV
STRUCTURED FIELD	★	★	
SNA CHARACTER STRING (SCS)	★	★	★
REQUEST MAINT. STATISTICS	★	★	
COMPRESS/ENCRYPT	★	★	
EXTENDED CHARACTER STREAM	★	★	★
SEVEN COLOR	★	★	★
GRAPHICS (PS)	★	★	★
DISPLAYWRITER ATTACH	★	★	★
3278/9 PC ATTACH	★	★	★
RESPONSE TIME MONITOR	★	★	★
ALERT	★	★	
ENTRY ASSIST		★	★
KEYSTROKING		★	★
DISTRIBUTED FUNCTION TERMINAL INTERFACE			
INTELLIGENT DEVICE SUPPORT	★	★	★
FILE TRANSFER	★	★	★
MULTIPLE LOGICAL UNIT	★	★	★
GRAPHICS (VECTOR)	★	★	★

THE WHOLE IS GREATER
THAN THE SUM OF THE PARTS

V-25

IBM 3270 PRODUCT LEADERSHIP

CENTRAL SITE & COMMUNICATIONS

- Host Based Response Time Monitor

- Alerts

- High Performance Communication Adapter

- X.25

- Encryption/Decryption

CONTROLLER

- Distributed Function Terminal

- Extended Data Stream (Vector Graphics)

- Entry Assist

- Dual Logic

WORKSTATION

- Complete Product Line — Local & Remote

- Application Program Interface

IBM 3270 "THE STANDARD OF THE INDUSTRY"

▷ **END-TO-END ARCHITECTURE**

▷ **USER PRODUCTIVITY FOR TODAY**
  - **The Right Workstation for Every User**

  - **Ergonomics**

▷ **FLEXIBILITY FOR TOMORROW'S GROWTH**
  - **Additional Function - 3274 Base**
  - **Additional Devices**
  - **New Technology**
  - **Performance**

▷ **IBM SUPPORT AND SERVICE**

PERFORMANCE PREDICTION

GUESSWORK IS EXPENSIVE
FOR LARGE NETWORKS!

Host System
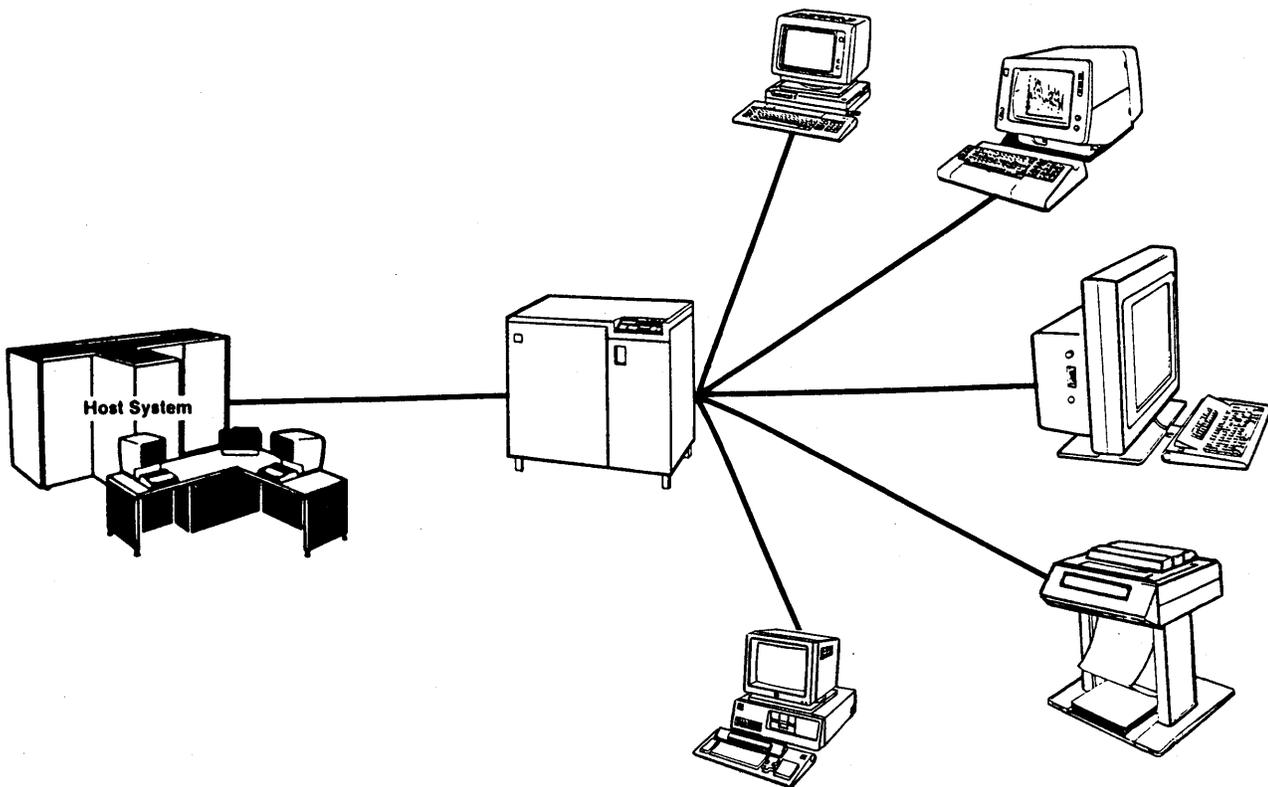
- **IBM PERFORMANCE PREDICTION TOOLS**

    —SNAPSHOT
    —FIVE3270

V 3274-1

COMPRESSION/ENCRYPTION
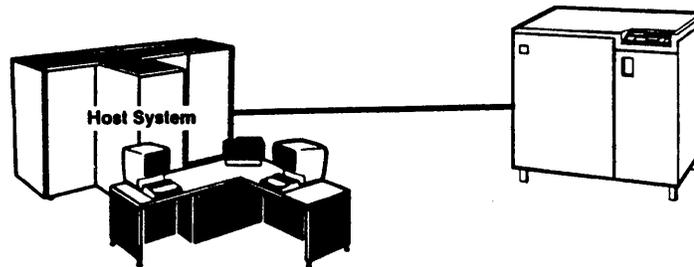
SHARED FUNCTION RESPONSIBILITY

- **COMPRESSION/COMPACTION**
  - **—Reduces Link Utilization**
  - **—Reduces Transmission of Redundant Data**

- **ENCRYPTION**
  - **—Provides Data Security Between Nodes Based on Data Encryption Standard**

    National Bureau of Standards

EXTENDED DATA STREAM
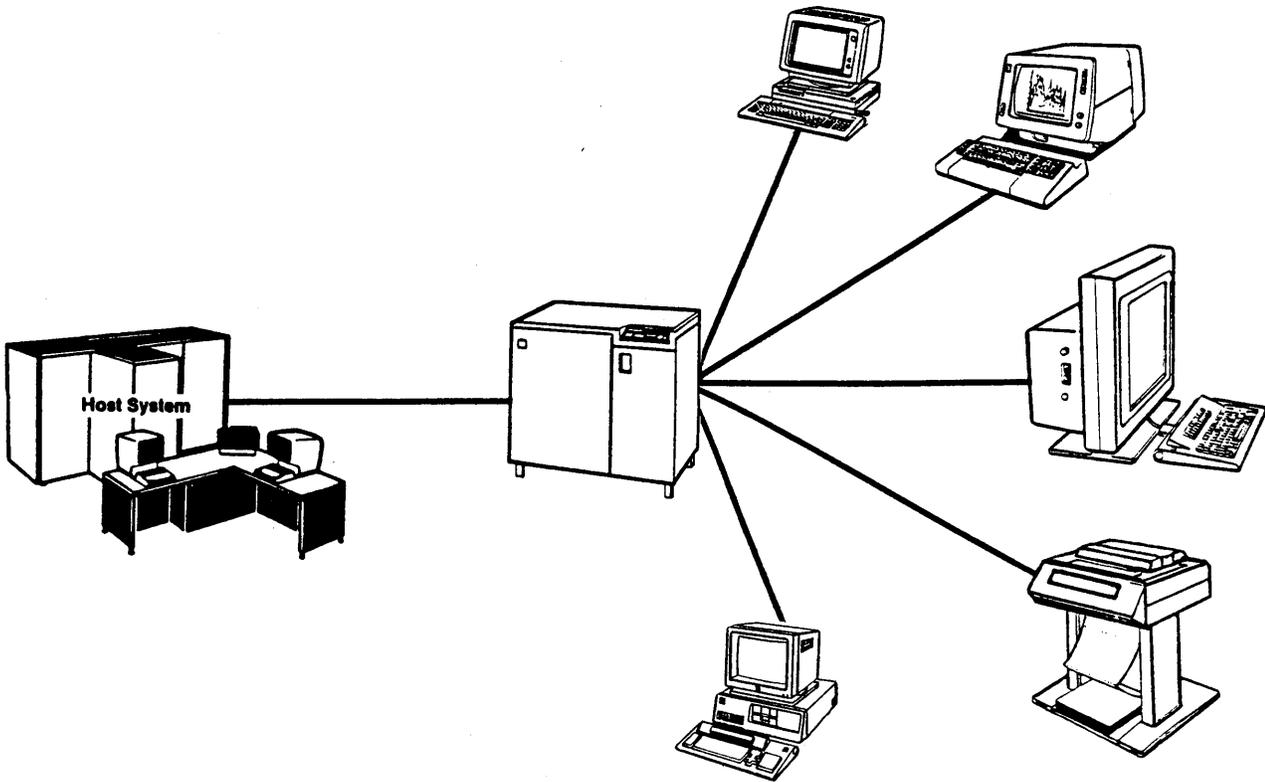
- **STRUCTURED FIELDS**

- **NON CHARACTER-CODED DATA**

    —Color
    —Extended Highlighting
    —Programmed Symbols
    —Data File Transfer
    —Vector Graphics

V 3274-3

3270 SCREEN SIZE/MEMORY

SCREEN SIZE	3178	3179	3179 G	3180 1	3290	3270 PC	3270 PC/G,GX
24 × 80–1920 char (3278-2)	✔	✔	✔	✔	✔	✔	✔
35 × 80–2560 char (3278-3)			✔	✔	✔		✔
43 × 80–3440 char 3278–4				✔	✔		✔
27 × 132–3564 char 3278–5				✔	✔		✔
62 × 160–9920 char 3290					✔		
SCREEN MEMORY				7K	24K		

V 3274-4

ENTRY ASSIST

3178, 3278, 3279, 3290, 3179, 3180, 3179/G

TYPEWRITER, APL KEYBOARDS

OPERATOR—ACTIVATED CAPABILITIES

- **ON-DEMAND SCALE LINE DISPLAY FOR ESTABLISHING:**
  —Margins
  —Tab Stops
  —End of Line Audible Signal

- **WORD WRAP (AUTOMATIC NEW LINE)**

- **TYPEMATIC CHARACTER DELETE**

- **ROW-COLUMN INDICATOR**

V 3274-5

ENTRY ASSIST FUNCTIONAL BENEFITS

- **FACILITATES "HEADS DOWN" ENTRY OF DATA**

- **PROVIDES ADDITIONAL ENTRY & EDITING CONVENIENCES**

- **OFF-LOADS HOST FUNCTION**

    —No Need for Host Word Adjustment

    —May Replace PF Key Functions, (Tabbing)

MULTIPLE LOGICAL UNITS

- **ENHANCE USER PRODUCTIVITY**
- **REDUCE WORKSTATION DUPLICATION**
- **3290, 3295, 3270 PC PRODUCTS**
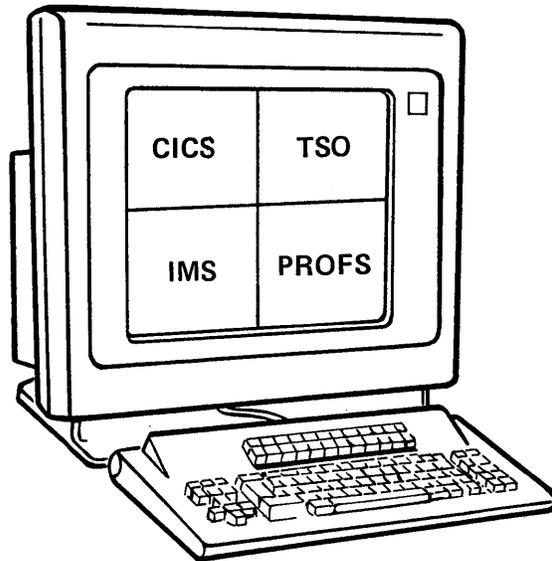
- **SINGLE CONTROL UNIT POSITION**
- **UP TO FIVE WINDOWS**

V 3274-7

RESPONSE TIME MONITOR FUNCTION

- **FOR EACH DISPLAY ATTACHED TO THE 3274:**

  —Five Response Time Interval Counters

COUNTER RANGE	#1 0-1 sec	#2 1-3 sec	#3 3-5 sec	#4 5-8 sec	#5 OFLO
	12	5044	4432	432	23

- **CUSTOMIZATION OPTIONS FOR:**

  —Immediate Response Time Display
  —Response Time Log Display
  —Counter Reset

- **HOST ACCESSIBLE DATA**

  —Performance Assessment
  —Trend Analysis
  —Charge Out Algorithms

V 3274-8

RESPONSE TIME SUMMARY DISPLAY

```
NLDM . RTSUM                  RESPONSE TIME SUMMARY                      PAGE  1
LUNAME: TEXTAB14         PERFORMANCE CLASS:  CICS22A         DOMAIN: NCF11
                    RESPONSE TIME FROM 09/01  10:00 TO 11:10

                                                    ACT:     75% UNDER 5 SEC
100% |                                              OBJ:     80% UNDER 5 SEC
 90% |                                                                 |
 80% |                                              [============]  V
 70% |                                              I ---+---+---+---- I
 60% |                                              0%  25%  50%  75%  100%
 50% |
 40% |                        35%                   NUMBER OF TRANS:  60
 30% |              23%      +---+
 20% |    17%      +---+     |   |          13%      LAST TRANS TIME:  6.3 SEC
     |   +---+     |   |     |   |  12%    +---+      AVG RESP TIME:    4.3 SEC
 10% |   |   |     |   |     |   | +---+   |   |
  0% |___|___|_____|___|_____|___|_|___|___|___|_____
       0  - 1 S     - 2 S     - 5 S    - 10 S   OVER 10 S

CUM %    17%        40%        75%       87%      100%
```
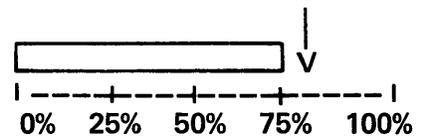
ENTER TO VIEW MORE DATA
ENTER 'R' TO RETURN TO PREVIOUS DISPLAY — OR COMMAND
CMD ==>

V 3274-9a
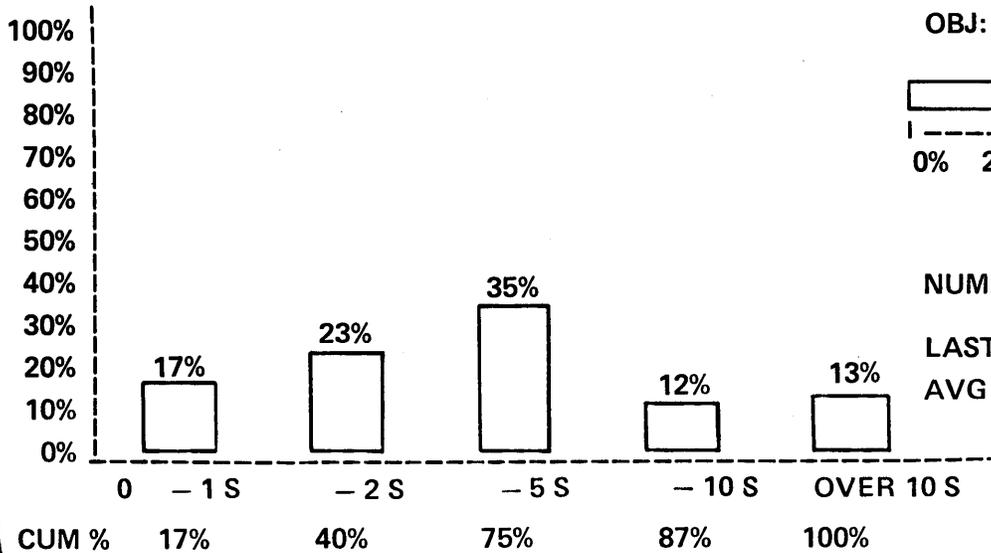
RESPONSE TIME BY
COLLECTION PERIOD DISPLAY

NLDM . STIME   SESSION RESPONSE TIME BY COLLECTION PERIOD   PAGE 1

------------ PRIMARY ------------------------------- SECONDARY --------- DOM.--

NAME CICS22 SA 00007968 EL 0023 | NAME TEXTAB17 SA 00009304 EL 0012 | NCF11

RESPONSE TIME FROM 09/01 10:00 TO 10:15   NETID WESTNET
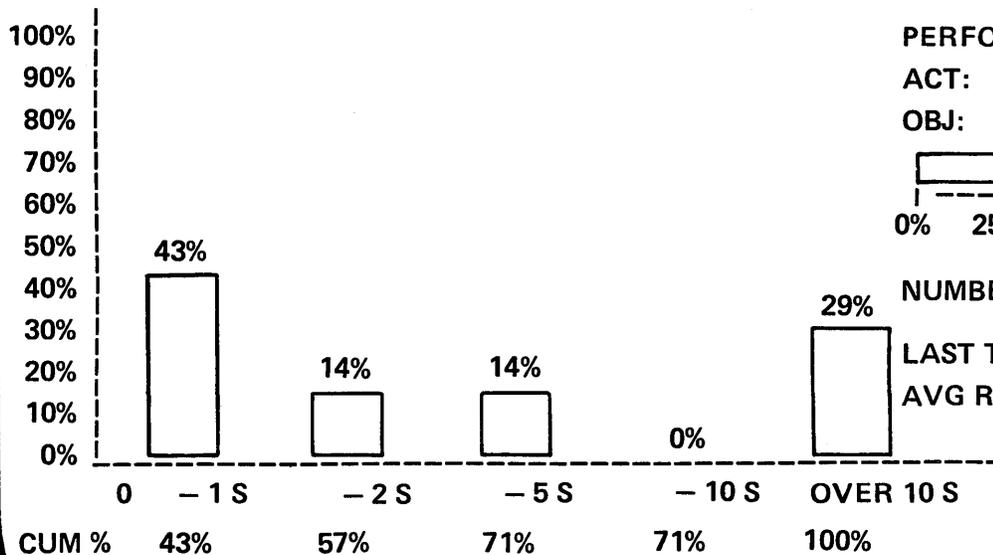
```
100% |                                           PERFORM CLASS:  CICS22AB
 90% |                                           ACT:    71% UNDER 5 SEC
 80% |                                           OBJ:    80% UNDER 5 SEC
 70% |                                                 _____  |
 60% |                                                |               |  V
 50% |     43%                                        | ---+---+---+----- |
 40% |    ____                                        0%   25%  50%  75%  100%
 30% |   |    |                              29%
 20% |   |    |    14%      14%              ____    NUMBER OF TRANS:    7
 10% |   |    |   ____     ____             |    |   LAST TRANS TIME:    4.1 SEC
  0% |___|____|__|____|___|____|____0%_____|____|__ AVG RESP TIME:     4.7 SEC
         0  -1 S    -2 S    -5 S    -10 S   OVER 10 S

CUM %   43%       57%     71%      71%     100%
```

ENTER TO VIEW MORE DATA
ENTER 'R' TO RETURN TO PREVIOUS DISPLAY — OR COMMAND
CMD ==>

V 3274-9b

RESPONSE TIME TREND DISPLAY

```
NLDM . RTREND              RESPONSE TIME TREND                    PAGE 1
LUNAME: TEXTAB14     PERFORMANCE CLASS: CICS22A        DOMAIN: NCF11
                     TRANSACTIONS UNDER  5 SECONDS
```
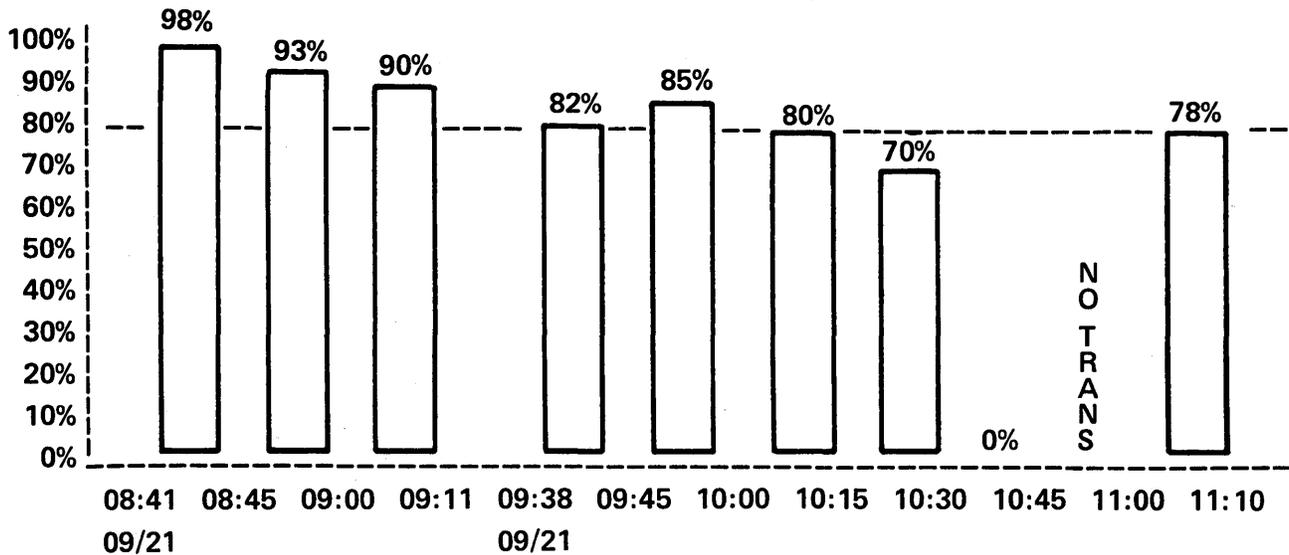
```
         98%
100% |    ┌──┐
 90% |    │  │   93%
 80% |    │  │   ┌──┐   90%                      85%
 70% |-- -│  │- -│  │- -┌──┐- - - 82%- - - - ┌──┐- - - 80% - - - - - - - - - 78% - -
 60% |    │  │   │  │   │  │      ┌──┐        │  │      ┌──┐      70%          ┌──┐
 50% |    │  │   │  │   │  │      │  │        │  │      │  │      ┌──┐         │  │
 40% |    │  │   │  │   │  │      │  │        │  │      │  │      │  │   N     │  │
 30% |    │  │   │  │   │  │      │  │        │  │      │  │      │  │   O     │  │
 20% |    │  │   │  │   │  │      │  │        │  │      │  │      │  │   T     │  │
 10% |    │  │   │  │   │  │      │  │        │  │      │  │      │  │   R     │  │
  0% |    │  │   │  │   │  │      │  │        │  │      │  │      │  │ 0% A    │  │
     |____│__│___│__│___│__│_____│__│_____│__│_____│__│_____N__│__│____
        08:41  08:45  09:00  09:11   09:38  09:45  10:00  10:15  10:30  10:45  11:00  11:10
        09/21                        09/21
```

```
ENTER TO VIEW MORE DATA
ENTER 'R' TO RETURN TO PREVIOUS DISPLAY — OR COMMAND
CMD == >
```

V 3274-9c

COMMUNICATIONS ERROR DATA
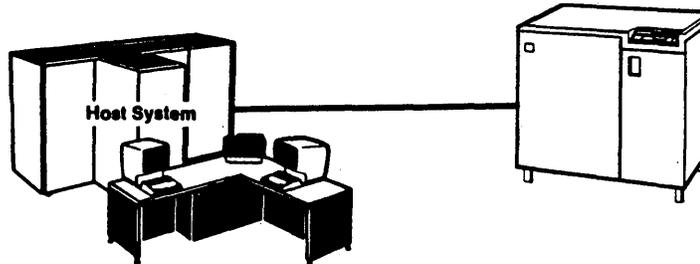
ENHANCED COMMUNICATIONS ERROR DATA

- **REQUEST MAINTENANCE STATISTICS—
  ON DEMAND**

- **ALERT—AS IT HAPPENS**
  —3274 Microcode
  —NPDA Version 3

DATA TRANSMITTED INCLUDES:

- **ALERT TYPE:**
  - —Permanent/Temporary
  - —Operator Input

- **GENERAL CAUSE, such as:**
  - —Hardware/Microcode
  - —Communications
  - —Operator, etc.

- **SPECIFIC CAUSE, such as:**
  - —Main Storage
  - —Keyboard
  - —Communications Adapter
  - —Coax Cable, etc.

- **DESCRIPTION/USER ACTION CODE**
  - —Customizing Error
  - —Device Error
  - —Crytpo Adapter Error
  - —Operator Initiated Alert, etc.

- **PLUS**
  - —Port Number
  - —LU Number
  - —Device ID, etc.

V 3274-11

3274 CENTRALIZED DISKETTE MAINTENANCE
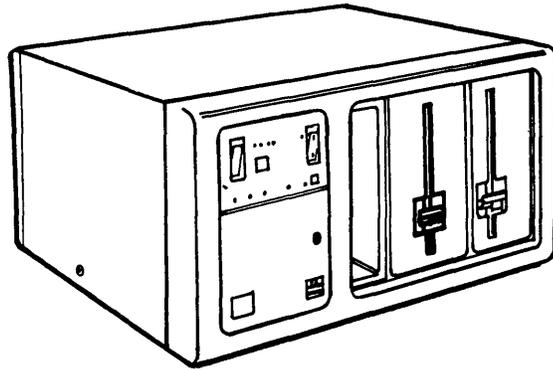
- **3274-51c**

- **SECOND DISKETTE DRIVE**

- **COPY UTILITY**
  - **—Variable Copy**
  - **—Fixed Copy**
  - **—Format**

- **50 BLANK DISKETTES**

- **REUSABLE MAILERS**

- **AUTOMATIC UPDATE SERVICE**

V 3274-12

3274 CONTROL UNIT EVOLUTION

YEAR	FUNCTION	MODEL		MODEL	MODEL		MODEL
		61-C	41-A,C,D	51-C	31-A,C,D	21-A,B,C,D	1-A,B,C,D
1977							
1978							
1979	Encryption						X
	Extended Data Stream (Color, PS)			X			X
1981	HPCA, DDS			X	X	X	X
	REQMS				X	X	X
1982							
1983							
	192K	X	X	X	X		
	DFT	X	X	X	X		
	E.D.S. II	X	X	X	X		
	3299	X	X	X	X		
	Entry Assist	X	X	X	X		
	RTM (Remote)	X	X	X	X		
	Alert	X	X	X	X		
1984	RTM (Host NLDM)	X	X	X	X		
	X.25	X	X	X	X		
	Dual Logic	X	X	X	X		
	3179/80	X	X	X	X		
1985	Vector Graphics	X	X	X	X		

WORKSTATION MAINTENANCE

NO PREVENTIVE MAINTENANCE REQUIRED

MAINTENANCE OPTIONS

- CUSTOMER CARRY-IN

- CUSTOMER ON-SITE EXCHANGE

- CUSTOMER CARRY-IN EXCHANGE

- IBM ON-SITE EXCHANGE

IBM 3178
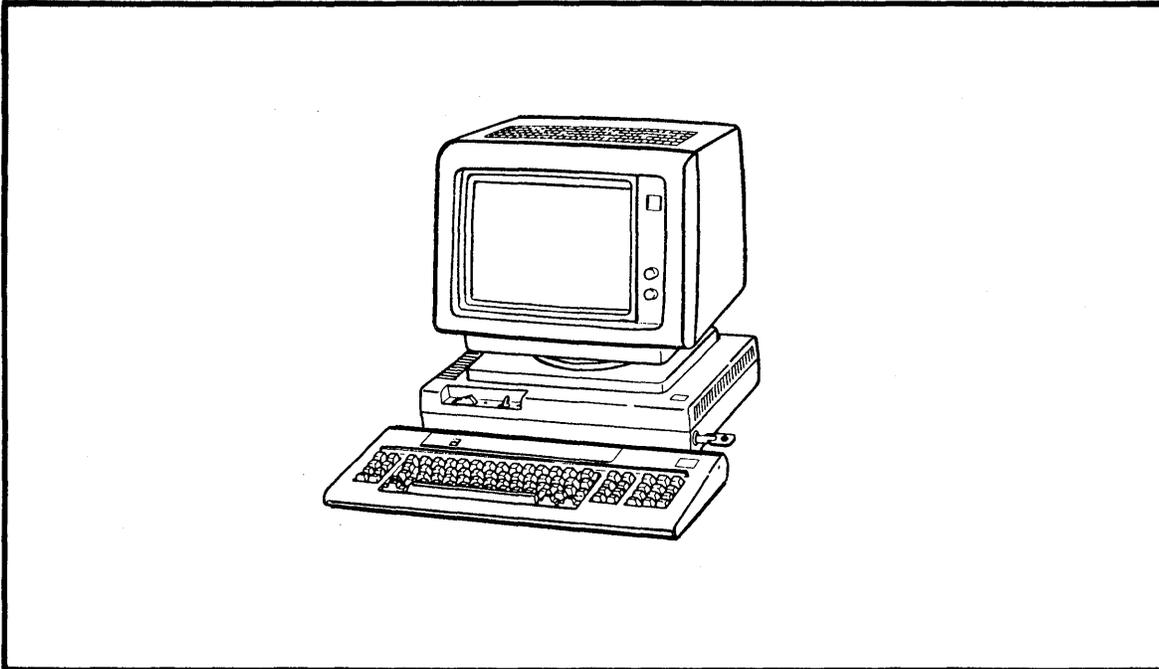
- **MODELS:**
  TYPEWRITER, DATA ENTRY, NUMERIC PAD

- **ERGONOMICS**

- **MAINTENANCE**

- **SHELF STOCK**

IBM 3276/3278
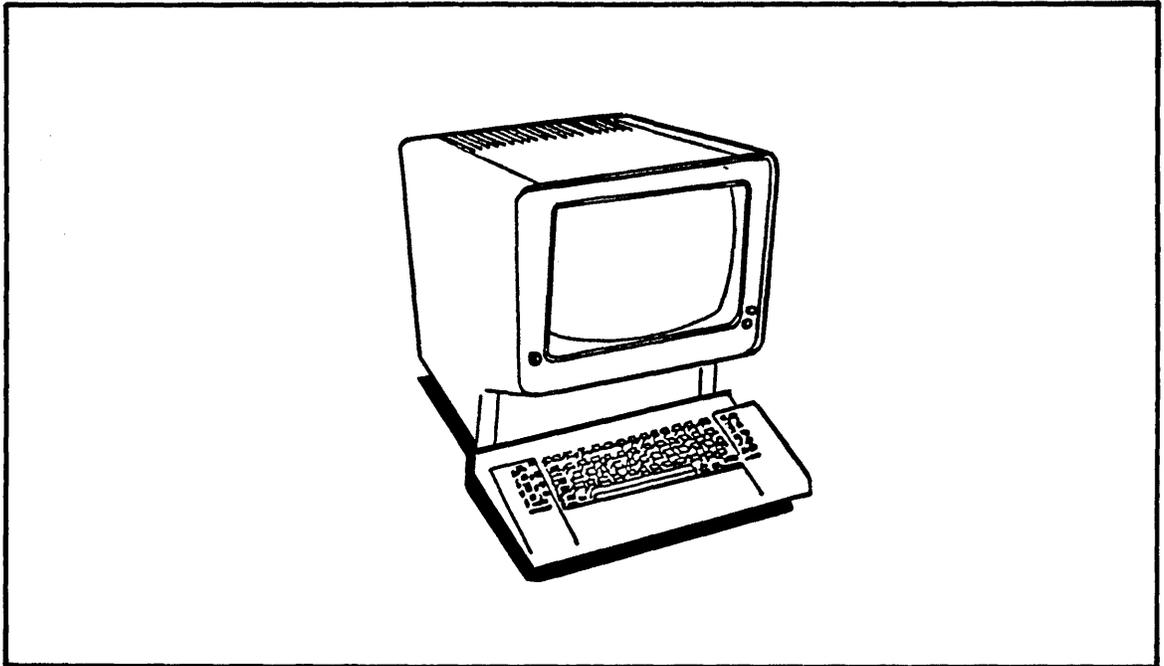
- • **SMALL CLUSTER**

- • **PC ATTACH**

- • **MONOCHROME GRAPHICS**

V W/S-3

IBM 3279
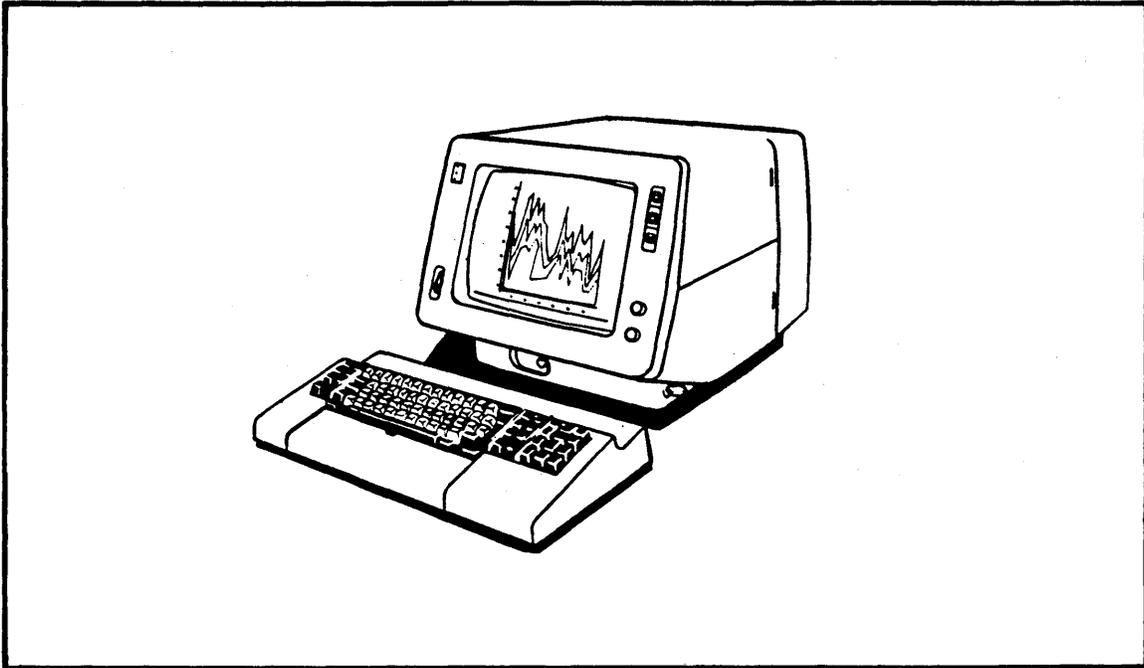
- • **4-COLOR**

- • **8-COLOR**

- • **COLOR GRAPHICS**

IBM 3290
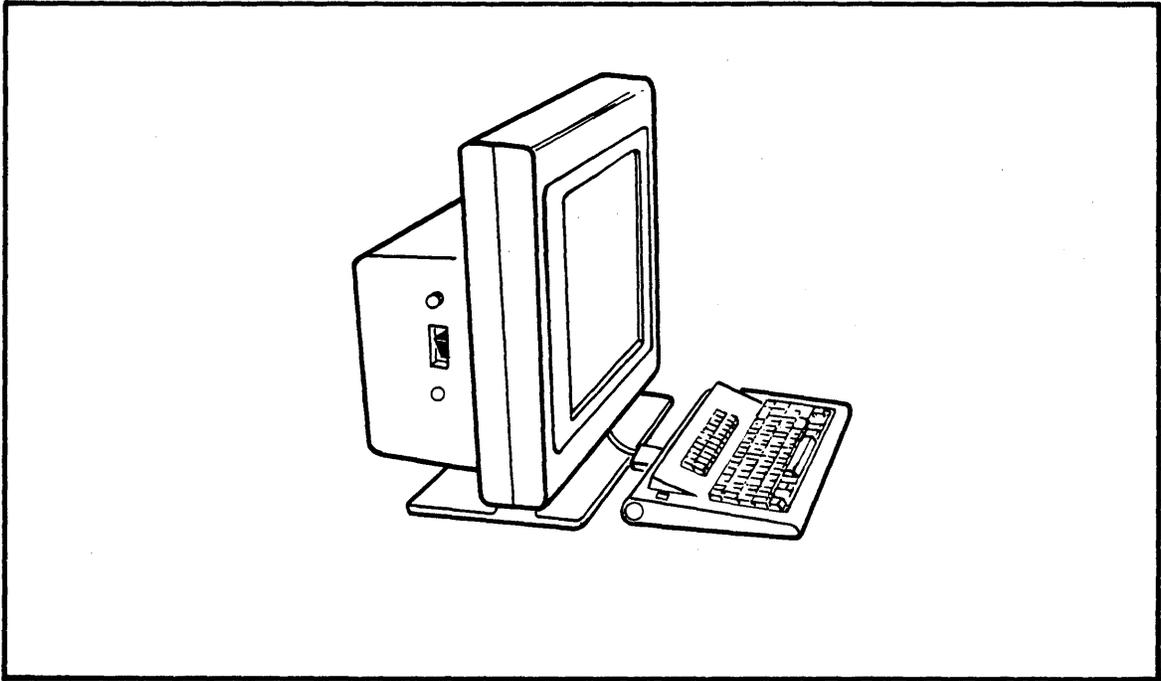
- LARGE SCREEN

- PARTITIONS/MEMORY

- GRAPHICS

- MULTIPLE APPLICATION ACCESS

IBM DISPLAYWRITER
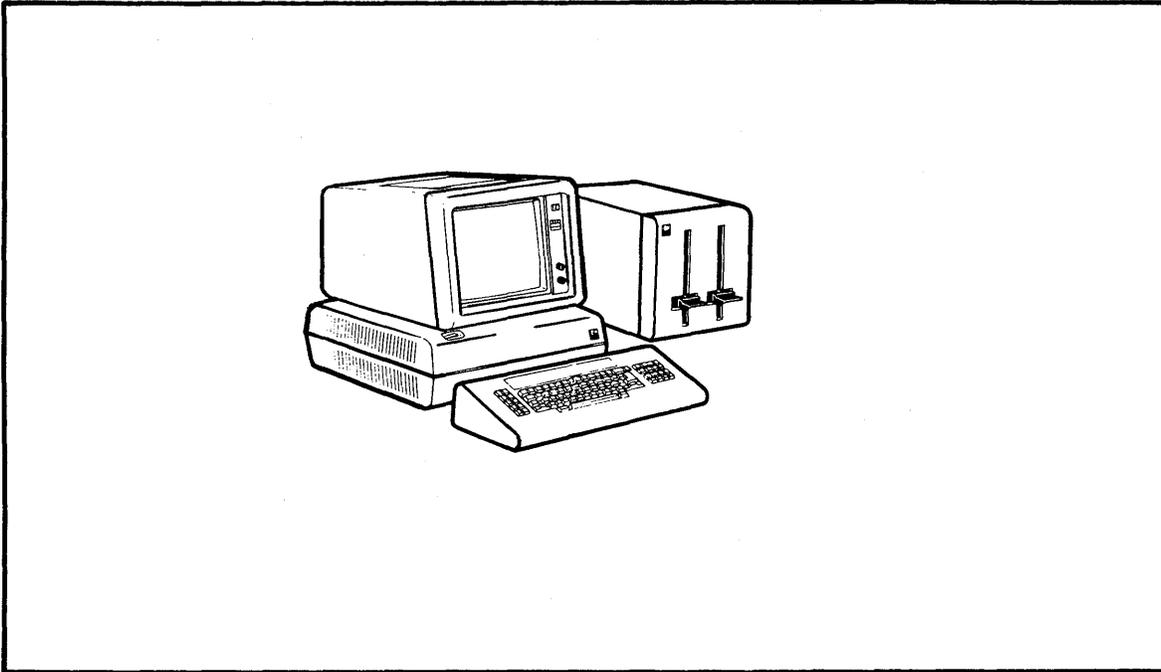
- 25/66-LINE DISPLAY

- 3277/3278-4 EMULATION

- 5218 PRINTWHEEL PRINTER
  FRONT EXIT SHEET AND ENVELOPE FEED

- TEXTPACK

- DCA/DIA COMPATIBILITY

- DISOSS DOCUMENT DISTRIBUTION

- UCSD p-System (tm) BASIC

V W/S-6

IBM 3278/3279-PC ATTACHMENT
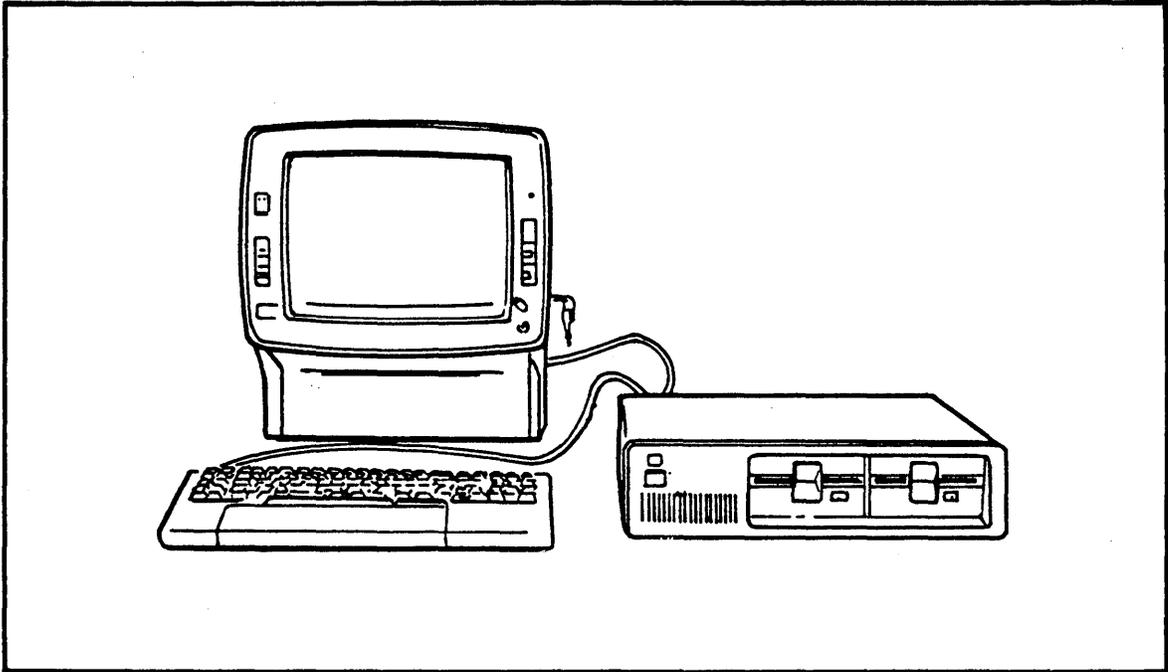
- **SHARED CONSOLE**

    - **—Full PC Function**
    - **—Full Main Frame Interactive Function**
    - **—Hot Key**

- **FILE TRANSFER**

IBM 3270-PC
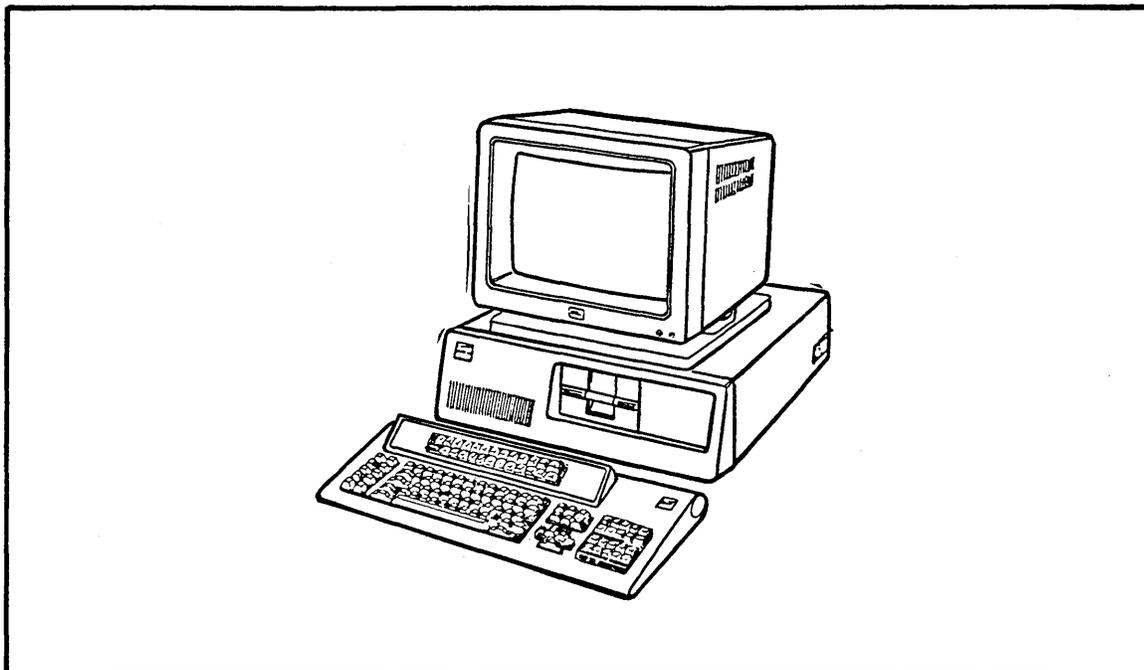
- **COMBINED HOST-INTERACTIVE, LOCAL INTERACTIVE**

    —**Concurrent Session Windows**
    —**File Transfer**
    —**Color Monitor**
    —**Converged Keyboard**
    —**Personal Computing**
    —**Application Program Interface**

V W/S-8

IBM PC/370 PERSONAL COMPUTER
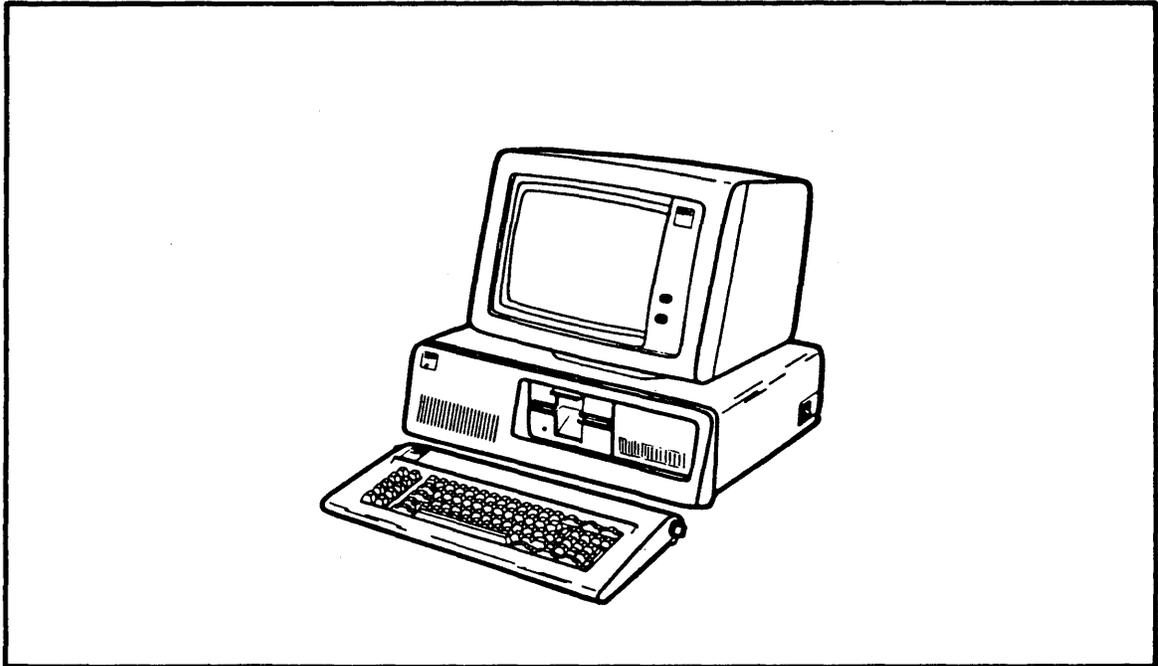
- **LOCAL CMS or TSO**

- **3270/3101 EMULATION**

- **PERSONAL COMPUTING**

- **XT or AT**

IBM PC 3278/3279 EMULATION
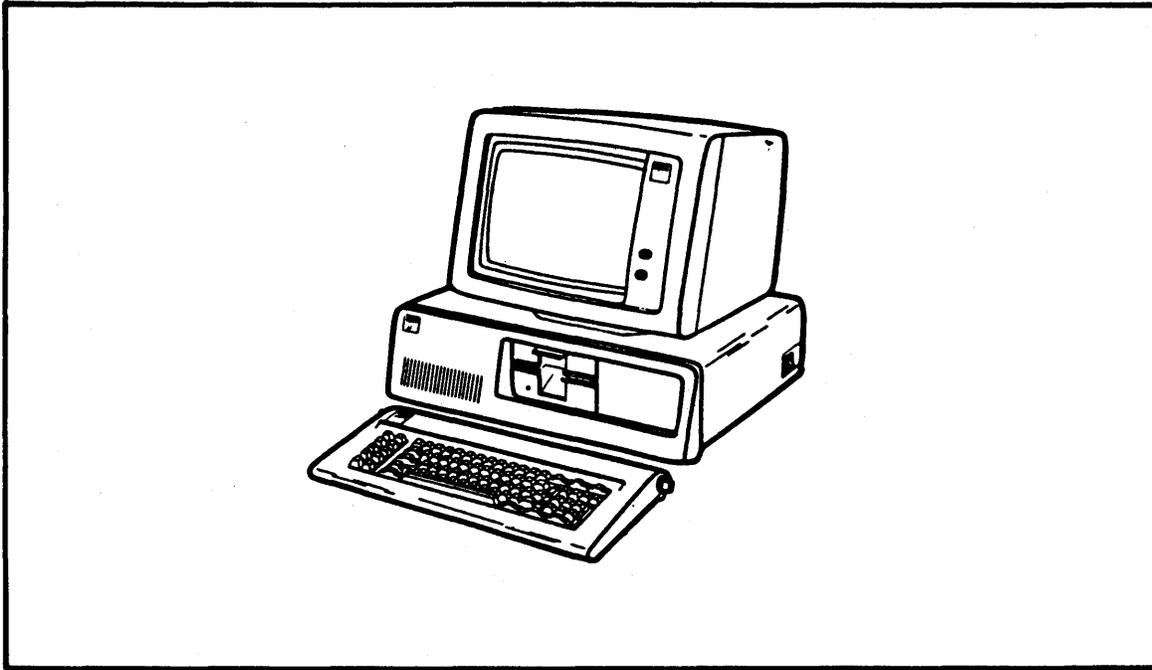
- **3274 DIRECT ATTACH**

- **3278/9 EMULATION**

- **FILE TRANSFER**

- **TWO SESSIONS—"HOT KEY"**
  - **—PC DOS**
  - **—HOST**

V W/S-10

IBM 3287 PRINTER
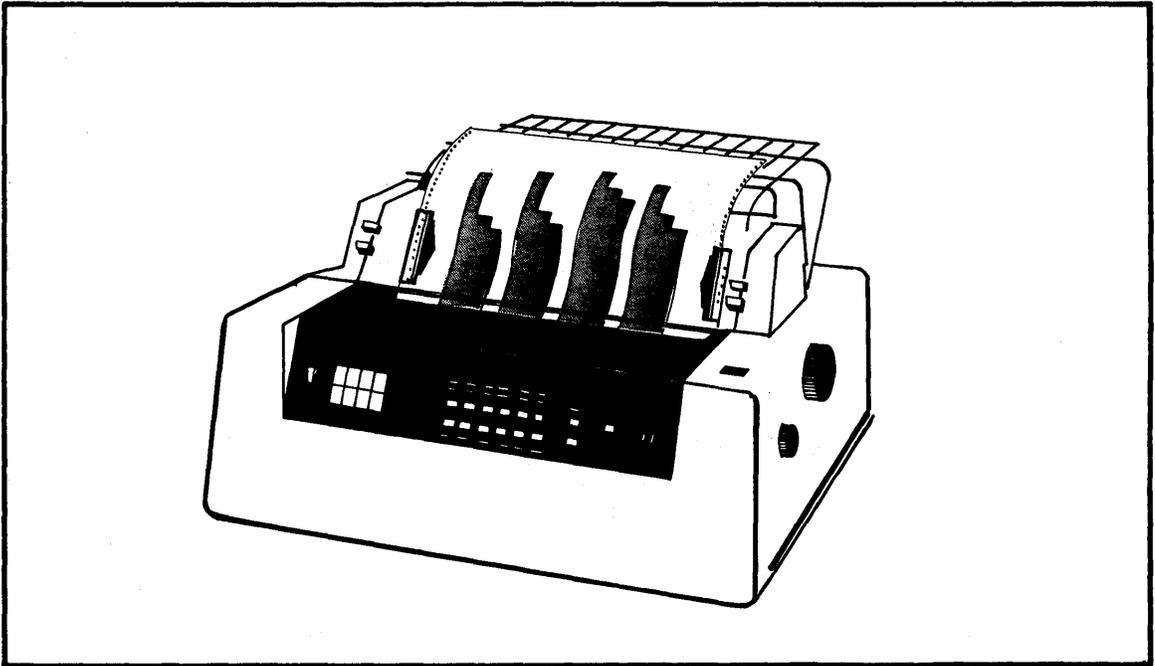
- **120 CHARACTERS PER SECOND**

- **COLOR**

- **GRAPHICS**

- **COPY FUNCTION**

IBM 3268 PRINTER
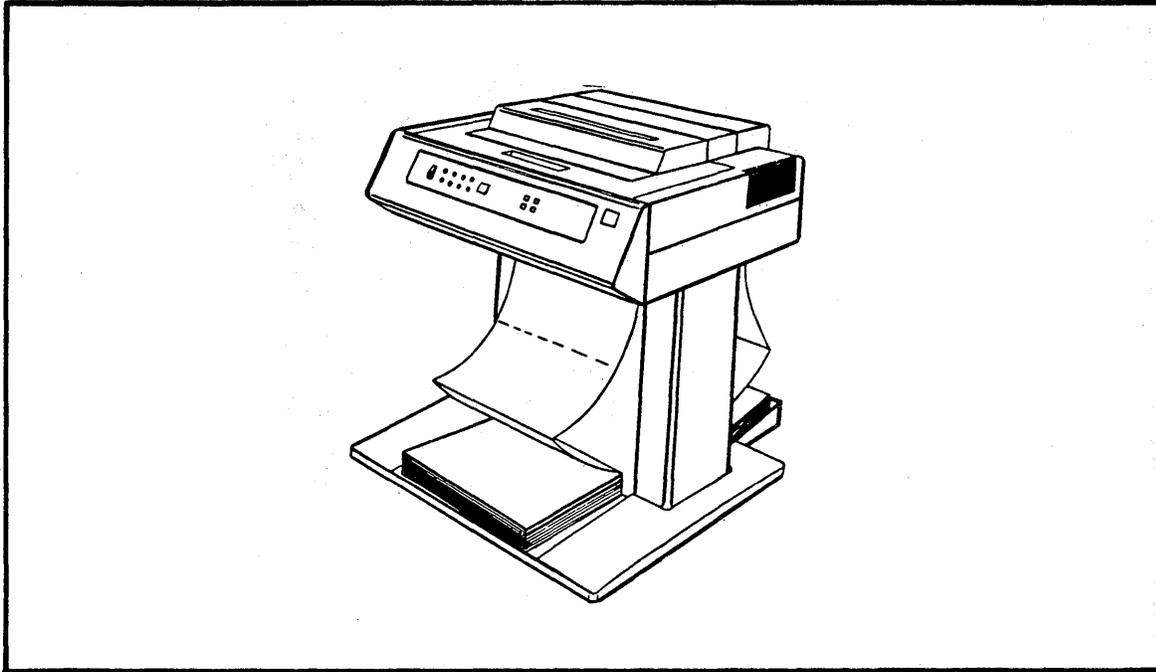
- **340 CHARACTERS PER SECOND**

- **4-COLOR**

- **VERY QUIET**

- **COPY FUNCTION**

IBM 3262 PRINTER
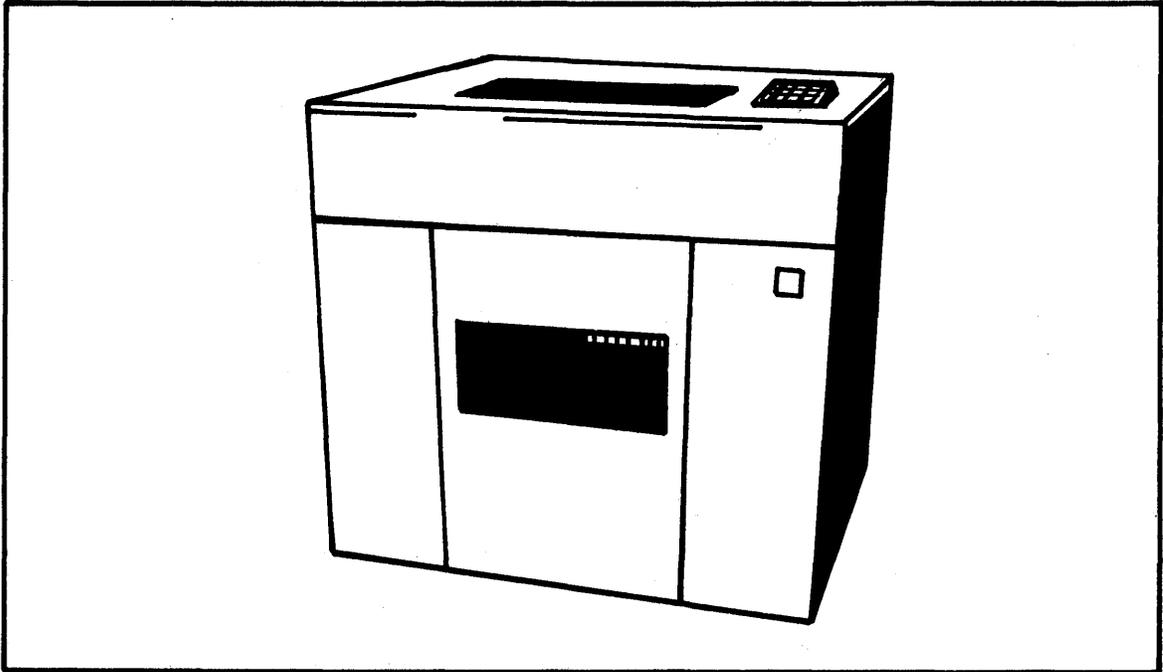
- **650 LINES PER MINUTE**

- **HIGH SPEED VOLUME PRINTER**

- **COPY FUNCTION**

IBM 5210 PRINTER
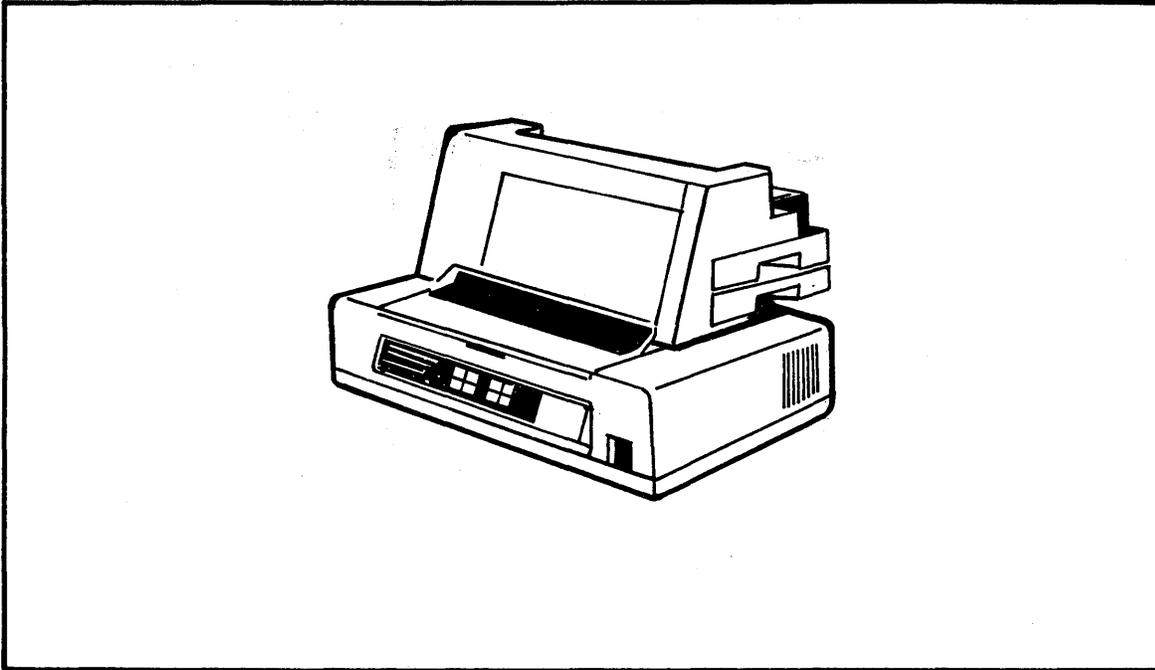
- **40-60 CHARACTERS PER MINUTE**
- **BI-DIRECTIONAL**
- **PRINTWHEEL**
- **LETTER QUALITY**
- **SINGLE SHEET/CUT SHEET FEED**
- **ENVELOPE FEED**

IBM 4250 PRINTER
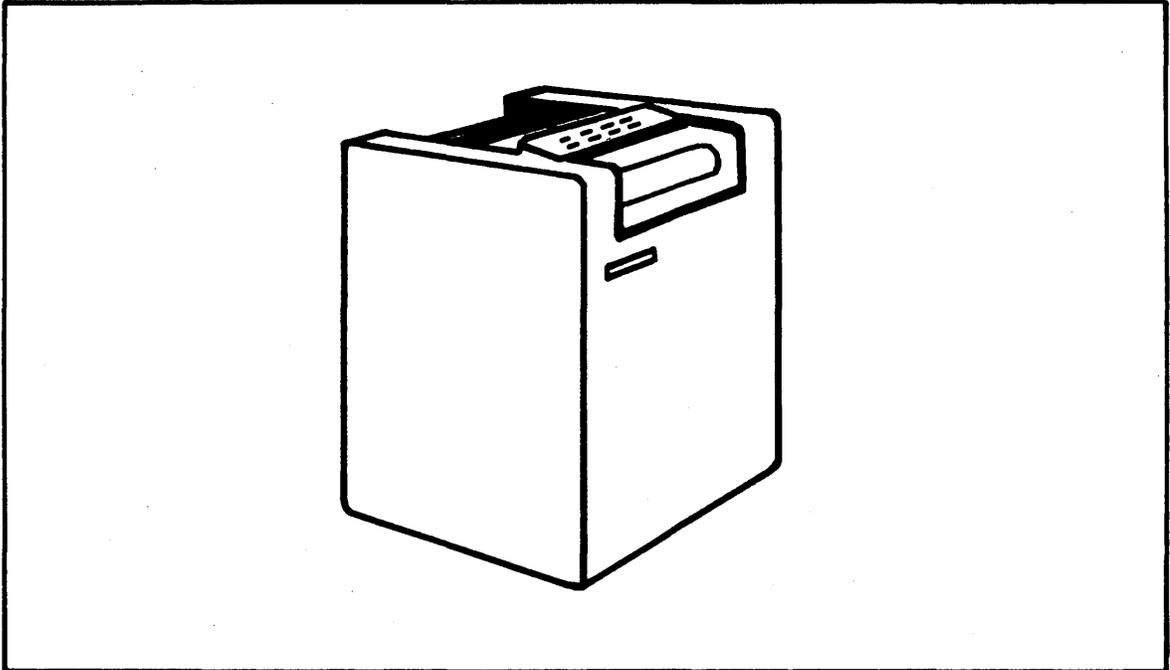
- **HIGH RESOLUTION APA (600×600)**

- **TYPESET-QUALITY, CAMERA-READY MASTERPAGES**

- **IMMEDIATELY USABLE DRY OUTPUT**

- **REQUIRES NO CHEMICALS/DARKROOM**

- **MERGES TEXT AND HIGH RESOLUTION GRAPHICS**

- **EASILY REPRODUCIBLE**

V W/S-15

IBM 3179 COLOR DISPLAY
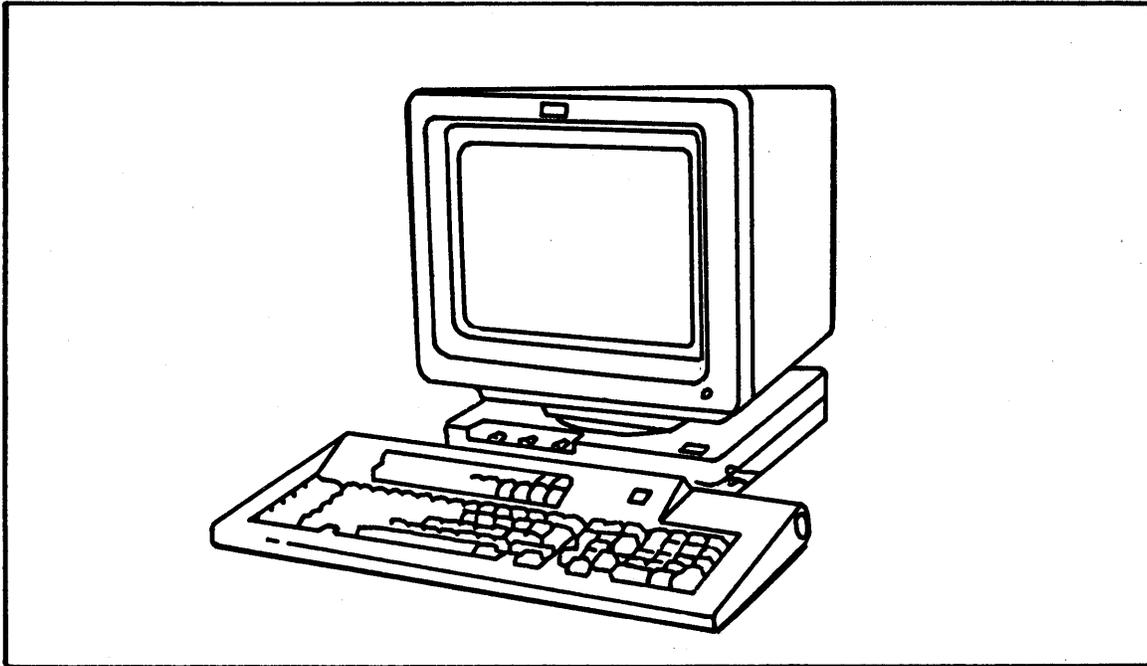
- 8 COLOR ALPHANUMERIC

- MODIFIABLE KEYBOARD (122 KEY)

- 1920 CHARACTER SCREEN

- ERGONOMIC DESIGN

IBM 3179/G COLOR GRAPHICS DISPLAY
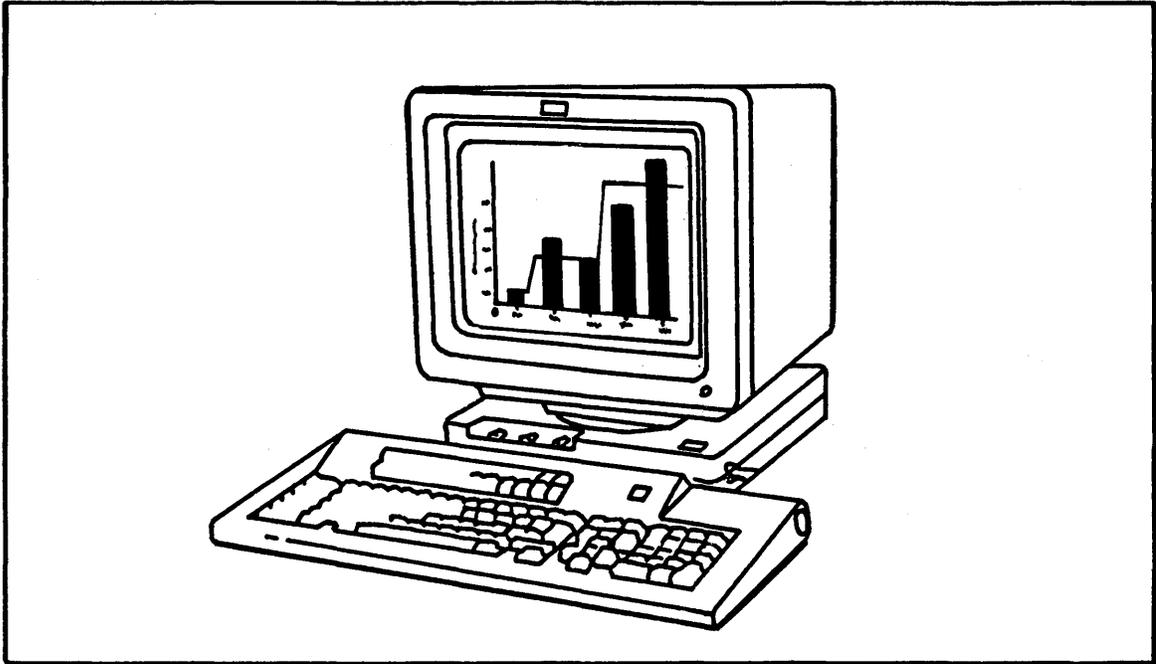
- **8 COLOR**

- **1920 OR 2560 CHARACTER SCREEN**

- **VECTOR-TO-RASTER GRAPHICS**

- **OPTIONAL MOUSE, COLOR PRINTER, PLOTTER**

- **ERGONOMIC DESIGN**

IBM 3180 DISPLAY
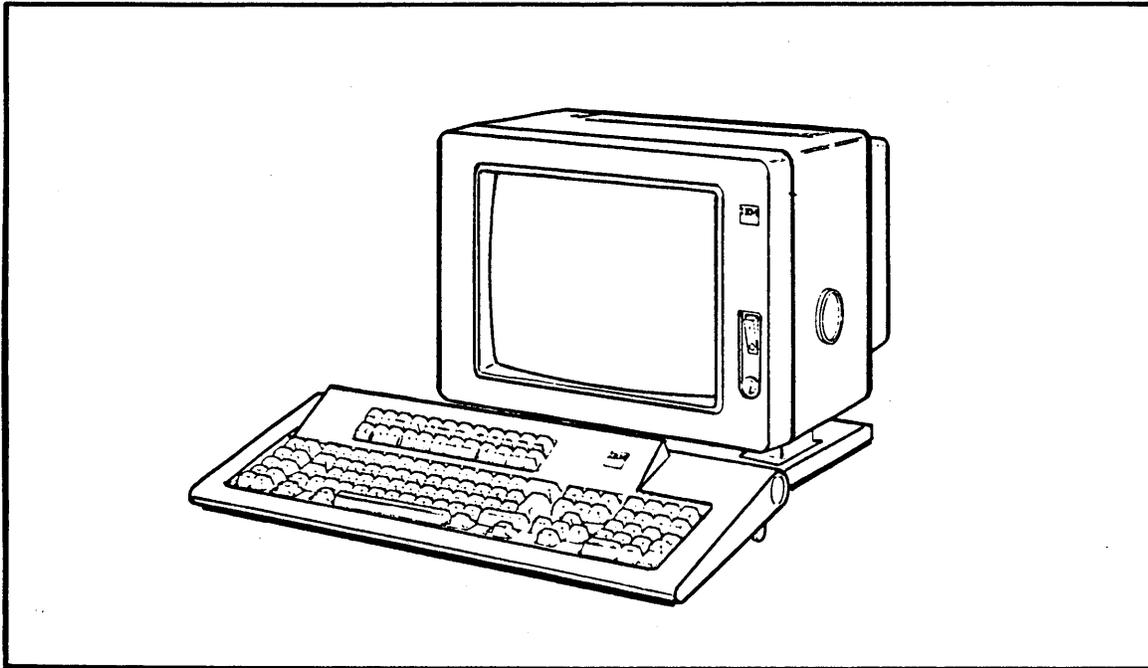
- **SELECTABLE SCREEN FORMATS (Models 2, 3, 4, 5)**

- **MULTIPLE CHARACTER GENERATORS**

- **MODIFIABLE KEYBOARD (122 KEY)**

- **EXCELLENT RESOLUTION, 15" SCREEN**

- **PARTITIONING & SCROLLING**

- **ERGONOMIC DESIGN**
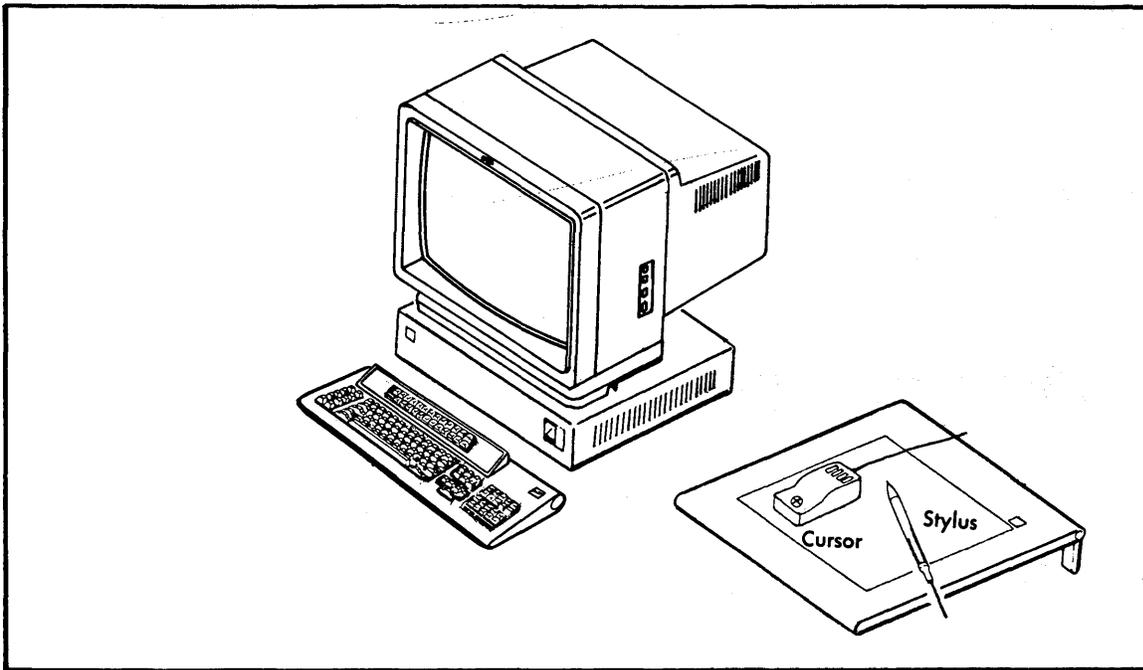
V W/S-18

IBM 3270 PC/G GRAPHICS WORKSTATIONS
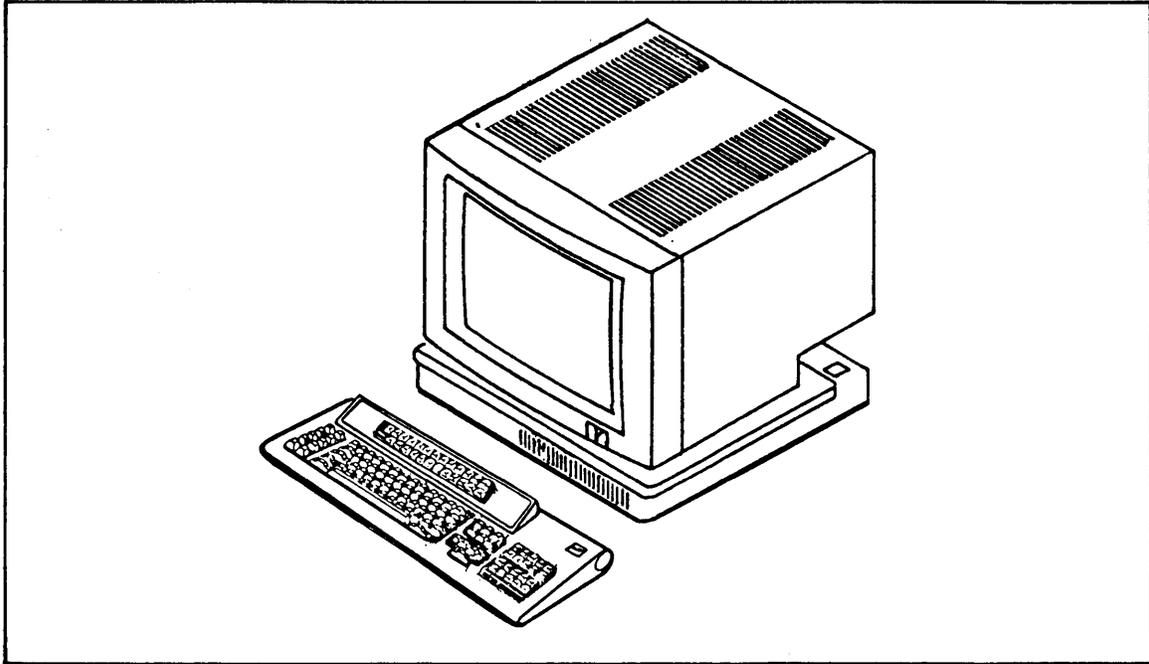
- **IBM 3270 PC FUNCTIONS PLUS...**

- **VECTOR TO RASTER**

- **INTERACTIVE GRAPHICS AT THE WORKSTATION**
  ZOOM, SCALE, ROTATE, ...

- **GRAPHICS PROGRAMMING INTERFACE**

- **GRAPHICS APPLICATIONS**
  HOST & WORKSTATION

- **MOUSE, DATA TABLET, PLOTTER,**
  COLOR INK JET PRINTER

V W/S-19

IBM 3270 PC/GX GRAPHICS WORKSTATION

- • IBM 3270 PC/G FUNCTIONS PLUS...

- • 19" HIGH RESOLUTION COLOR DISPLAY

- • ENHANCED GRAPHICS PERFORMANCE

- • 16 COLORS

V W/S-20
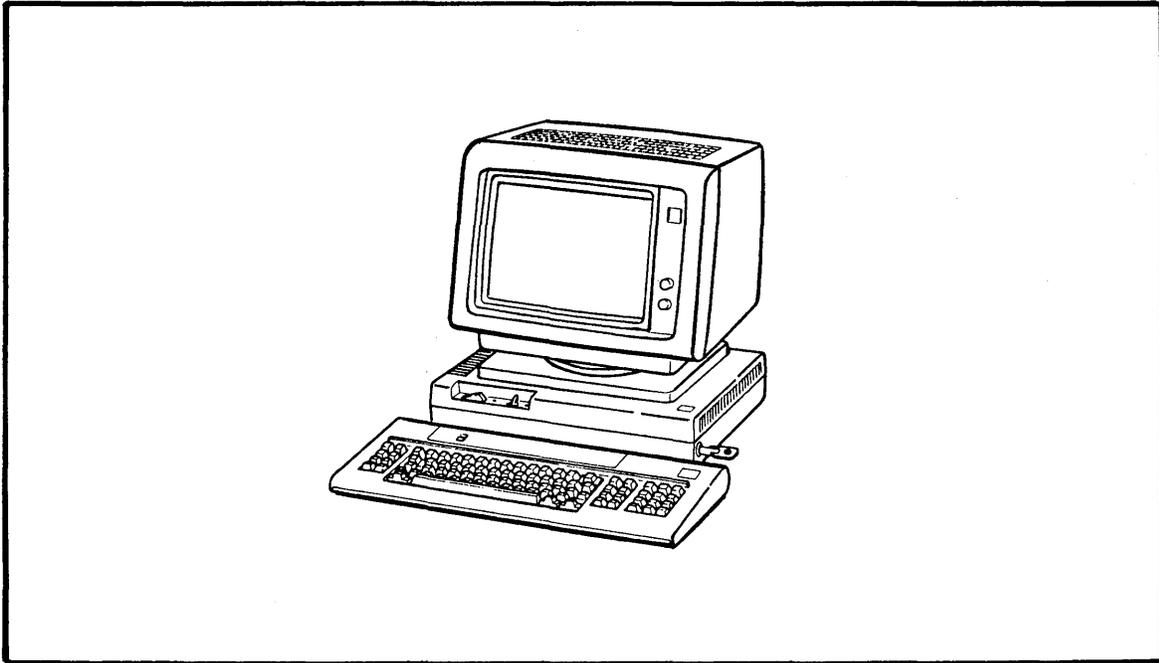
WORKSTATION INVESTMENT DECISION

- **MANAGING CHANGE THROUGH PRODUCTIVITY**

- **ENVIRONMENT – PRODUCTIVITY SQUEEZE**

- **WORKSTATION ECONOMICS**

- **INVESTMENT DECISION**

- **PROFESSIONAL PRODUCTIVITY**

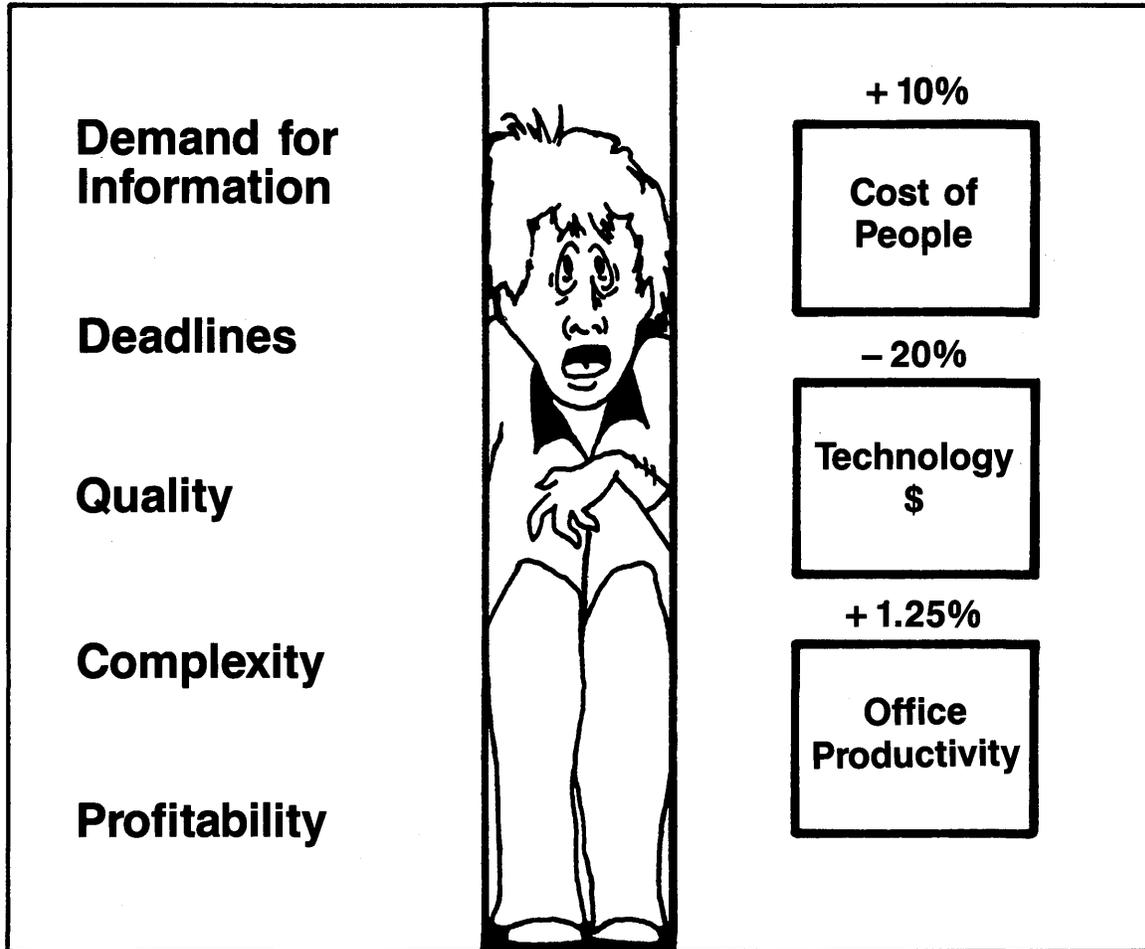- **END USER REQUIREMENT**

THE WORKSTATION
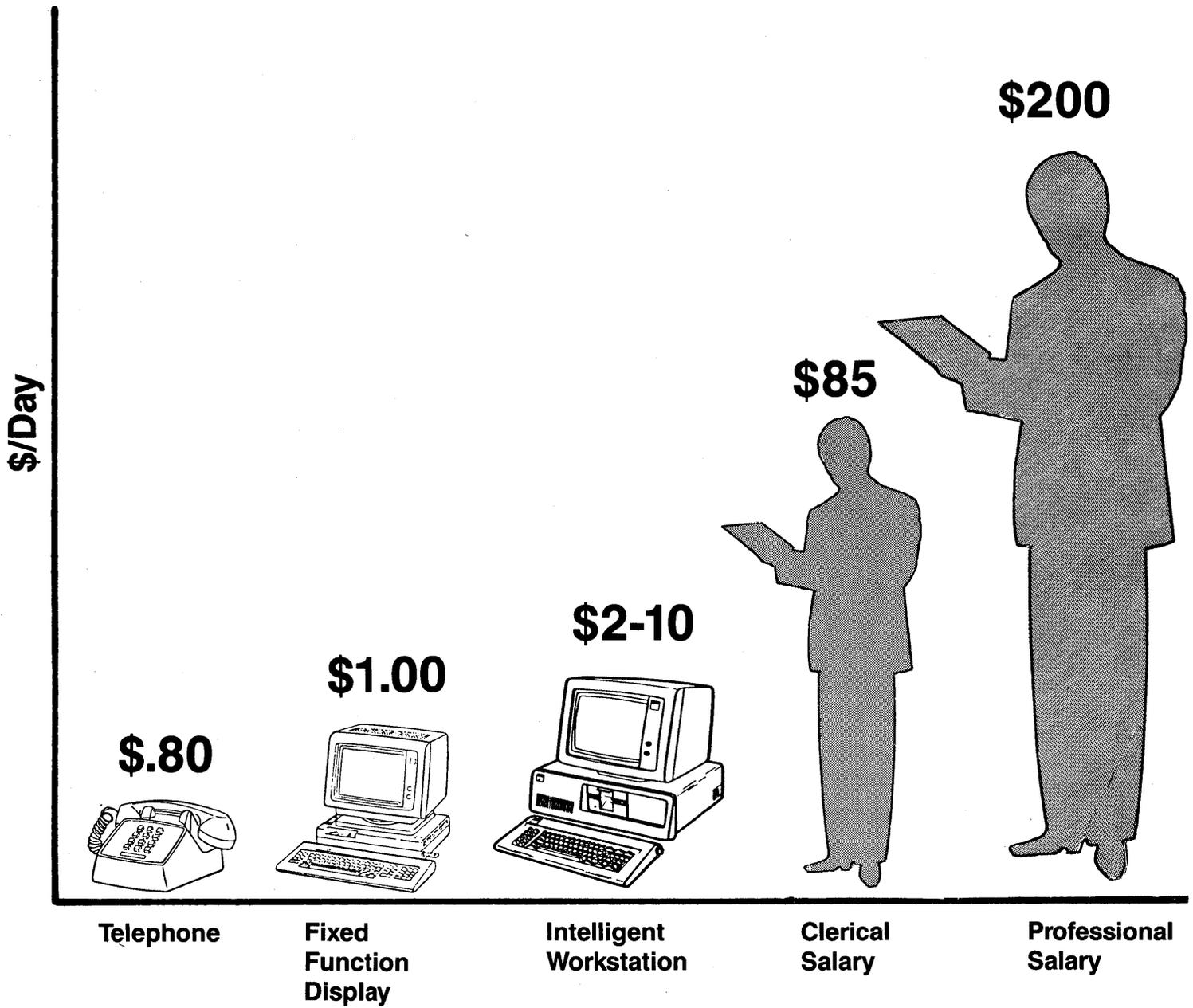# INVESTMENT DECISION

MANAGING CHANGE THROUGH
PRODUCTIVITY

W-2

ENVIRONMENT

THE PRODUCTIVITY "SQUEEZE"

Demand for
Information

Deadlines

Quality

Complexity

Profitability

+ 10%

Cost of
People

− 20%

Technology
$

+ 1.25%

Office
Productivity

ECONOMICS

$/Day

$.80	$1.00	$2-10	$85	$200
Telephone	Fixed Function Display	Intelligent Workstation	Clerical Salary	Professional Salary

Intelligent Workstation Productivity Required for Justification

2-12%

1-5%

W-4

WORKSTATION INVESTMENT CONSIDERATIONS
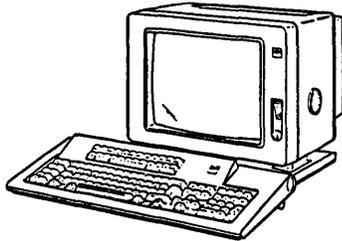
Investment =   Workstation   +   Salary × Years

Investment = $2,500   + $175,000*

Investment =   1.5%   +   98.5%
                      Workstation   Salary

* $35,000 × 5 YEARS

CONCLUSIONS:

  • Optimize End User Productivity vs
    Workstation Cost

  • Evaluate Total Cost Including Residual Value

W-5

PROFESSIONAL PRODUCTIVITY

Spreadsheet/Analysis	Business Graphics	Data Base	Info Gather/XFER	Problem Solve	Text	Self Mgmt.	Electronic Mail	Archival/Retr.
3%	2%	3%	4%	10%	5%	2%	3%	4%

Single Workstation on User's Desk
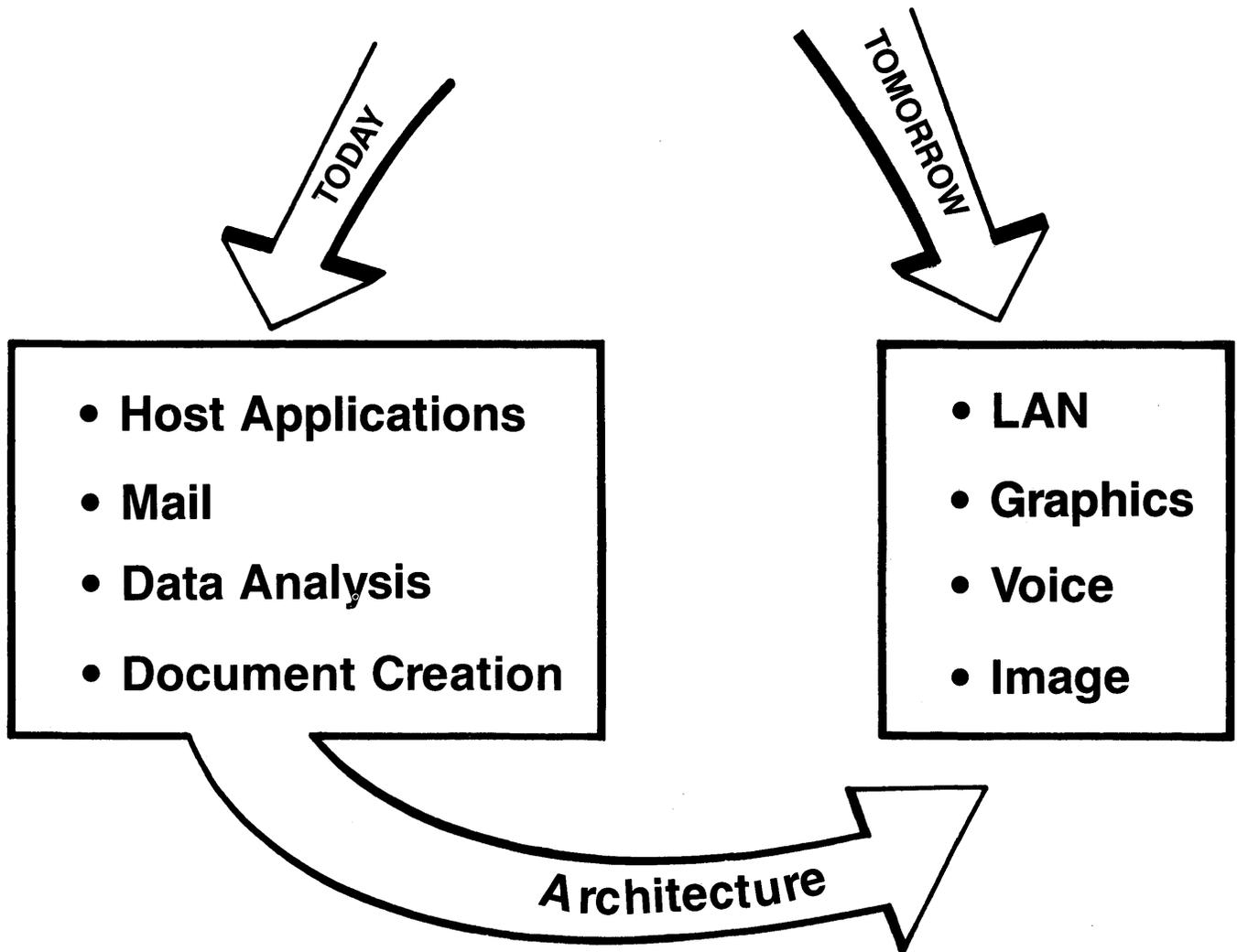
Multiple Uses--Over Time

Productivity = Sum of All Applications

Productivity Not Just Time Saved

END USER REQUIREMENT

- **WIDE VARIETY OF END USERS**

- **WIDE VARIETY OF APPLICATIONS**

TODAY

TOMORROW

- **Host Applications**

- **Mail**

- **Data Analysis**

- **Document Creation**

- **LAN**

- **Graphics**

- **Voice**

- **Image**

Architecture

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READER'S COMMENT FORM

Title: 3274 PRODUCT EXCELLENCE...1985

Form Number: ZZ05-0264-01

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