

PN-AAM-869
ISN-29528

66 0070/62

INVESTIGATION OF MICROCOMPUTER
SYSTEM ALTERNATIVES
FOR THE
SERVICE D'ETUDES
DEPARTMENT OF AGRICULTURE
GOVERNMENT OF ZAIRE

March 6, 1983 to April 11, 1983

ZASSP * PROJECT 070

KINSHASA, ZAIRE

GEORGE D. FRAZIER, Ph.D.

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SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

My report of February 1983, recommended that the Division of Statistics should devote its efforts to the creation of an Integrated Agricultural Data Base Management System and, for that reason, presented a proposed computer system configuration that would permit this development. The proposed configuration was based upon limited information available to Zaire, and thus it was also proposed that a study be carried out in the United States to determine the feasibility of implementing the proposed system. This recommendation was approved by USAID/Kinshasa, and hence, a brief field survey was carried out. This report gives the results of that survey with a preliminary evaluation of alternative computer configurations.

The key objective of the survey was to determine the existence of a proven capability for configuring hardware and software as recommended in the February 1983 report. Proven capability is defined as the identification of existing operational systems closely approximating the proposed configuration and the satisfaction of the users of the installed system.

The investigation started with a visit to the United States Department of Agriculture (USDA), Statistical Research Service (SRS) which has been an early

developer of microcomputer technology for installation in the lesser developed countries (LDCs). It has made an early commitment to the Northstar microcomputer and has developed specialized programs for agricultural surveys for that system. Northstar had just announced (November 1982) its Local Area Networking (LAN) System. Unfortunately, the USDA SRS has not had an opportunity to fully evaluate that system as of this time. However, because of the specialized agricultural survey programming software developed and maintained by the SRS, the Northstar microcomputer was retained as an alternative even though a site was not found in actual operation.

The International Statistical Programs Center of the Bureau of Census was also visited. This group has a contract with AID to evaluate microcomputer hardware and software for application in LDCs. Although its project has accumulated a considerable amount of data which proved useful, it has no information with respect to operational LAN sites at this time. A preliminary report (October 27, 1982) had been prepared for AID with the recommendation that Apple and IBM were the present and preferred manufacturers. (See Appendix A.)

During the period of March 6, 1983-April 11, 1983, a multitude of hardware and software vendors were contacted, both by phone and personal visits. See Appendix B.

It was discovered that the concept embodied in the proposed configuration is known as Local Area Networking (LAN) and during the past 18 months a great deal of development has occurred in both hardware and software for implementing such systems. Corvus Systems Inc. has been one of the forerunners in this development, and, through its marketing department, I was able to identify three sites using either Apple II or IBM(PC) systems. In general, the users were well pleased with their systems.

A number of other software developers and hardware manufacturers--Alspa Computer Inc., Altos Computers, and Nestar Systems, Inc., have developed or are in the process of developing LAN capability. A number of these systems were identified and literature was assembled. Technical and product brochures are included in Appendix C.

The original report of February 1983 recommended that four products be evaluated:

Apple

Hewlett-Packard

IBM

Wang

It was not possible to find installed systems similar to the proposed configuration for either Hewlett-Packard or Wang. Considerable time was spent in attempting to find installations by both of these vendors without success, although I was assured by both manufacturers that their hardware could handle the proposed configuration. Since operational sites could not be identified during the course of the study these manufacturers were not considered. In addition, I was told that the Wang Laboratories' LAN System Wangnet will not be supportable in Europe for at least two more years.

Attempts were made to determine the cost of the proposed configuration for each of the systems discussed for comparative purposes. They have been estimated as follows:

<u>System</u>	<u>Estimated Cost</u>
Apple IIe - Corvus	\$84,046
IBM(PC)	95,429
Northstar	88,518

It should be noted that these cost estimates are total costs, which includes all hardware and software plus miscellaneous supplies. These costs do not include costs of pre-shipment testing, packing, shipping and other costs attendant to delivery and installation in Zaire. Nor do these costs include provision for spare parts because the replication provided in the proposed system should provide sufficient redundancy to minimize the need for spare parts.

Further, it should be noted that these comparative costs differ slightly from the originally proposed configuration. The costs include two mass storage devices instead of one as originally proposed. This was done because the mass storage device was the only element not redundant in the proposed system. I believe, because of the problems of maintenance and repair, that an additional hard disc should be installed to assure continual operation in the case of failure of one disc. Second, a fast printer capability on the "host system" was not included because of the many other printers in the proposed system. And again, because of the maintenance and repair situation in Zaire, I don't believe that it is desirable to duplicate this printer capability with the several other printers within the system. Thus, rather than have two faster printers for redundancy, I would recommend a slower printer which will be redundant with seven other work stations.

In addition to user satisfaction and cost, a number of other factors were evaluated, including:

- ...backup system capability
- ...French capability
- ...existence of integrated 10-key pad
- ...mass storage support
- ...ability for multi-tasking
- ...ability to operate work station stand-alones
- ...spooling of printer(s)

It is not surprising to note that the Apple and IBM(PC) can be configured with only the difference of the CPU. Other than that difference, they have identical capabilities with the exception of the fact that the Apple is an 8 bit system whereas the IBM(PC) is a 16 bit system. The reason that they are so similar everywhere else is because they are both configured around the Corvus disc system capability.

In comparing the two demonstrable systems--Apple and IBM--it is clear at this time that the only difference in the two is in processing capability; i.e., the Apple has an 8 bit processor whereas the IBM is based on 16 bit technology.

It was not possible to verify the availability of French keyboards, printer character sets and software in the United States. All of this activity is carried out in Europe and little is known about the stage of development here. Appointments have been made with Apple and IBM to visit with their people in Paris, France to evaluate the French capability for both the Apple and the IBM configurations.

The conclusions to be made from this study are, first, that the system configuration as recommended in my February 1983 report is feasible for installation at DOA/DOS because very similar systems exist in operation in the United States, thus verifying that the appropriate technology does exist.

Second, it can be concluded that both the Apple-Corvus system and the IBM-Corvus system can provide the proposed system capability of my February 1983 report.

Third, there are desirable agricultural survey programs available from USDA/SRS on the Northstar microcomputer and Northstar is in the final test stages with release expected by June 1983.

A final recommendation with respect to a system must await the discussions to be held in Paris. A memorandum detailing the results of the French capability for Apple and IBM will be added to this report shortly after returning to Zaire.

INTRODUCTION

The objective of the present investigation was to determine the existence, in an operating environment, of microcomputer hardware and software systems as recommended in my report of February 1983. That report evaluated the near term data processing needs of the Bureau of Studies, Department of Agriculture, Government of Zaire. The study recommended that a hardware-software capability be identified capable of supporting the creation of Integrated Agricultural Data Base Management System. Figure 1 illustrates the computer configuration recommended in that report which would be capable of supporting the development and maintenance of such a data base management system. This recommendation was made based upon the assumption that hardware and software capability could be identified and demonstrated by on-site installation presently at operative sites in the United States.

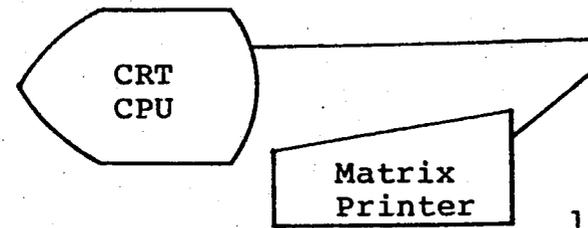
During the period March 6, 1983 to April 9, 1983, a number of hardware and software vendors were contacted by phone and personally.

It was discovered that the microcomputer industry is just now involved in the development and marketing of hardware and software systems fulfilling the needs of the proposed system. This system is called a "net-work." It is typified by the sharing of one or more of the resources

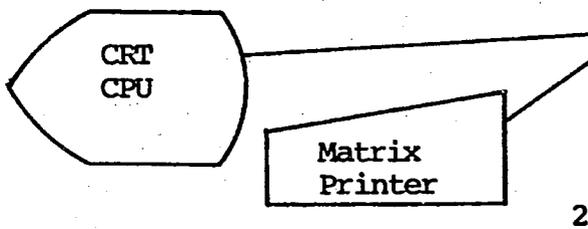
Other Business

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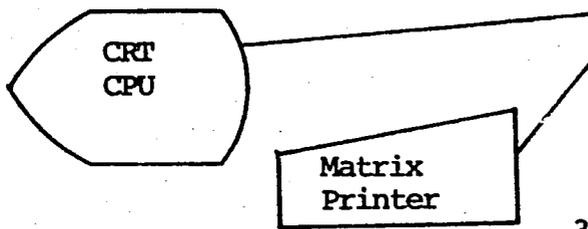
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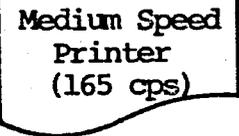
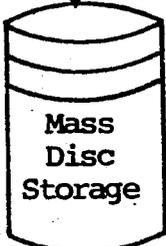
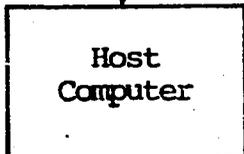
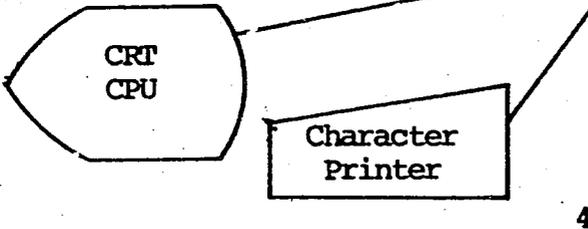
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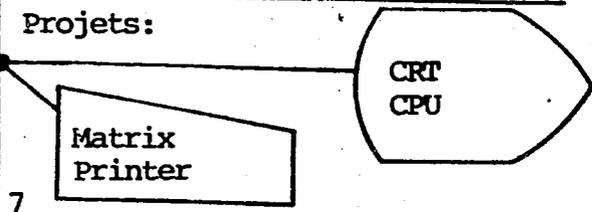
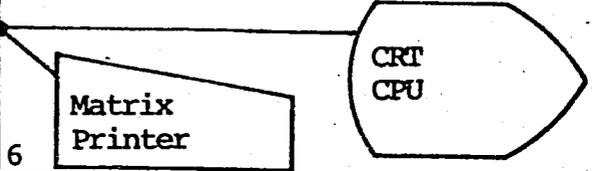
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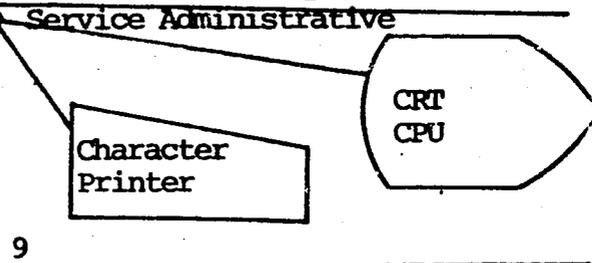
Administration



Strategie Planification et Projets Agricole Planification:



Recherches Agronomiques et Zootechnique Formation Centre Documents Agricole:



* See text for alternative linkages

FIGURE 1

the system by means of connecting various locations of work directly or by means of communication lines such as telephone lines. When the network of terminals or computers are linked together directly, it is called a local area network (LAN).

In the network proposed in Figure 1, various work stations are connected directly to one microcomputer designated as the Host Computer which is responsible for the management of the networking operating system and the mass storage device, i.e. hard disc. The individual work stations have access to the data base resident on the mass disc storage device.

My February 1983 report recommended that four major manufacturers were most likely to be able to provide the proposed capability:

Apple

Hewlett-Packard

IBM

Wang

It subsequently proved, because of the explosive development of net-working applications, that a considerable number of manufacturers of hardware and software, have announced or are in the process of announcing, new products for net-working configurations.

Vendors have taken either or both of two approaches to the development of Local Area Networking (LAN). There are those vendors who have developed hardware/software capability as a stand-alone system. That is to say, a complete system, both hardware and software, is provided by a single manufacturer. Other vendors have developed hardware which has the capability of being linked in a LAN configuration, but which uses software developed by a software house, e.g., Digital Research Inc. which was the developer of the major operating system for microcomputers, CP/M. There is a third group characterized by at least one manufacturer (Corvus Systems, Inc.) which entered the LAN effort through the manufacturing of the mass storage devices with software for LAN and subsequently has developed its own total system--including a Central Processing Unit (CPU). As a result of these developments, it is possible to configure a LAN system with a CPU, mass storage device, operating system, and applications programs--all from different manufacturers. Such a configuration could raise serious hardware and software support problems for the buyer under the best of circumstances.

Thus, this study took on additional dimensions over that originally envisaged. Technical and product brochures were assembled where time permitted and those acquired are provided in Appendix B. Wherever LAN capability was

discovered, the vendor was asked for information regarding presently installed systems configured like or similar to that proposed in Figure 1. None of the additional vendors identified were able to provide information on specific sites where LAN systems, similar in configuration to the one proposed for DOS, could be found and observed.

METHODS OF INVESTIGATION

The investigation reported here was commenced in Washington, D.C. with visits to USDA, Statistical Reporting Service and the Bureau of Census, International Division which have both been involved in microcomputers and their installation in the lesser developed countries (LDCs). It was discovered that both of these agencies have efforts devoted to microcomputer evaluations for applications such as those being considered in Zaire. The USDA, because of an early-on decision, is committed to the Northstar computer for its cooperative installations in LDCs. The Bureau of Census has a variety of equipment installed internationally and has not made a commitment to a single manufacturer. However, by means of an AID contract, it is inventorying the present utilization of microcomputers internationally and investigating the capabilities of the various manufacturers of both hardware and software. The results of its study thus far have been summarized in a AID memo dated October 27, 1982 which suggests that Apple and IBM(PC) are the desirable vendors and a proposed configuration was recommended. (See Appendix A.) However, no comments were evident with respect to LAN, nor were there any indications that LAN had yet been considered.

A meeting was held with Mr. Raymond C. Luebbe, President of MICROsystems Inc., who had previously been

involved in the development of the USDA/SRS agriculture survey programs and their application on the Northstar microcomputer. Through Mr. Luebbe's efforts, a visit was held with Ms. Beulah Edoe who, until recently, was responsible for the application of the Northstar System in Jamaica.

The next step was to contact a number of companies and organizations to determine the present status of LAN, their plans and/or capabilities in this area. (See Appendix D.) The marketing departments of these companies were contacted to identify purchasers who could be interviewed with respect to their experiences with the particular LAN systems they had installed. With respect to this latter objective, the level of success was not as high as would be desirable because (1) the manufacturers did not have a list of users and/or (2) the systems were too new to have a broad base of installations. However, it was possible to make some enquiries both onsite and by telephone.

THE EVALUATION CRITERIA

The fundamental criteria implied by the network configuration illustrated in Figure 1 were the basis for the evaluation of the microcomputer systems. Further, any system which could nominally fill the implied conditions of Figure 1 should have at least one user who was reasonably satisfied with the system.

There are several other factors which are important in evaluating the systems with specific application to conditions in Zaire. They can be summarized into two general categories--technical and administrative.

Technical criteria

- ...French capability with respect to keyboard, printer and software.
- ...Capability of Local Area Net-working, at least up to ten work stations
- ...Capability of support in an initial mass storage device of 20 megabytes up to at least 40 megabytes.
- ...Capability of multi-tasking at each station.
- ...Capability of stand-alone procesing at each station
- ...Capability of tape media back-up for mass storage device
- ...Capability of spooling for the system printer

- ...Capabiltiy of continued operation if one or several work stations fail
- ...Capability of ten-key pad on keyboard
- ...Capability of utilizing all applications software, such as word processing, data base management system, electronic spread sheet, and statistical analyses system with a single operating system.

Administrative Criteria

- ...Purchasable from a U.S. vendor in the U.S.
- ...Supportable technically and maintenance-wise in Zaire
- ...Least cost, other things being equal.

EVALUATION OF SYSTEMS INVESTIGATED

It should be stated at the outset that the results of this study are already out of date. The world of microcomputers is just that dynamic. Further, it would appear that this is likely to be the case over the foreseeable future.

My evaluations are confined to those configurations which presently exist in a demonstrable sense; i.e. users of the proposed systems exist who are reasonably satisfied with the performance of their system.

The results of the study must be further qualified by the statement that identification of users fitting the above

qualifications was very difficult, and vendor organizational problems restricted my ability to identify the existence of such systems.

Information and data are presented in Appendix B which cover all of the materials, both software and hardware, that I was able to evaluate in the time allowed for this investigation. This information was collected by personal visits and by phone requests during my travels to the Los Angeles and San Jose, California areas and in the Washington, D.C. Metropolitan Area.

Three major hardware manufacturers and one software developer readily stand out with respect to LAN systems. They are, in alphabetical order:

Apple

Corvus

IBM

Northstar

With respect to the primary criteria of existence in use of the systems and user-satisfaction, I was able to visit or discuss present installations with the following users.

Apple II--Corvus

Mt. San Antonio College

Walnut, California

This college has a sizeable main-frame and microcomputer data processing system in operation.

See Appendix D for a description of its overall system. The college was an early utilizer of local area networking as well as communications networking of microcomputers, and has experience with a variety of microcomputers including Radio Shack and Apple. It presently has five Apple-Corvus network systems. These systems vary from 12 to 20 CPUs and have Corvus discs up to 20 megabytes in size in each system. It is a Beta test site for much of Corvus soft and firm-ware products.* The users expressed a high level of satisfaction with the systems. It has had some problems with the early versions of soft and firm-ware products which is to be expected at a Beta test site. It indicated without reservation that the proposed configuration and soft-ware concept could be implemented and could be made operationally successful. It also had successfully converted IBM magnetic tape files to the Corvus hard-disc and expressed a willingness to convert DOA/Service d'Etude tapes at minimal cost.

*Microcomputers go through several stages of testing. Preliminary testing is primarily done inhouse by the manufacturer for debugging purposes. Beta testing is done by an actual user, which runs the system and checks for all condtions under which it might fail.

Merrill Lynch--Ibar

Pasadena, California

This group is an investment counseling and management firm. They have several Apple IIs in a network configuration with a 30 megabyte Corvus disc. They use the system for financial planning and analysis. In my meeting with Mr. Hively, the Systems Manager, he was unwilling to take the time to demonstrate the system--I suspect, because the nature of their work is highly confidential. However, he expressed a great deal of satisfaction with the system and its capability. The individual account managers utilize a large financial data base for making financial analyses in much the same manner as the proposed configuration for the DOS. Most of the software they use is especially developed for their own use.

IBM(PC)

Price-Waterhouse

Los Angeles, CA

Price-Waterhouse is a large "Big 8" accounting firm. One of its capabilities is in the area of management consulting, including the evaluation of computer systems for its clients. It has a local area network composed of 17 IBM(PC)s with a 20

megabyte Corvus disc containing a large data base. It is presently using this system in a manner similar to that recommended for the DOS. It is using Wordstar as a word processing system, dBase II for data base management, and Visicalc as an electronic spreadsheet, but most recently has changed to "1,2,3", a competitive electronic spreadsheet system. It indicated complete satisfaction with its system, including response time. Mr. Redding, System Manager, was reluctant to take time for demonstration because of the high level of system usage during this "tax season." He recommended the system in a positive tone. There had been one problem with dBase II when two people were entering data to the same dBase II file. We discussed this problem and, subsequently, I discussed it with several other dBase II users. I was told that the problem is recognized by Ashton-Tate, the developer of dBase II, and Corvus. Corvus indicates that the problem has been solved with MP/M-86 which is specifically designed for networking applications. In any event, it will not be a problem for the DOS configuration with a suitable data-entry system design.

Northstar

The USDA Statistical Research Service is in the process of investigating the networking of Northstar computers. However, it has only investigated small configurations (two units) and has not had an opportunity to fully evaluate Northnet (the LAN for the Northstar microcomputer, which had only been announced in November 1982). It was not possible to find any significant installations currently in operation.

Finding installations of the various vendors which approximated the proposed configuration for the DOS was very difficult because of the relative newness of the concept.

Conversations with past and present staff members of USDA indicated that a number of Northstar computers were installed in the Departments of Agriculture of several developing countries under U.S. Government funding. Discussions were also held with a member of the Statistics Division of the Jamaican Department of Agriculture with direct experience with Northstar who expressed satisfaction with the system. The Northstar computers installed in these countries were funded by the Statistical Reporting Service of the USDA and AID. The name of

the project was Remote Sensing for Agriculture.

They were installed in the following countries:

Jamaica	1978	Sudan	1981
Ecuador	1980	Philippines	1980
Tunisia	1980	Cameroon	1982
Morocco	1980	Liberia	

In addition to the above, FAO funded a similar installation in Peru in 1978.

The following were also identified:

AID-sponsored microcomputer acquisitions in the Middle East and North Africa which are in trial stages at the project:

Egypt: ORDEV has an Apple II system,
CRS has three Apple II systems
MSU has a TRS80

The Population and Family Planning Board has an Apple II.

American University has more than a dozen micros in operation.

Yemen: The Confederation of Yemeni Development Associations has two Apple II systems.

Morocco: The Ministry of Health has 4 Apple II systems.

Tunisia: The Central Tunisian Development Authority - 2 Apple IIs.

The Ministry of Agriculture has 2 Apple II and a Northstar system.

Turkey: The Division of Planning of the Ministry of Agriculture has Apple II (number unknown).

Sudan: A remote sensing project is using a Northstar.

Other Systems

Wang Laboratories, Inc. has two systems, one called the OIS (Office Information System) which is primarily designed for word processing, and the other "VS" Systems. Wang's word processing system--OIS--has the disadvantage at the present time of being limited to four work stations. The other systems, designated VS25 and VS45, are very powerful networking hardware and software systems. However, Wang Laboratories indicated that the Wangnet LAN would not be supported overseas for at least another two years on the OIS. As a consequence, Wang equipment was not considered further.

Hewlett-Packard has announced the HP200 system which is called "shared resources system." This system is equivalent to a LAN system and will support up to 96 work stations in the network. A

preliminary evaluation indicates that, while the system is extremely powerful and meets all of the criteria established, it is a very high cost system. The microcomputer work station with only a CRT and keyboard is priced at \$5,550.00. I estimate that the proposed system configuration would cost in excess of \$100,000 for hardware only. In my opinion, this level of cost and capability is not necessary for the DOS.

FRANCOPHONE CAPABILITIES

An important consideration of this project was to determine the availability of French capability in hardware and software for the Division of Statistics. Although many of the Zairean personnel have developed competence in English with respect to computer and computer operations, it is highly desirable that the computer capability utilize the national language which is French. This is especially true in the case of papers and reports and the ability to computer-generate reports by means of word processing software.

It would appear that U.S. manufacturers have recognized the importance of international markets for their products and most have begun to establish sales and support organizations around the world. As a result, most of the major manufacturers have or are in the process of developing

a French language capability. However, this in turn presents a problem with respect to AID policy of "Buy American". To provide hardware and software, French capability from a U.S. vendor will require a special effort on the part of most U.S. manufacturers. In response to my enquiries, Apple first indicated that it would not sell except through an European dealer, although subsequently it suggested the possibility of a U.S. sale. In contrast, Northstar indicated that it would find a way to work out what needed to be done.

In general, the development of French capability is very recent with respect to microcomputer technology for most manufacturers. And, the marketing and distribution methods of most firms have not been completely worked out at this time other than through European vendors. In returning to Zaire, I expect to discuss the acquisition of French capability with the international divisions of Apple and IBM. Symptomatic of the problems was the fact that I spent many hours trying to resolve the availability of this capability while carrying out this project. The final resolution was that no one in the United States could discuss the present status of this capability and it could only be discussed in their European offices. As a consequence, a brief memo outlining my findings in Paris will be prepared and circulated shortly after my arrival in Zaire.

PRELIMINARY COMPARATIVE EVALUATION

Three systems are evaluated in the following analysis:

...Apple IIe--Corvus Disc System

...I.B.M. (PC)--Corvus Disc System

---Northstar--Northnet System.

The Apple and IBM systems were the only ones for which operating installations could be found at this time. There are most likely other systems which exist, but none of the major vendors could provide lead in the time available for this study.

Although the Northstar LAN system did not satisfy the primary criterion of personal observation of an operating site, it is included in the analysis for two reasons. First and foremost, the USDA/SRS has developed a considerable amount of agricultural survey software which would be desirable to have for the GOZ/DOA, other things being equal. Second, Northnet is in final (Beta) testing and is to be delivered to its first customers by June 1983.

Table 1 presents a comparison of the three systems with respect to the set of criteria discussed in this report above, with the exception of the data regarding the French keyboard, print and software capability. This data will be provided in a separate memorandum after discussions with Apple and IBM in Paris.

TABLE 1

Local Area Network System	CPU	Type	Hard Disc	Operating System	Backup Mfg.	System Media	Install	..French...			16 Key Pad	Mass Stor. MBytes	Multi Task	Stand Alone	Spool	Soft Ware	Est. Cost US \$	W/Pr \$
								KB	Print	SW								
Apple	Apple	8	Corvus	MP/M-86	Corvus	VCR tape	Yes				P	36.8	Y	Y	Y	Y	84,046	
IBM(PC)		8/16	Corvus	MP/M-86	Corvus	VCR tape	Yes				Y	36.8	Y	Y	Y	Y	95,429	
Northstar Advantage		8/16	Northstar	Northnet	Northstar	Diskette	No	Y	Y	Y	Y	30.0	Y	Y	Y	Y	88,516	

Table Abbreviations:

CPU = Manufacturer of Central Processing Unit
 Type = 8 bit or 16 bit technology
 VCR = Video Cassette REcorder
 Install = Present existing installations
 KB = Keyboard

Print = Printer
 SW = Software
 Y = Yes
 N = No
 P = Programmable

A Technical Comparison

The original microcomputers were based upon what is known as 8-bit processing capability. This refers to the amount of data which can be utilized in a single task of the computer such as transfer of data from a disc drive to the CPU, from the screen to the CPU, etc. With the advent of 16 bit technology, the speed of data transfer is theoretically doubled and, consequently, the speed of computation is doubled. However, this is not precisely true because the speed of a computer application is directly related to the slowest element in the system. As a consequence, the improvement in operation speed is a function of the architecture of the system. Manufacturers are experiencing from 25% to 70% increases in CPU speeds and/or in data transfer speeds. The importance of the 16 bit technology to this project is two-fold. First, because it is relatively new, not all of the software has yet been converted from presently existing 8-bit software. Second, if and when the first problem has been solved, the micro-computer capability will be significantly enhanced. Thus, from this project's standpoint, timing of a decision will be important.

It is clear that the Apple-Corvus and IBM-Corvus are essentially the same system with the exception that the Apple uses 8 bit technology whereas the IBM uses 16 bit

technology. In those cases where the software has not been converted or developed for the 16 bit processor, boards are available for the IBM which permit it to use software developed for the 8 bit processor. This is also the case for the Northstar Advantage computer recommended for the Northnet application. This development permits the utilization of much of the software developed for 8 bit processors on the 16 bit CPUs. However, some of the advantages of a 16 bit processor are lost when using software developed for 8 bit processors.

There is a major and important difference between the Northstar configuration and the Apple and IBM systems--the ability for quick and efficient hard disc backup. At the present time, I was unable to identify tape backup capability for the Northnet Advantage CPU. The Northstar system is presented with a 5 1/4" floppy disc backup system. Because of the nature of floppy disc backup, it could take as many as 40 or more to backup the 30 megabytes of hard disc storage in the system. This is time consuming and could take up to four hours for backup. The large number of discs require extremely careful attention to both backup and reload procedures. It is easy to create chaos if mistakes are made, and can lead to lost files and costly re-establishment expenses.

Administrative Comparisons

The question of the capability of purchasing either the Apple or IBM systems with French capability from U.S. vendors must await the discussions to be held in Paris. I have been told by a U.S. Northstar distributor that they have French capability and he can provide it. However, the actual existence of this capability has not yet been verified.

Both Apple and IBM have local representation in Kinshasa. However, as of January of this year, IBM/Zaire had no plans for support of the IBM(PC). The local Apple representative indicated that they would support the Apple equipment and Epson printers. They indicated an unwillingness to support the Corvus hardware or software. In any event, local support for any system is very suspect in the foreseeable future in Zaire because of the non-availability of hard currency for the purchase of parts.

Because of the local maintenance situation, the repair of the system elements will have to be done by shipment to the U.S. The high level of redundancy provides that, except under extreme circumstances, the system will continue to be operational even though one or several units may be down for repairs.

The following exhibits provide the hardware and software estimated prices and costs for each of the three

systems. These pro-formas are followed by a preliminary list of peripheral equipment which would be common to all three systems. Finally, a preliminary list of applications software and miscellaneous supplies required for the various configurations is presented. The total preliminary estimated costs are presented for comparative purposes in Table 1.

PROFORMA 1

APPLE IIe - CORVUS DISC SYSTEM

	<u>\$ Price</u>	<u>Qty/Unit</u>	<u>\$ Total</u>
Apple IIe with 64K (1) floppy disk drive with controller card 80 column card monitor (Apple II or other) documentation	1,995	10	19,950
Additional floppy disk drive	479	8	3,832
Z80 card	112.50	10	1,125
Serial I/O card	200	10	2,000
<hr/>			
Corvus 18.4 Mb, Hard disk	4,295	2	8,590
Corvus disk server, includ- ing Constellation software for OmniNet	990	2	1,980
Cable for net, 1,000 feet	250	4	1,000
Transporter cards and top box	495	2	990
Mirror, video tape backup	790	2	1,580
VCR	1,000	2	2,000
Transporter card and top box, quantity 4	1,895	2	3,796
Active junction box, i.e. repeater	150		
Apple CP/M	100	10	1,000
Creative logic print server	795	2	1,590
Creative logic multiplexer	400	2	<u>2,000</u>
Systems Total			50,227

PROFORMA 2

IBM(PC) - CORVUS DISC SYSTEM

	Price	Qty	Total
IBM(PC) with 64K and (1) floppy disk	2,235	10	22,350
Adapter card for monochrome monitor	335	10	3,350
Serial I/O card for printer	150	10	1,500
Additional floppy disk drive	570	8	4,560
Monochrome monitor	345	10	3,450
Z80 card, for CP/M	300	10	3,000
Corvus 18.4 Mb Hard disk	4,295	2	8,590
Corvus disk server, includ- ing constellation soft- ware for OmniNet	990	2	1,980
Cable for net, 1,000 feet	250	4	1,000
Transporter cards and tap box	495	2	990
Mirror, video tape backup	790	2	1,580
VCR (Video Cassette Recorder)	1,000	2	2,000
Transporter card and top box, quantity (4)	1,895	2	3,790
DOS	40	2	80
Creative Logic Print Server	795	2	1,590
Creative Logic Multiplexer	400	2	800
CP/M	100	10	<u>1,000</u>
System Total			61,610

PROFORMA 3

NORTHSTAR EQUIPMENT PRICES

	Price	Qty	Total
Advantage with 2 quad floppy drives	3,599	8	28,792
Advantage with (1) quad floppy drive and 15 Mb Winchester hard disk	5,999	2	11,998
Server Board	499	2	998
Work station board (for Advantage)	399	10	3,990
Tap box, Quantity 2	69	5	345
Cable for network, 1,000 feet, including 2 repeaters	249	4	996
NorthNet, network software for CP/M	349	10	3,490
CP/M, operating system	149	10	1,490
Advantage Serial I/O ld	175	2	<u>350</u>
System Total			52,449

PROFORMA 4

ESTIMATED COSTS OF PERIPHERAL EQUIPMENT

	Price	Qty	Total
Diablo 620 character printer	1,385	2	2,770
Cut sheet feed	1,040	2	2,080
Forms tractor	275	2	550
Star/Gemini 15 matrix printer	649	8	5,192
Cables for printers	35	10	350
Sola Micro/Mini computer regulator:			
500 volt amp; 220 v, 50 hz	427	8	3,416
1000 volt amp; 220 v, 50 hz	618	2	<u>1,236</u>
System Total			15,594

PROFORMA 5

ESTIMATED OTHER COSTS

	Price	Qty	Total
<u>Software</u>			
U.S.			
Wordstar	495	9	4,455
dBase II	695	9	6,255
Visicalc	250	9	2,250
Statpak	250	9	<u>2,250</u>
Total System			15,210
French			
Wordstar	?	9	?
dBase II	?	9	?
Visicalc	?	9	?
Statpak	?	9	?
<u>Miscellaneous Supplies (Apple-IBM)</u>			
VCR Tape cartridge	20	50	1,000
5 1/4" Discs - Maxwell box of 10	65	25	1,625
Ribbons	12	25	300
Daisy Wheels	15	6	<u>90</u>
Total System			3,015
<u>Miscellaneous Supplies (NorthStar)</u>			
5 1/4" Discs - Marell	76	75	4,875
Ribbons			300
Daisy Wheels			<u>90</u>
Total System			5,265

Comparative Evaluation

To make a single recommendation, it would seem that the tradeoffs are relatively simple, assuming comparable French capability for all three systems.

Apple-IBM: The IBM system costs \$11,000 greater than the Apple. For this increased cost, one achieves from 25 to 50 percent increase in processing speed. The difference is in 16 bit versus 8 bit processing. One also benefits from the experience in manufacturing maintenance and service of the giant in the computer field--IBM--although it is a late entrant in the microcomputer market. If IBM increases its share to 50% of the U.S. microcomputer market in the future, it is expected that the availability of applicable IBM software will be significant. Although with the continued market performance of Apple, in the near term future, this difference in software is unlikely to be overly significant.

Apple-Northstar: The Northstar costs \$4,500 more than the Apple. For this increased cost, one gains the ability to utilize the SRS agricultural survey programs. However, in addition, the Northstar has a 16 bit processor with the attendant advantages. Because there is no tape media backup for the two-disc, 30 megabyte hard disc capability, backup must be done with floppy discs which, if done daily, will require a minimum of four hours every day to backup the two discs and around 80 floppy discs per backup. This can be extremely costly in manpower and machine time.

Northstar-IBM: The IBM system costs approximately \$7,000 more than the Northstar system. Here again, the Northstar advantages and disadvantages apply to the IBM as well as the Apple discussed above.

In making a decision with respect to the installation of the LAN system at the DOS, two situations can be described. First, if the USAID mission is desirous of providing the LAN capability as quickly as possible, say within the next three to six months, then the decision must be made between the Apple and the IBM systems. If the mission is willing to defer the decision for a year because of the value attributable to having the USDA/SRS agricultural survey software then the final decision would be based upon demonstrated performance of the Northstar Northnet system. If Northnet were demonstrable, then the Northstar would be installed. If not, then, given the information available today, the decision would have to be made between Apple and IBM.

I am not prepared to make a final recommendation until the French capability has been fully evaluated. However, I tend toward the IBM(PC) because of the backing and commitment that the giant has made to the microcomputer world and because of the improved efficiency currently and prospectively available with the 16 bit processor.

APPENDIX A
USAID MEMORANDUM

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D.C. 20523

AID/W NOTICE
M/SER/DM
October 22, 1982
Issue date: 10-27-82

SUBJECT: Microcomputer Project Report, First Phase

INTRODUCTION

This memo summarizes the first phase of the microcomputer evaluation program announced by the Administrator in July 1982.

BACKGROUND

The Agency initiated the program in response to a growing perception within AID of the potential for using powerful, accessible and relatively inexpensive microcomputer systems. Given this growing interest, a project was initiated to:

1. Define AID/W and USAID potential uses for microcomputers
2. Evaluate and recommend appropriate microcomputer hardware and software
3. Determine maintenance and support procedures
4. Study training alternatives
5. Develop a comprehensive administrative and management strategy
6. Select the standard microcomputers for use within AID

RESEARCH PROJECT

To this end, the Office of Data Management interviewed a representative cross-section of AID staff members, including those who responded to the Administrator's announcement. We also met with individuals involved in other ongoing microcomputer evaluation studies and with a number of microcomputer specialists. After reviewing many products we procured a number of microcomputers and a variety of software packages for testing. In addition to conducting benchmark tests and comparisons, we invited AID staff members to attend demonstrations of the microcomputer systems in order to solicit their comments and suggestions. Hardware and software products were then rated according to the following criteria:

1. User acceptance of product
2. Vendor's capability and commitment to product
3. Support/Maintenance considerations
4. Cost
5. Performance
6. Potential utility and suitability for AID

Bill Shaffer 632 9744

CONCLUSIONS

User needs identified during our study were quite diverse although spreadsheet capabilities were most frequently requested. Most potential users cited specific ways in which microcomputer systems could perform current manual tasks and be adapted for new tasks. Most needs could be subsumed within several broad functional categories:

- ① Spreadsheet programs for financial management and planning
2. Data management programs for data collection, storage, and retrieval
3. Statistical software for data analysis
4. Graphics capabilities
5. Basic programming language for specific applications
6. Communications software to interface with other equipment
- ② Word processing capabilities to complement the microcomputer's data processing capabilities

The two microcomputers with the highest scores, the IBM Personal Computer (PC) and the Apple II, offered the most potential for meeting AID's diverse and expanding needs. Each system the Agency acquires will be configured with a screen, matrix printer with graphics capabilities, two floppy disk drives, and related supplies and components. Each overseas unit will be provided with an uninterruptible power supply (UPS). A small number of systems are now being acquired to meet the Agency's more pressing needs.

Software common to both systems will be provided to meet many of the needs identified during the interviews: Supercalc (Spreadsheet), dBase II (Data Base Management System), Wordstar (Word Processing), Microstat (Statistics), several graphics programs, Basic, and a communications package (in AID/W).

Although comprehensive diagnostic capabilities are included with each system, the initial systems were procured with an on-site (AID/W) maintenance agreement. Therefore, malfunctioning components in the first machines installed overseas will have to be pouched back for repairs. As soon as possible, however, maintenance responsibilities for the overseas equipment will be delegated to the missions. USAID's will be asked to become proficient in trouble shooting, identify capable local repair facilities, and establish a parts inventory in order to minimize down time. In all cases M/SER/DM will coordinate AID/W and USAID support and maintenance requirements.

All software and hardware products are fully documented and in many cases, the documentation is suitable for first-time users. Nevertheless, a significant training effort is likely to be required if AID managers are to use these microcomputers to do their work more effectively and efficiently. M/SER/DM will work with PM/TD to develop training strategies.

In addressing the administration and management of this program, M/SER/DM believes that AID's microcomputer systems represent only one node in an expanding, integrated network of information processing tools and capabilities. In order to determine the appropriate tools for each specific information processing need, the Office of Data Management will perform a needs assessment and work with each Agency client to develop an effective information processing strategy.

The microcomputer field is evolving at a very rapid pace. M/SER/DM has contracted with a senior consultant to draft a policy statement on how AID should deal with this. His report will be distributed as soon as it is completed.

ACTION

Requests for microcomputers should be addressed to the Office of Data Management. In AID/W, each microcomputer system including hardware, software, annual maintenance, and supplies will cost less than \$8,000 depending on the configuration. In order to allocate limited resources fairly and effectively, and to help each user develop an appropriate and coherent implementation strategy, M/SER/DM asks each requesting office to explicitly:

1. Prioritize its information processing needs
2. Describe in detail the specific applications proposed (this is critical to avoid unnecessary expenditures that would result from several locations developing the same applications)
3. Indicate the potential users and anticipated volume of activity
4. Delegate two individuals (one as a backup) to assume responsibility for the microcomputer systems
5. Indicate the level of support and training that would be necessary before the microcomputer systems could be used effectively
6. Consider how microcomputer information processing capabilities could be integrated with extant manual and automated activities

DISTRIBUTION:
AID List H, Position 8

Appendix B

CONTACTS MADE DURING ENQUIRY

Altos Computers
2641 Orchard Parkway
San Jose, CA 95134

(800) 538-7872

New multi-station local area networking computer/software system with 16 bit logic

Alspa Computer
300 Harvey West Blvd.
Santa Cruz, CA 95060

(408) 429-6000

Newly announced Zero-Net local area network hardware/software system.

Apple Computer Inc.
20525 Mariani Ave.
Cupertino, CA 95014

(408) 996-1010

Mr. Ron Boring, Manager
International Sales and
African Office

Apple Computer, Inc.
7 rue de Chartres
92200 Neuilly-sur-Siene
France

33-1624-2113

Aurora Data Corporation
1600 Wilson Blvd. N.
Arlington, VA

(703) 522-6692

Northstar Dealer w/knowledge
of Northnet

Computer City
1904 N. Tustin Ave.
Orange, CA 92665

(714) 974-3082

Mr. Fred Holborn, Account Exec
To verify Apple-Corvus configuration feasibility, and identify users.

Corvus Systems, Inc.
2029 O'Toole Avenue
San Jose, CA 95131

(408) 946-7700

Mr. Hughes, V.P. Marketing
Ms. Virginia Sykes, Marketing
Rep. N.W.
Mr. Bob Clark, L.A. Regional
Marketing Mgr. (714) 641-3518

Digital Research
Oxford House
12/20 Oxford Street
Newbury, Berkshire
England RG131JB

44-635-35304

Digital Research Inc.
P.O. Box 579
Pacific Grove, CA 93950

(408) 649-3896

Ms. Beulah Edoe
Washington, D.C.

Electronic Marketing
Associates, Inc.
11716 Parklawn Dr.
Rockville, MD 20852

(301) 744-7700

IBM
Boca Raton, FL

(305) 998-6048

IBM - France
Tour Generale
La Defense Paris

33-1-776-4132

King County Police Dept.
Seattle, WN

(206) 344-4135

Merrill Lynch - Ibar
225 S. Lake Ave., #700
Pasadena, CA

(213) 793-1800

M. Maureen Minnes,
Administrator

Developers of general operat-
ing System CP/M and new net-
work systems.

Vicki Heisinger, Customer
Services

Experience with USDA/SRS
North Star Agricultural Survey
System in Jamaica

Mr. Dan Briganti
Professional Engineer
Power conditioning and control
devices

Information relative to French
configured systems.

M. Remi Menegaux
Michel Aguerrebarry
M. Eric de la Rouziere

Officer Shoemaker
(Test Site for Corvus Omninet
and Mirror System)

Mr. Steven Hively
Apple-Corvus System network
installation

Microcomputer Networking
1903 Glenstone Ave.
Hacienda Heights, CA 91745

(213) 968-5844

Doug Cabell
Dale Cabell
Experts in Corvus Omninet and
Mirror Systems

Microsystems International, Inc.
P.O. Box 6206
Falls Church, VA 22046

(703) 573-3849

Mr. Raymond C. Luebbe
Local Area Network
Expertise and experience
with North Star Computers

Mt. San Antonio College
1100 North Grand Ave.
Walnut, CA 91789

(714) 594-5611

Mr. Hal Roach, Manager,
Computer Services
Mr. Dwight Ayle, Instructional
Analyst/Programmer
Multiple installations of
Apple II - Corvus Omninet,
Mirror networks

Nestar Systems, Inc.
2585 E. Bayshore Road
Palo Alto, CA 94303

(415) 493-2223

Newly announced Local Area
network hardware/software
system

Northstar Computers, Inc.
14440 Catalina St.
San Leandro, CA 94577

(415) 357-8500

Price Waterhouse
606 S. Olive
Los Angeles, CA

(213) 625-4597

Mr. Doug Redding
IBM (PC) network system
installation

USDA Statistical Reporting
Service
3524 South Building
Washington, D.C. 20250

(202) 447-4505

Donald J. Steele
Mathematical Statistician

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Wang Laboratories, Inc.
1 Industrial Ave.
Lowell, MA 01851

(617) 459-5000

Wang Laboratories, Inc.
Bethesda, MD

(301) 986-1010

Mr. Philip B. Noyce
Regional Director Mid-Africa
Mr. John Torrance, Technical
Support Ext. 3155

Mr. Alan Bluteginger
Government Marketing (AID)

APPENDIX C

Technical and Product Brochures

Apple Computers, Inc.

Alspa Computers, Inc.

Altos Computer Systems

Data Products, Inc.

Corvus Systems

Diablo Systems, Inc.

Digital Research

Ethershare

IBM

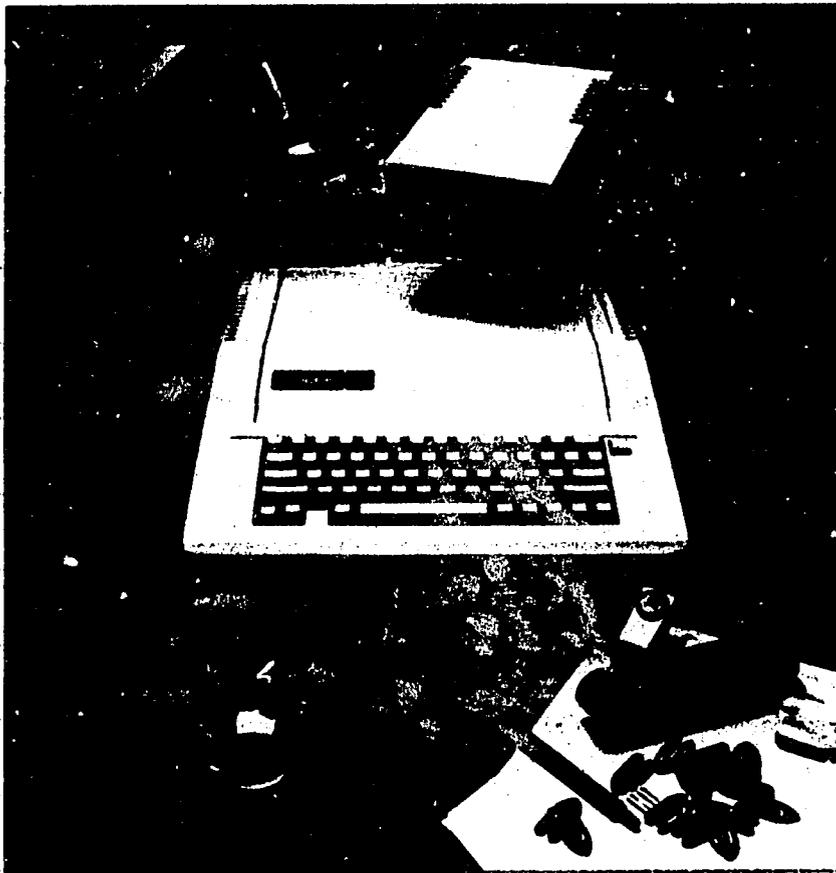
Nestar Systems, Inc.

Northstar Computers, Inc.

Tandy, Inc.

Pascal Systems

Wang Laboratories, Inc.





Whatever your personal goals, and whatever the scope of your activities or business, the Apple IIe can contribute greatly to your success—possibly more than any other investment you'll make this year.

The Apple Advantages.

With more than three-quarter million computers installed worldwide, Apple ranks first in the personal computer industry with more software programs available for its computers than any other company.

We invented the affordable personal computer for home and work at a time when minicomputers were the outstanding technology.

Today we continue to dedicate our efforts to the personal computer... to make your learning, work, and play time more productive, more creative, and more manageable.

You're in control.

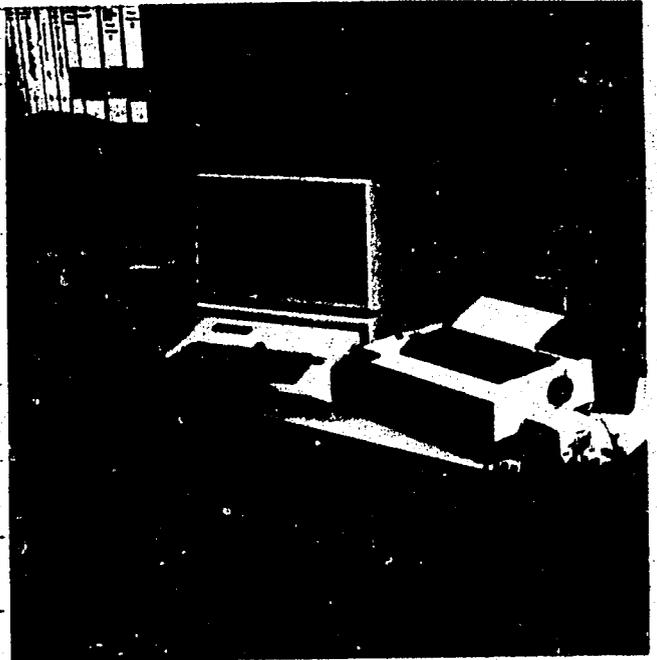
The Apple IIe Personal Computer System is a continuation of our commitment to your personal productivity—present and future. Because it puts you in control of day-to-day activities in a variety of situations.

Like gathering and storing facts and figures. Planning corporate or family budgets. Allocating resources. Polishing presentations.

Taken together, the advantages of personal computing on the Apple IIe mean taking personal control of vital information-gathering and decision-making.

Once you've settled down to business with the Apple IIe, you'll be impressed with how it handles your information needs.

But perhaps just as important—you'll discover frontiers unknown to you now and, in the process, explore your own potential for growth and creativity.



Apple does, for one.

We know that a computer strategy is important to all areas of our operations.

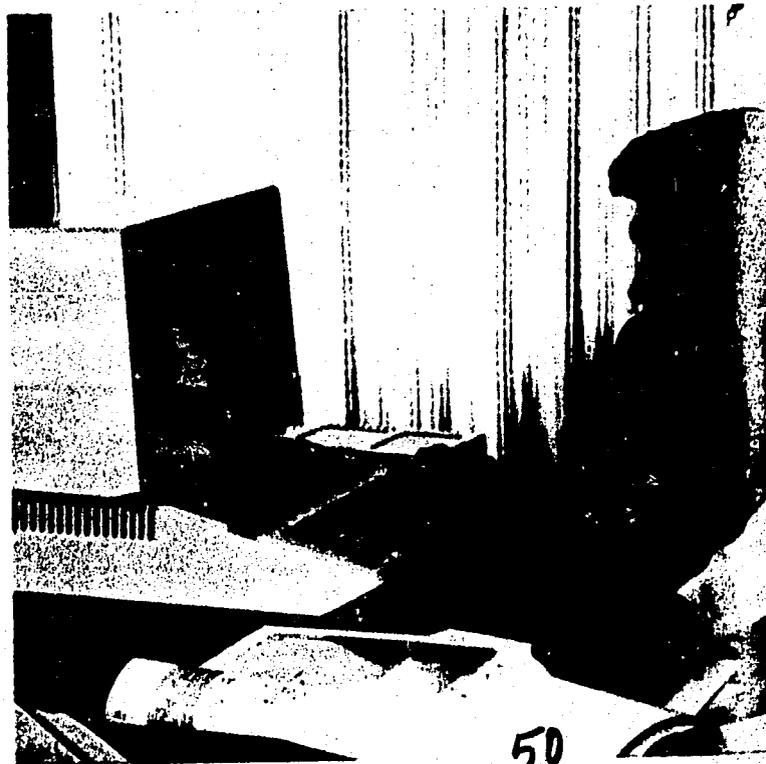
At Apple, we compute facts and figures more efficiently with Apples. Budget and forecast more accurately. Manage tasks and data more efficiently. Satisfy and encourage the personal involvement of our employees. And control bottom-line priorities.

In every corner of the world, Apples are used by business people at work. By families and students at home or school. By scientists in laboratories and universities. By teachers in classrooms and industry. And by others in thousands of applications from the typical to the extraordinary.

The Apple IIe means serious business.

Information is missing. Time is lost. Decisions are questionable. It happens all too often in business.

You need to see the picture at many levels and control your time and your productivity. That's where an Apple IIe can make a difference. So you can get facts quickly, organize your time, get a handle on numbers, and adjust for changes.





You can keep records and files up to date, simply and quickly. Access critical facts. Create "what-if" scenarios and solve problems. Enhance your presentations. Dramatically increase engineering data precision and standardization. Manage cash and budgets. Reduce wasted paper, labor, and time. Communicate more effectively.

And replace a lot of "dedicated" special-purpose objects, such as pencils, calculators, typewriters, files, and even mail.

You're free to manage your time and efforts better, and pursue ideas and opportunities. You're personally in control.

▶ **Orderly growth for the fast-paced enterprise.**

Perhaps you're an entrepreneur or small-business principal. You're making plans that require well-placed attention and timely decisions. You can't afford to have strategies backfire, details trip you up.

Use the Apple IIe for word processing memos, reports, proposals. Dedicate it to accounts receivable and payable, payroll, inventory control, and general ledger. Delegate it to know when to take discounts, to track late-paying customers, to manage cash flow.

Turn it into a letter carrier with electronic mail. Make it a smart terminal to talk with a mainframe or timesharing system.

In other words, don't bury yourself in details if you don't have to. And rediscover the time to wrestle with priorities that the computer can't handle.



► **Infinite personal resources under one roof.**

Ever decide to analyze spending for the year, and come up with a workable budget—only to find cancelled checks, tax records, and receipts scattered to the four corners of the house?

Whatever your goal, there's a solution to the loss of vital information.

With the Apple IIe, you can manage that budget. Students can master lessons interactively with the computer. The family financier can do bookkeeping. The investor can watchdog and manage stock, real estate, and investment portfolios.

The moonlighter can perform entire business transactions. The tinkerer can control lights, alarms, pool, or sprinklers.

Anyone can work efficiently at home in his or her own Office of the Future. And everyone gets a well-earned timeout for mildly (or wildly) addicting computer games.

► **A new approach to education.**

As subjects become more complex and educational needs more diverse, the traditional teaching tools can no longer do it all. They must be more sophisticated, yet affordable enough to fit a budget.

There has to be a better way. And there is.

Students save time and effort in gathering, analyzing, and reporting facts—and in writing and editing reports, papers, and assignments.

With the Apple IIe, teachers can develop exciting instruction and visual aids, administer testing with on-the-spot feedback to students, grade responses, measure program effectiveness, and keep records any way they like—with just a few keystrokes.

Quick learners learn even faster. Slower learners can pace themselves while lowering the frustration factor. The handicapped enter the mainstream more confidently.





You'll see more than just drill and practice with an Apple IIe. You can tap the resources of other data bases, computers, and developed lessons. Teach yourself (and your students) any level of programming. Develop powerful training and computer-aided instruction (CAI) for specialized needs. It's still an open book.



Precise control of the scientific parameters.

Quality of information integrated with reliable hardware can be more important to engineers, scientists, and researchers than perhaps anyone else.

With an Apple IIe, you'll exercise greater control over all operations. Consider a low-cost, intelligent terminal for networking and communicating with mainframes.

High-level languages like FORTRAN and Pascal. Support of industry standard interfaces such as the IEEE-488. Analog to digital and digital to analog converters. Computer-aided design (CAD). Voice output and recognition equipment. Process and instrument control, and tailor-made microprocessor-controlled devices.

And when you're ready to expand your operations, the Apple IIe is designed to provide optimal growth avenues.

In addition to speeding up the research process, you'll have the advantages of personal computing in day-to-day operations such as record-keeping, writing, budgeting, and calculating. You'll find the Apple IIe gives you precise parameters—on time and on target.



The Apple II gives you more options than any other personal computer to make the most of your resources, centralize information, and impart orderly control—in a way you've never seen or thought possible. By incorporating the Apple II into your operation, you'll see results immediately, and with minimal investment.

▶ **Financial Planning and Modeling for Corporations and Small Businesses:** Tying together the pieces in one smart location.

The Apple II makes it easy for you to develop and execute customized planning and analysis—without experience in computer programming.

Administrators can plan budgets, compare actuals with forecasts, and modify projections. Sales and marketing managers can develop accurate forecasting models, pricing strategies, and sales plans. Accountants can calculate rates of return, design pro forms, and draft financial statements.

You can use a spreadsheet program for precise, sophisticated financial modeling. For example, you can consolidate budgets, profit and loss statements, cash flow projections, forecasts, and more. Complex calculations are done quickly and precisely, and some software lets you merge as many models as you wish into one—all with easy-to-follow commands.

If you're in charge of a small business and often wonder where your time goes, the Apple II can answer important questions. Who is paying bills on time? Who's not? What's tied up in receivables, payables, inventory? How can payroll be streamlined? Accounting packages for the Apple II are available that can free up your time from important but time-consuming tasks—for more profitable use of your management time and talents.

▶ **File and Project Management:** Taking control of vital information.

Finding, sorting and centralizing information that you can use exactly when you need it means efficiency. Using a typical data base management program, you just key in data and later decide on the most useful order. Then selectively print out file listings when you need them.

Once an important project is identified, you can schedule, track, and analyze the milestones. You can generate project status reports and charts, and pinpoint the critical paths and project costs. Any time along the way, you can create "what-if" scenarios of complex tasks to help you make tough decisions.



You can share data bases, communications among systems, and take advantage of thousands of programs from Apple as well as outside software developers.

For both business and personal record-keeping you can find a program to organize cash and credit card payments, tax records, checkbook statements, and various finances—in one location.

Editing and Word Processing: Revise, re-size word and number gathering.

One of the major benefits of the Apple II's personal approach is versatility. Because when you're through calculating, modeling,

forecasting, and any of hundreds of other uses, you can take care of the briefest of memos—as well as the longest of books.

You can quickly create and edit text, and also format headers, footers, paragraphs, pages, and tabs according to your specifications. You can view different portions of your document in 40- or (with optional card) 80-column format, access a custom-made glossary, move around to different locations in your text, and merge text with other programs such as spreadsheets. You'll be delighted to find you can print out reports as complicated or as plain as you want them.

Whether at home, school, laboratory, or office, rest assured that with an Apple II you can change your mind without changing your deadlines.

Business, Presentation, and Design Graphics: Add style and originality to your persuasive messages.

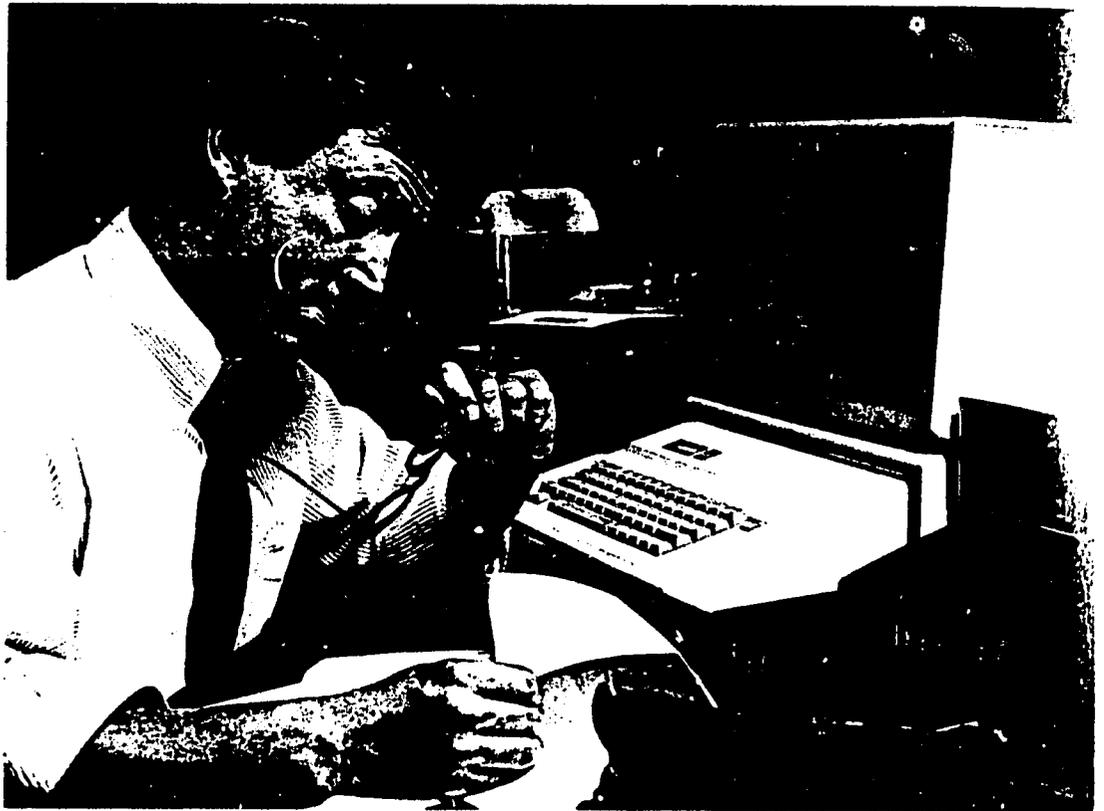
Nothing gets to the heart of a message as quickly as a finely-tuned graphic presentation.

You can use the Apple II to assemble facts and figures, convert data to visually appealing charts and graphs, and hook up to a suitable printing or plotting device. So you can produce condensed visuals, make sense of massive amounts of data, spot trends, pinpoint priorities, and identify potential hotspots.

For example, save hours of drawing and design time for depicting any activity including sales, stock performance, calorie consumption, and miles per gallon. You specify each axis, and the Apple II will help you create a bar, line, or scatter chart for transparencies or reports. Then update any information at any point. Label the charts exactly as you wish. And color it all for maximum visual appeal.

You can perform curve-fitting and trend-line analysis. Produce pie charts and horizontal bar graphics. Plot two or more graphics on the same set of axes. And perform a few more extraordinary things you've never been able to do so simply—without programming knowledge.

The Apple Graphics Tablet lets you make and display block diagrams, architectural renderings, logic diagrams, schematics, mechanical shapes—and even fine art.



Educational Software:
An exciting new realm
of possibilities for
school and home.

No matter what the setting, educators have found that an Apple personal computer can transform the learning process. Assignments are more individualized, creative and open-ended. Teachers have more time to channel personal attention. Bright students move even faster. The handicapped are motivated to participate.

Aided by an Apple, you can teach everything from bridge to astronomy. Help kids learn to spell,

recognize words, understand arithmetic concepts, and sharpen problem-solving. Compose music and play (with internal speaker) your own compositions. Learn U.S. geography and capitals more enjoyably. Or breeze through a primer on BASIC programming.

In addition to basic skills, the Apple can help in specialized education such as advanced computer programming and industrial training.

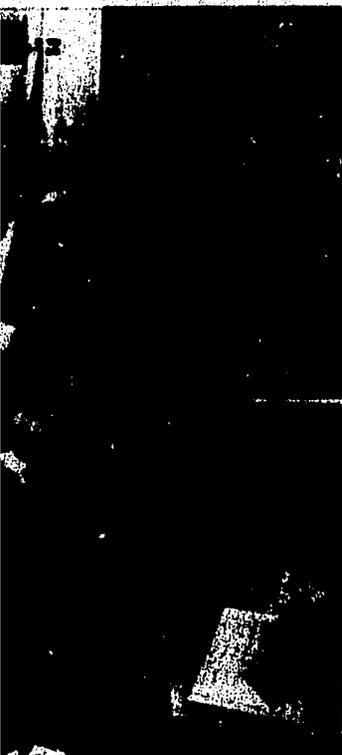
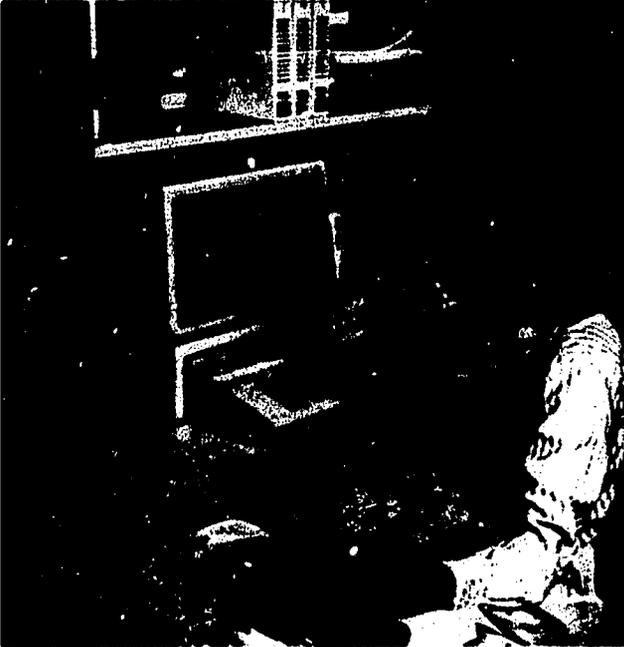
You'll find these and hundreds of other programs by Apple and other sources that provide the best in educational design—aided by the most popular personal computer in history.

Telecommunications:
Instant worldwide
mail, telegrams,
news, and stock
quotes.

Because your Apple can be connected (via low-cost modem) to telephone networks, you can sit back while your computer directly accesses timely data.

For instance, your Apple can send and receive letters and messages instantly from other microcomputers. Send Mailgrams. Send and receive TWX, Telex, and international cables. You can order flowers and wire money. Check headlines and research stories from the Wall Street Journal, and even catch the latest sports and weather information in major cities.





Nothing requires special installation or expert consultation. Your Apple IIe keeps everything running without programmers. And if you don't want to sit back and watch, we're sure you'll use the free time to your advantage.

▶ **Programming:**
Virtually endless possibilities for creative development.

The Apple IIe speaks several languages fluently, including BASIC, Pascal, SuperPILLOT, and Logo. You'll also have access to a library of CP/M® based programs.

© CP/M is the trademark of Digital Research, Inc.

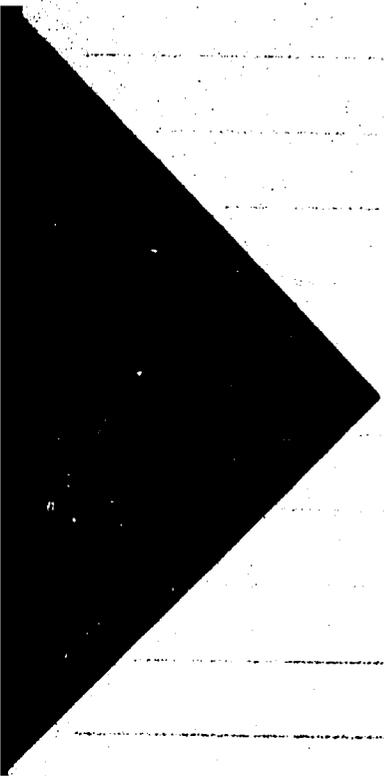
This flexibility is one reason why computer science teachers choose Apples for the classroom. Cost effectiveness is another reason. The Apple IIe system is equally valuable in engineering, math, and science courses, where students may be problem-solving in BASIC or Logo, or developing application programs in Pascal. Teachers and trainers can construct interactive lessons with SuperPILLOT and its graphics, animation, and color capabilities.

For all your creative and professional computing needs, there's a solution. Write your own software, or choose from the thousands of BASIC programs already available. Use Pascal for structured applications and port both programs and data to an Apple III if desired. Take advantage

of our powerful built-in Applesoft BASIC that is easy to learn and use. Along with other languages, you'll also find programming tools such as graphic libraries, editors, assemblers, and debuggers.

▶ **And everything in between.**

You'll have access to a vast and constantly growing electronic library. Ask your dealer about current developments in software and peripherals, and other Apple literature and directories.



One of the most rewarding aspects of owning the Apple IIe is its amazing versatility. Once you've matched your Apple to your immediate needs, you'll discover endless ways to save time and bring down costs.

The Apple II family's latest.

Designed from the start to make the most popular personal computer even better, the powerful Apple IIe provides many advantages to increase your efficiency and productivity. You'll also find several significant features never before built into the Apple II, that give you a wealth of benefits.

Solution Power: 64K bytes of user memory. The Apple IIe's internal memory provides more than enough room to handle your data and programming needs, and plenty of space to accommodate the vast body of business, educational, scientific, and other programs immediately available from many sources. And should you wish to add on another 64K of memory, a special-purpose slot allows you to plug in a card for this purpose.

Customized expansion. The Apple IIe's eight expansion slots allow you to personalize and expand your system by means of peripheral and interface devices manufactured by Apple and others. This also allows for technology that will offer even more memory by means of a single text card, and access to personal mass storage devices.

You can choose from a wide range of options such as numeric keypad, printers, plotters, joysticks and hand controls, audio and video devices, modems, networking, mainframe communications, and much, much more.

Apple disk storage. Disk II is Apple's floppy disk subsystem designed to help you store and retrieve data smoothly and effortlessly. Each flexible disk allows you to store the equivalent of 35 single-spaced, typewritten pages. Each Disk II drive comes with the Disk Operating System (DOS) program when you purchase a Disk II with controller. Because each controller supports two disk drives, you'll be able to attach a second drive to it when you wish to expand your system. And you can expand to as many as six drives.





Color graphics and sound effects. Enjoy the advantages of both high- and low-resolution graphics in 6- or 16-color choices with your Apple IIe connected to a color monitor or television. With video and audio attachments, you'll add important new dimensions to instruction, presentations, and games.

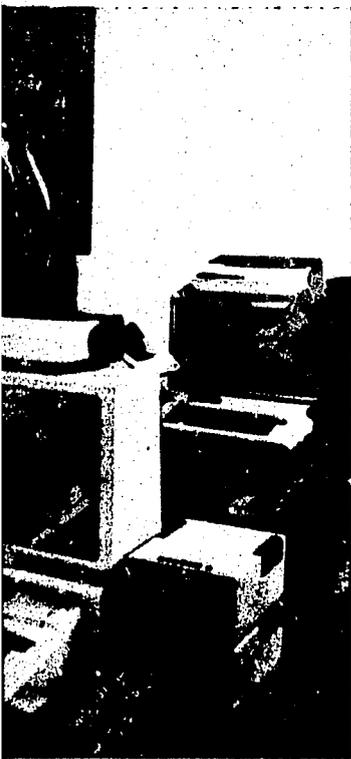
Portable design. Apple built the Apple IIe with significant safety, convenience, and compact design features. By means of D-style connectors on the back of the computer, you can quickly connect or remove any peripherals without the inconvenience of opening the case. You'll also find that when you need to travel with it, the Apple IIe, weighing in at 12 pounds, fits compactly in small spaces and under airplane seats.

Safety features include: lockable case lid; power-on light both inside and outside of the computer; and UL and FCC approval.

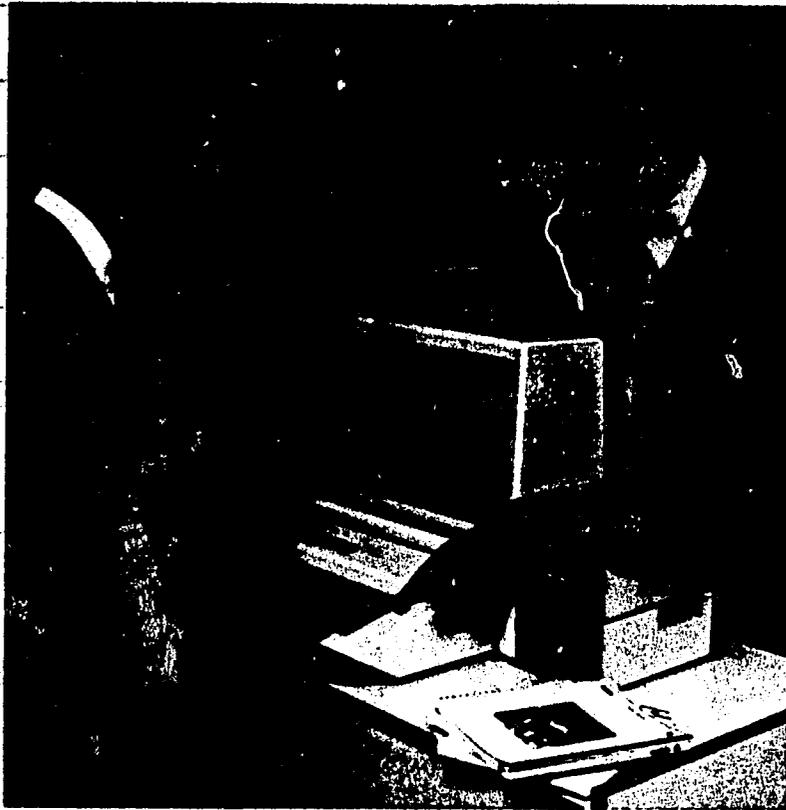
Fall ASCII[®] keyboard. The Apple IIe keyboard is as comfortable and easy to use as a standard typewriter. The 63 keys provide 128 different characters (96 printable characters) to satisfy everyday business as well as scientific uses. Video or printed output duplicates a perfect typewritten page, with both upper and lower case. Additionally, the Apple IIe provides 80-column screen capabilities (with optional card) and automatic repeat for every key.

Special-purpose keys.

Apple IIe special-purpose keys serve a variety of purposes, including time-saving text entry and editing. Easier, more efficient software development. And use of software languages available now and later. CONTROL, CAPS LOCK, ESCAPE, and RESET functions mean you can move around infinitely easier and quicker in all of your operations. ARROW UP, DOWN, LEFT, or RIGHT, and TAB let you move your cursor precisely where you want it in a fraction of a second. Programmable OPEN-APPLE and CLOSED-APPLE keys let you decide what sequences you wish to combine into one key—for anything from line spacing while printing, to exotic scientific applications. DELETE allows you to erase characters in programs designed to utilize this feature.



[®]American Standard Code for Information Interchange



Built-in self testing. At any time you wish, you're able to run your Apple IIe through a series of built-in diagnostics that check for normal operating status.

Easy manuals. No one takes more seriously than Apple the task of producing straightforward, easy-talking manuals. Your Apple IIe owner's manual guides you through start-up, step by step, and gives you a glossary of terms and index. So you won't need a technical dictionary or a mechanic. And you will be using your Apple IIe within hours of set up.

Local and worldwide service and support. No company can truly serve its customer base without adequate support once the system is out its doors. At Apple, we stand by our commitment to provide quality service, training, and follow through. Ask about our more than 2500 local service centers, 24-hour Level I services, and hotline trouble-shooting.

Comprehensive warranty. Apple's 90-day limited warranty covers your system and any Apple-Trade products. After that, AppleCare, Apple's extended limited warranty, is available to cover your Apple IIe, renewable yearly.

More literature. Apple produces catalogs, brochures, data sheets, magazines, and even books to help you find whatever products and information you need. Your dealer also supplies several directories of Apple-compatible products.

The competition. No other personal computer company puts so many features in one machine. And makes it so easy to add onto. And gives you everything you need at one affordable price. Simply compare the quality of our presentation to anyone else's, and we're sure you'll pick an Apple IIe.

Visit the expert—your dealer. Worldwide, Apple supports a network of more than 2000 dealers—so chances are there's one close by. Your full-support dealer is specially trained to evaluate your needs, recommend solutions, and provide after-sale support. Ask for a demonstration. And get acquainted with how you can do just about anything better than before with the Apple IIe Personal Computer.

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H2S 1Z6
(514) 345-4137



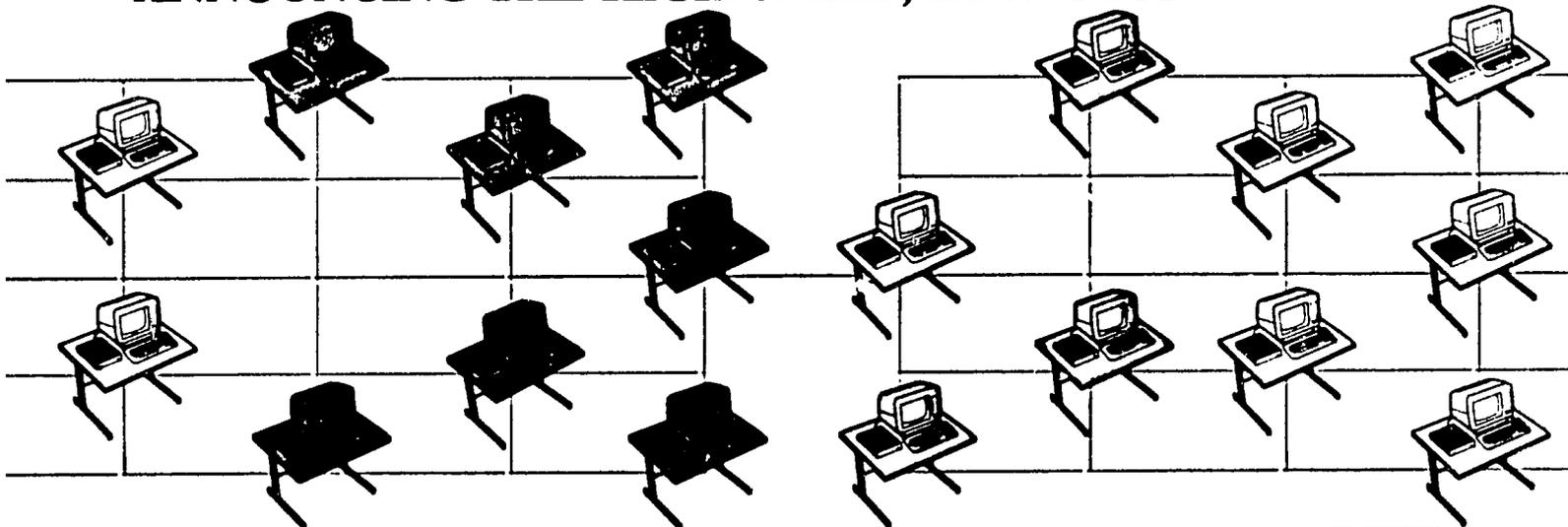
20525 Mariani Avenue
Cupertino, California 95014
(408) 998-1010
TLX 171-576

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Alspa

ZERO

ANNOUNCING THE HIGH SPEED, LOW COST NETWORK



The ZERO is designed to bring high performance LOCAL AREA NETWORKING to users at budget prices.

The ZERO and ZERO-NET are unique. Any ZERO station can be a Network Master or Network Remote, permitting, for the first time, a low cost non stop network.

The ZERO-NET features a High Level Data Link Controller (message synchronous) at 400K bps carried over a simple twisted pair cable. To achieve maximum speed and reliability we use collision detection/avoidance circuitry and automatic CRC error detection/retransmission.

Each ZERO computer in the net can have Floppy Disk and/or Winchester Drives. The ZERO itself is a Z80 based Micro-computer with 64K Ram, 2K to 16K of EPROM, 2 Serial ports, 2 parallel ports, floppy disk controller, Z80CTC counter-timer and Z80DMA direct memory access.

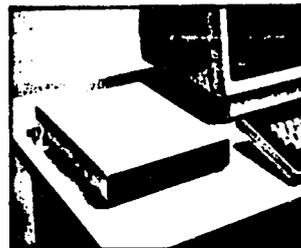
The ZERO hardware design was optimized for TURBODOS*, (CP/M**, MP/M** compatible) including such enhancements as console type-ahead (buffering), 1.416 Mbytes per 8 inch Double-sided floppy, multi-processing (background processing) such as print spooling, etc.

KEY PARAMETERS

- Local Area Networks up to 256 nodes per NET, with any mix of Master and Remote stations. Each station may support up to 16 logical drives, local or remote.
- Local Area Networks may be linked through gateways.
- Per Node — 0 to 2 floppies and 0 to 4 hard disks with appropriate Driver Modules.
- Per Node — parallel and/or serial printer.
- Each user can control print routing and/or spooling.
- Each node may reference a file system and/or printer on any other node.
- Each node may have an Autostart Log-on with security access protection.
- Each node may have a FIFO type Electronic Mailbox.

*TURBODOS is a trademark of Software 2000, Inc.

- Each node may operate with MP/M compatible file/ record interlocks, or with special TURBODOS relaxation rules.
- Maximum recommended bus length of 4,000 L.Ft.
- Full CP/M and MP/M compatibility.
- The TURBODOS operating system can support up to one GIGA Byte (1,000 Mega Bytes) per logical drive.



The ZERO-NET product family — the ZERO, the ZERO/FD, the Z-DRIVE and the ZNT terminal — all the components required to configure an entire system are available for immediate delivery. The ZERO provides a microcomputer network that OUTPERFORMS many multi-user minicomputer systems at substantially lower cost. While the competition is still studying it, ALSPA has done it!

ZERO-NET



Alspa Computer, Inc.

300 Harvey West Boulevard, Santa Cruz, CA 95060
(408) 429-6000 Telex 176279

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SPECIFICATIONS

The ZERO-NET

Operating system: TURBODOS
Main Buss: Two wire twisted pair cable
Data transfer: 400 Kilobaud, message synchronous
Protocol: CSMA/CD (carrier sense multiple access with collision detection)
Maximum buss length: 4000 ft.

The ZERO Computer

CPU Z80 @ 4MHz
ROM 4K standard, to 16K Bytes optional
RAM 64K Bytes standard
I/O 2 ea. RS-232 serial, 1 each printer parallel, 1 each hard disk port.
Floppy controller, Western Digital 1793 standard
DMA standard
POWER, 110VAC, 10 Watts, 220VAC, 50Hz optional

The ZERO/FD Computer

CPU Z80 @ 4MHz
ROM 4K standard, to 16K Bytes optional
RAM 64K Bytes standard
I/O 2 ea. RS-232 serial, 1 each printer parallel, 1 each hard disk port.
Floppy controller, Western Digital 1793 standard
DMA standard
DRIVE, 1 each 8" double sided floppy disk drive, 1.4M Bytes formatted.
POWER, 110VAC, 40 Watts, 220VAC, 50Hz optional

The Z-DRIVE

A single double sided 8" floppy disk drive in an enclosure including power supply.

The ZNT Terminal

Screen	12 inch (305mm) diagonal, 146 (green) phosphor, raster scan
Capacity	80 characters/line × 24 lines (1920 characters)
Character Format	7 × 9 dot matrix in 9 × 12 window, dual intensity. Character shows through cursor in reverse video when superimposed.
Keyboard	Detached typamatic keyboard with 14 key numeric pad. Key click selected or cancelled form keyboard.

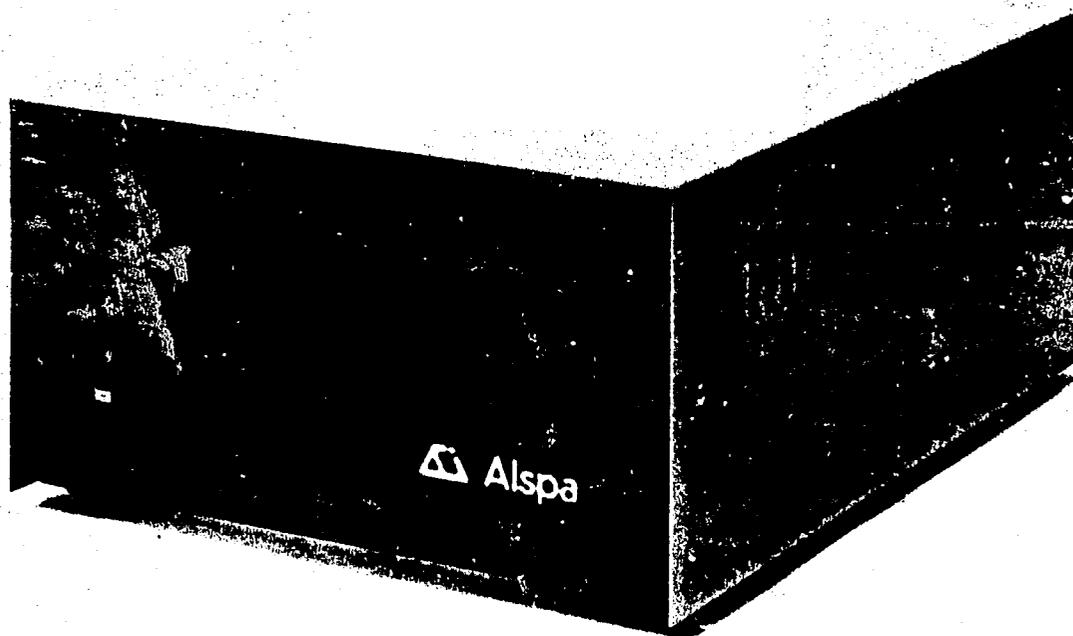


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HARD DISK

For Alspa Computers



- Quiet
- Compact
- Low Cost
- Easy to Install
- Integral Controller and Power Supply

The HD-11M and HD-22M are optimized for the Alspa ACI-1, ACI-2 and ZERO computers. These hard disk drives greatly increase the speed and storage of floppy based Alspa systems. Installation takes only minutes.

SPECIFICATIONS

CAPACITY:

HD-11M

Unformatted — 13.3 Mbytes.

Formatted — 10.8 Mbytes, 2 logical drives of 5.4 Mbytes each.

HD-22M

Unformatted — 26.7 Mbytes

Formatted — 21.6 Mbytes, 3 logical drives of 7.2 Mbytes each.

INTERFACE:

ALSPA parallel port interface.

MECHANICAL:

Sheet Steel case.

Height — 4.62 In. (11.7 cm)

Width — 8.87 In. (22.5 cm)

Depth — 11.75 In. (29.8 cm)

Weight — 17 lbs. (7.7 Kg)

POWER:

115 VAC, 60 Hz, 0.5 Amp.

230 VAC, 50 Hz, 0.3 Amp.

ENVIRONMENTAL:

+10 to +40 Degrees Centigrade.

20 to 80% relative humidity, no condensation.



Alspa Computer, Inc.

300 Harvey West Blvd.
Santa Cruz CA 95063
(408) 429-6000
Telex 176279

A fully integrated computer system





Alspa Computer, Inc.

300 Harvey West Boulevard, Santa Cruz, CA 95060

408-429-6000 Telex 176279

BL THE BOTTOM LINE

Today's High Speed, Powerful CP/M* Microcomputer System Is Complete And Ready To Go!

COMPUTER

uses a Z80A @ 4MHz, has 64K RAM, 2K ROM, three RS-232 serial ports, one parallel port, one hard disk expansion port, and a very fast 8" floppy disk drive with 600 Kbytes of storage.

TERMINAL

has a 12 inch, 80 character by 24 line screen, a removable keyboard, and interfaces with the computer at 19.2K Baud for fastest possible performance. The screen characters are a well defined 7 by 11 dot matrix on a non-reflective green phosphor giving excellent legibility.

SPELLBINDER*

is the best word processing program in the industry; it includes a mail merge function and Macro command files.

CONDOR*

is a powerful, yet easy-to-learn, easy-to-use database management program.

PROFITPLAN*

is acclaimed as one of the most complete and easy-to-learn electronic spreadsheets. It can be upgraded to the comprehensive financial modeling program, MICROPLAN*, at nominal cost.

SOFTCOM*

is a complete communications program which allows the computer to connect to valuable data sources and other computers.

CP/M

is the industry standard operating system. Over 2000 ready to run programs are available.

COMPUTER OPTIONS

include: a double sided 8" drive, 1.2 MBytes fully formatted.
two single sided 8" drives, 600 Kbytes per drive, 1.2 Mbytes fully formatted.
two double sided 8" drives, 1.2 Mbytes per drive, 2.4 Mbytes fully formatted.

SOFTWARE OPTIONS

include: an upgrade of PROFITPLAN to MICROPLAN.
uGRAF, a new dynamic graphics analysis program which is fully integrated with Condor and ProfitPlan.

PRINTER OPTION (shown at right)

is a high speed 120 characters per second dot matrix printer with 96 ASCII characters, 64 graphics characters, and 14 European characters. Prints either 80 columns letter width, or 136 columns financial report width, on either tractor or sheet fed paper.



Regional Offices

San Diego, CA
(619) 296-6565

Manasquin, NJ
(201) 528-7550

Atlanta, GA
(404) 253-5400

*CP/M is a trademark of Digital Research, Inc. Condor is a trademark of Condor Computer Corporation. Spellbinder is a trademark of Lexisoft, Inc. Profit Plan and Micro Plan are trademarks of Chang Laboratories, Inc. Softcom is a trademark of Cedar Systems. uGRAF is a trademark of Transparent Data Systems, Inc.



Alspa Computer, Inc.

NEW PRODUCT ANNOUNCEMENT

EDITORIAL CONTACT:
Steven Rupp,
Vice President, Marketing
(408) 429-6000

FOR IMMEDIATE RELEASE
October 11, 1982

ALSPA COMPUTER, INC. today announced a new product line designed to bring "LOCAL AREA NETWORKING" into the realm of non Fortune-500 companies and organizations without a Department of Defense budget.

The product, "The ZERO", is a compact high speed microcomputer designed to be the key building block for a Local Area Network. A ZERO network is unique in that any ZERO station can be a Network Master or Network Remote, permitting the final solution to the problem of "I'm sorry, our Master Computer is DOWN" story which we hear all too often. Best of all the Suggested Retail for the ZERO starts at only \$1,195

The ZERO-NET features HDLC (message synchronous) at 800 Kbps carried over an inexpensive and easily installed twisted pair cable. To achieve maximum speed and reliability, collision detection/avoidance circuitry, automatic CRC error detection and retransmission are employed.

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Each ZERO can operate with Floppy Disk Drives , Winchester Drives , both or none. The ZERO itself is a Z80 based Microcomputer with 64K Ram, 2K to 16K of EPROM, 2 Serial ports, 2 Parallel ports, floppy disk controller, Z80CTC counter-timer and Z80DMA direct memory access.

The ZERO contains a compact switching regulator with efficiency >80% with a wide range of input line voltages. Total power consumption is a cool 9 watts!

The ZERO hardware design was optimized for use with TURBODOS (a CP/M, MP/M compatible operating system). The Operating System includes such enhancements as console type-ahead (buffering), 1.416 Mbytes per Double-Sided floppy diskette, multi-processing (background processing) such as print spooling, etc. The ZERO makes available a microcomputer system that can OUTPERFORM a multi-user minicomputer systems in the PDP-11/34 class at a substantially lower cost.

ZEROs installed with local hard disks will usually be configured to boot as Network Masters, those without local disks (or disks turned off) will automatically boot as Remotes. An operator may change his node from Remote to Master (or vice versa) by issuing a single command.

THE FLEXIBILITY CONSIDERATIONS:

- 1 **Number of Users: Local Area Networks up to 256 nodes per NET, which may be any mix of Master and Remote stations. Each station may support up to 16 logical drives, either local or remote.**
- 2 **Local Area Networks may be linked through gateways.**
- 3 **Per Node - 0 to 2 floppies and from 0 to 4 Corvus compatible hard disks. Any disk system connected to the parallel port may be substituted for the Corvus with appropriate Driver Modules.**
- 4 **Per Node - parallel and/or serial printer.**
- 5 **Each user can control print routing and/or spooling.**
- 6 **Each node may reference a file system and/or printer on any other node.**
- 7 **Each node may have an Autostart Log-on with security access protection.**
- 8 **Each node may have a FIFO type Electronic Mailbox.**
- 9 **Each node may operate with MP/M compatible file/record interlocks, or with special TURBODOS relaxation rules.**
- 10 **Maximum recommended buss length of 4,000 L.Ft.**
- 11 **Full CP/M and MP/M compatibility.**
- 12 **The TURBODOS operating system can support up to one GIGA Byte (1,000 Mega Bytes) per logical drive.**

ALSPA COMPUTER, INC. will be showing off its new line this November at the Fall COMDEX Show in Las Vegas. The product family will be the ZERO, the ZERO/FD, the Z-DRIVE and the ZNT terminal, all the components required to configure an entire system. While the competition is still studying it, ALSPA has done it!

ALSPA COMPUTER, INC. has corporate headquarters located at 300 Harvey West Boulevard, Santa Cruz, CA 95060, (408) 429-6000.

* TURBODOS trademark of Software 2000, Inc.

** CP/M and MP/M trademarks of Digital Research, Inc.

*** CORVUS trade mark of CORVUS SYSTEMS, Inc.

**OVERCOME THE
LIMITATIONS OF CP/M WITH**



**THE POWERFUL NEW DISK
OPERATING SYSTEM FOR
Z80-BASED
MICROCOMPUTERS**

TurboDOS™ is a powerful new state-of-the-art operating system that is designed specifically for use on Z80-based microcomputers. The result of several man-years of intensive development effort, it can provide your computer system with a significant improvement in performance without the need to purchase additional hardware or accessories. TurboDOS provides professional features and advanced capabilities that are either not available, extra cost options, or simply not possible under CP/M™, the acknowledged de facto standard of microcomputer operating systems. However, TurboDOS is not a Z80 translation, derivative, or "re-write" of CP/M code but represents a totally new and dramatically improved approach to file and disk system management. A brief overview of just a few of these features is described below.

CP/M COMPATIBILITY TurboDOS was designed to be fully compatible with CP/M (version 2.x) to enable users to have full access to the vast library of software that already exists for the Digital Research system. It can be used as a direct replacement for CP/M, MP/M, or CP/NET on any Z80-based microcomputer and virtually any CP/M application, language processor or programming tool will operate under TurboDOS without modification. Both CP/M BIOS functions and direct BIOS calls are fully supported. TurboDOS is also fully media-compatible with CP/M and will automatically detect whether a diskette is recorded in standard CP/M-format or in TurboDOS format. The format of a newly-created diskette is determined when the diskette is initialized and a disk utility is provided that enables users to initialize diskettes in either CP/M or TurboDOS format. Compatibility with CP/M, however, is not the only similarity between the two operating systems as TurboDOS provides extensive file-management facilities that are more like those normally associated with mainframe operating systems.

USER FRIENDLY. TurboDOS is as easy to use as it is powerful. BIOS errors are completely eliminated and self-explanatory screen prompts are provided whenever an error is detected or mistakes are made by the operator. A wide range of error recovery options are available to enable users to gracefully recover from mistakes without destroying or compromising valuable data.

MODULAR ARCHITECTURE. Modular architecture is one of the most unique features of TurboDOS. TurboDOS is packaged as a set of "building block" modules which can be combined in various ways to produce a family of complete operating systems. TurboDOS configurations presently available include single-task, spooling, multi-task, real-time, time-sharing, distributed-processing, and networking versions. Each functional area of the operating system is packaged as a separate relocatable module, as is each hardware-dependent driver. Some of these modules are mutually-exclusive alternatives while others are optional. Modular architecture makes it relatively simple to adapt TurboDOS to different hardware configurations. Because each hardware-dependent element is a separate relocatable module, any or all of these modules can be changed easily, without having to perform massive re-assemblies or complex system generation procedures. In fact, reconfiguring TurboDOS to a new hardware environment is so simple, it can even be performed by the end-user. TurboDOS source code is also available on a module-by-module basis to high volume OEMs and users.

INCREASED DISK CAPACITY. Business applications are often limited by the available disk capacity of a system. TurboDOS permits the storage of 25% to 35% more data on each floppy disk, compared to most CP/M implementations. Much of this increased capacity is achieved through the use of larger physical sector sizes on diskette. Additional capacity is achieved by eliminating the reserved "system tracks" required by CP/M and other operating systems. To provide full compatibility, standard-format CP/M 5" 1/4 525 diskettes (128 bytes/sector) are also accommodated. To meet the needs of more sophisticated applications, TurboDOS also supports large hard disk drives in excess of 1,000 megabytes without partitioning, and allows random access to files up to 134 megabytes. In comparison, CP/M and MP/M have internal limitations which prevent them from supporting disk drives or disk files larger than 8 megabytes. Disk drives larger than 8 megabytes have to be partitioned into logical segments which makes them awkward to use.

SPECTACULAR PERFORMANCE. In comparative performance benchmarks, program loading under TurboDOS is six to ten times faster than CP/M with similar speed improvements obtained in file processing applications. In tests conducted by

an independent computer consulting firm, speed improvements were obtained with some applications that measured over fifteen times faster under TurboDOS than under CP/M. Much of this speed advantage is accomplished by a unique buffer manager that performs multi-level buffering of disk I/O (using least-recently-used (LRU) buffer assignment) combined with other sophisticated optimizations. The number and size of buffers can be changed dynamically using a utility program or an operating system call - permitting users to fine "tune" the operating system for optimum performance in a wide range of applications. Additional speed is provided by a program load optimizer which scans the allocation map of a program file, determines the sequentially allocated segments of the file, and loads these segments at the maximum transfer rate of the disk controller. The result is a substantial reduction in the number of physical disk accesses needed for sequential and random operations and a remarkable improvement in overall processing speed.

Another performance improvement is the elimination of warm-start and disk log-on delays. Warm-start is instantaneous in TurboDOS because the command interpreter is resident in system RAM and disk log-on is not required because the allocation map for each disk is stored on the disk itself. Written specifically for the Z80, TurboDOS takes full advantage of the extended instruction repertoire of the Z80 to provide additional increases in speed and reduce memory overhead. Use of Z80 registers has made it practical for the TurboDOS kernel to be fully re-entrant, providing high-performance concurrent print spooling operation capabilities with little or no impact on either console response or printer speed. A fundamental obstacle to multi-task performance under MP/M and CP/NET (and to despooling under CP/M) is the fact that the file management portion of these operating systems is not re-entrant. This means that a single task may block all other tasks for intervals up to several seconds (e.g., while deleting a multi-extent file). TurboDOS was implemented to be fully re-entrant throughout, making such extended blockages impossible.

ENHANCED RELIABILITY. Reliability and graceful recovery from errors is provided for by the TurboDOS operating system with capabilities similar to those available on mainframe operating systems. TurboDOS performs read-after-write verification of all disk update operations and its buffer manager makes it possible to do so without degrading performance to an intolerable degree. Whenever errors are detected, TurboDOS displays meaningful diagnostic messages on the console and provides the operator with a choice of recovery options. These include retrying the disk operation again, accepting the error and continue processing, or to abort the program.

Disk drive operation can be totally independent under TurboDOS. A major weakness of CP/M and MP/M is its hard-coded dependency on the availability of the "A" drive for cold-start and warm-start. If the "A" drive fails, the system will not run. TurboDOS does not depend on the availability of a specific disk drive but automatically scans all drives in the system to allow system start-up from any functioning drive. This feature allows normal operation even if the "A" drive fails enabling the operator to make continued use of the system until the defective drive is repaired or replaced. Independent drive operation can be an important feature in any serious business environment or application.

SIMPLIFIED DISK CHANGES. Changing disks has always been a problem under many operating systems. If an operator changes a disk at the wrong time under CP/M, the new disk is marked "read-only" and often results in an unrecoverable termination of the processing job. This can be very confusing to the operator and possibly catastrophic for the data. The problem of changing disks under MP/M is considerably worse.

This problem has been solved completely with TurboDOS as the allocation map for each disk is maintained on the disk itself. This permits the operator to change any disk at any time without fear of the disk becoming "read-only" or the data being compromised. TurboDOS also senses and automatically adapts to changes of disk format (one- or two-sided, single- or double-density, etc.).

OTHER ADVANCED FEATURES. TurboDOS includes a superb set of utilities that provides microcomputers with additional mainframe-like features: an incremental backup utility, high-performance automatic print spooling, a command language interpreter that accepts strings of multiple commands (not just single commands), a command file processor that permits multi-level nesting of command files, advanced record and file interlocks to permit multi-user access to common data bases, password/log-on security, a log file that keeps an automatic record of all system usage, system date and time functions, standard communications channel interface, and numerous others. Extensive error recovery and user verification options are also provided that make TurboDOS an extremely user-friendly operating system. Some examples include:

AUTOLOAD provides a flexible and user-defined facility for loading any program automatically at initial system start-up. This feature can be used to shield the operator from having to interact with the operating system completely.

DIR displays an alphabetized disk directory in columnar format on either the console or printer. Full or selective directories may be requested. The size of each file and the amount of space remaining on the disk is also included in the display.

COPY, RENAME and DELETE provide the means to copy, rename, and delete individual files or groups of files with full verification messages displayed on the console. All three utilities honor file names with "wild cards", and allow optional confirmation of individual file operations. Incremental disk copying capabilities are also included to enable users to copy files stored on larger capacity disks (e.g., a hard disk) onto multiple smaller capacity ones (e.g., floppies).

LABEL enables the user to assign a name or label to a disk volume. The disk label is displayed by DIR, and can be read or changed by user programs.

DRIVE displays on the console or printer the disk format specifications including data capacity, directory size, block size, sector size, sectors per track, number of tracks, and number of reserved tracks (if any).

DUMP displays a combined HEX/ASCII file dump on the console or printer.

LOGON and LOGOFF provide the user with the options of password protection and a record of all computer usage. The system can also be configured to assign designated users to specific user areas or disk drives with limited or unlimited access to files or programs for additional security.

PRINT, PRINTER, AND QUEUE allows the user to control the routing of print output including spooling and de-spooling functions.

SET and SHOW enable the user to set, display or clear file attributes such as Read-Only, Global, Shared/Not Shared, etc. for enhanced security

TYPE displays the contents of an ASCII file on the console or printer.

VERIFY enables the user to verify a disk for bad blocks or sectors and mark them to prevent the defective areas from being used. This permits continued use of media (e.g., a hard disk) that may have only a single flawed sector without necessitating immediate replacement or repair.

A Summary of TurboDOS' additional capabilities include:

- Automatic concurrent print spooling including concurrent operation of multiple printers while the operator maintains complete control at the console keyboard for other functions
- Automatic disk type sensing (one- or two-sided, single- or double density)
- Multiple commands per line
- Command files may be nested to any depth
- User programs may send command line to DOS for execution
- User programs may activate command files for execution
- Automatic command file execution at each cold- or warm-start
- User-defined program auto-load at cold-start and/or warm-start
- Automatic read-only access to user zero files from any user number
- Communications channel interface
- Real-time clock support (system time and date functions)
- Logical-to-physical mapping of disk drives
- User program can determine which disk drives are ready
- Most TurboDOS parameters can be changed by end-user

MULTI-USER FACILITIES. Multi-user configurations of TurboDOS provide the file and record interlocks necessary to permit simultaneous multi-user access to common data bases. Implicit file-level interlocks are completely automatic, require no user-program participation, and support multiple inquiry tasks concurrent with one update task. Explicit record-level interlocks support concurrent interleaved update by multiple tasks. Password-type log-on security prevents unauthorized access and protects private file libraries. A log file keeps an automatic record of all system usage. TurboDOS supports a sophisticated multi-queue print spooler that allows up to 16 printers to be shared by any number of users. The spooler accommodates special printing situations such as multiple forms, multiple fonts, and even hand-fed single sheets.

NETWORK CONFIGURATIONS. TurboDOS supports a multi-user network of interconnected microcomputers which can share a common pool of mass storage, printers and other peripherals. Since this approach provides a microcomputer dedicated to each user, TurboDOS is able to support a large number of simultaneous users with excellent performance. Networking configurations support all of the file/record interlocks and security features described above making networking TurboDOS ideally suited to the new generation of bus-oriented multi-processor microcomputer hardware which is now becoming available. Both master-to-master and master-to-slave interconnections are supported. Slave processor may be entirely down-line loaded from a master processor or may have their own local disk storage. Networking TurboDOS incorporates an advanced failure detection and recovery facility that makes the system virtually crashproof. Even a malicious user running in a slave processor cannot compromise the files or processing of data belonging to another user.

In the on-going search for better performance and a competitive edge, TurboDOS offers a cost-effective means of significantly improving the performance of Z80 based microcomputers. The enhanced utilities of TurboDOS alone could justify its purchase to the average user. Complete documentation is available for \$25 which includes a "User's Guide to TurboDOS" and a companion "Configuration Guide to TurboDOS". The configuration manual provides detailed step-by-step procedures that will enable virtually any person competent in Z80 Assembler to write the hardware-dependent drivers required to adapt the operating system to a new hardware environment. Source listings of sample drivers are included. A signed License Agreement is required before TurboDOS can be shipped. Contact your local computer dealer or order direct.



Alspa Computer, Inc.

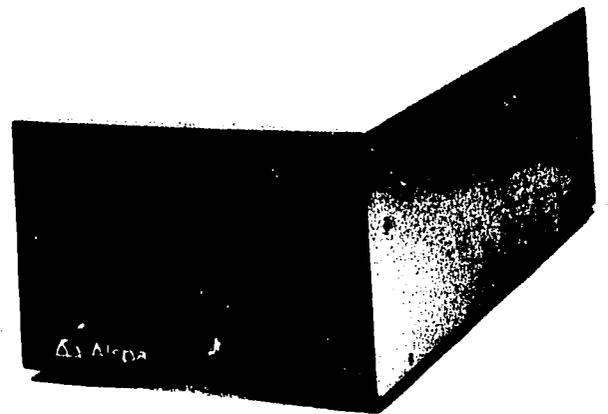
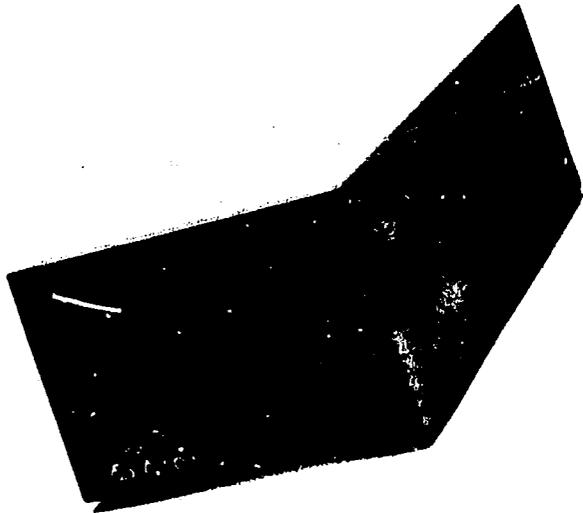
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Alspa Computer, Inc.

**High Speed
Business
Computers**



DESCRIPTION:

The ACI-1 and ACI-2 are powerful ISA based microcomputer systems which represent a new standard for effectiveness in high speed business computers. The system combines high performance 8-inch floppy disk drives, a sophisticated interrupt driven controller, 64K of RAM, three serial and two parallel I/O ports in a compact and sturdy metal enclosure designed for the office environment. The ACI-1 and ACI-2 computers will run all standard CP/M* software.

FEATURES:

Interrupt driven disk operating system (DOS) with 3ms track to track seek time, minimizes the time required for disk access.

Three RS-232 serial I/O ports which will run to 19.2K Baud, speeds communications with peripherals.

64K of Random Access Memory (RAM) is standard, runs all CP/M software.

Will run any industry standard high performance video terminal (usually 80 character by 24 lines) with a serial RS-232 interface.

Printer port will run all serial communication protocols including TX/ACK (daisy wheel printers), XON-XOFF, or RS-232 flow control and handshakes (dot matrix printers).

SOFTWARE:

The ACI-1 and ACI-2 computers are designed for use in the business world. They are highly efficient tools which may be used for word processing, spreadsheets, payroll, general ledger, inventory control, mailing lists, database management, etc. The large capacity of the 8-inch disk drive can easily store over 100 pages of text per diskette when used as a word processor, or all of the spreadsheet information for a business or department with a budget of several million dollars per year.

The small and versatile ACI-1 and ACI-2 computers are ideally suited for custom applications because they may be easily configured for specific requirements.

The ACI-1, with its IBM formatted 5.25 inch diskettes, is ideally suited for point of sale and data collection applications.

APPLICATIONS:

ALSPA system utility programs are provided with the CP/M master system diskette. They provide the following improvements on standard CP/M applications:

D.COM Our program which displays on the video terminal an alphabetical listing of the files on a diskette, their size, and how much storage space is left on the diskette.

FCOPY.COM Our copyrighted file copy and backup program for a single drive computer. FCOPY allows the files which you desire to copy to be addressed directly. For example the entry

FCOPY *.COM *DAT
would cause all of the COM and DAT files to be copied, the entry

FCOPY *.*
copies an entire diskette, the entry
FCOPY MYDATA

copies only the file MYDATA. More than 55K of data is transferred per diskette swap.

FORM1K.COM Formats a new diskette, installs the CP/M operating system and installs the program D.COM in a single operation. This is a significant improvement on standard CP/M. Single density (IBM-3740), or double density formatting is operator selectable when running the program.

SYST1K.COM A program which allows the CP/M operating system to be transferred from one diskette to another without disturbing the data tracks on either diskette. SYST1K.COM also allows the user to reconfigure the operating system on a diskette (printer drivers, etc.) and USART initialization in a menu driven fashion, eliminating long hours with DDT.

VALID1K.COM Our program which verifies that a diskette is properly formatted and that it has no bad sectors. The program may be run on working diskettes with no loss of data. Bad sectors, if found, are identified and displayed on the terminal.

CP/M:

CP/M is a powerful and easy to use operating system which manages the way the ACI-1 and ACI-2 computers use and run programs. It is a very comprehensive operating system for the programmer, yet is virtually transparent to the non-programmer using prewritten software. CP/M occupies a small space on the system diskette and is automatically loaded and ready for use after system power-on. It resides in system RAM (Random Access Memory) while the computer is on and in use. CP/M is recognized as the industry standard in operating systems, and has probably the largest selection of prewritten programs available of any operating system in use today.

MONITOR:

ACI-1 and ACI-2 computers contain a monitor program which resides in ROM. The monitor program will be accessed when no diskette is in the drive. The monitor program contains the following functions:

machine

code: LOAD, DUMP, MOVE, FILL, VIEW, GO

diagnostics: MEMORY TEST, DISKETTE TRACK-SECTOR

other: READ TERMINAL (emulates a full or half-duplex I/O terminal to both modem and printer ports).

Supports XON-XOFF communications protocol.

EXPANDABILITY:

ACI-1 and ACI-2 computers have a built-in RS232 port intended for use with a modem for easy communications over a telephone line. It can also be used as a "smart" time-share terminal.

ACI-1 and ACI-2 computers have a built-in hard disk interface. Up to 20MBytes of memory may be added with install time of less than 5 minutes.

RELIABILITY:

ACI-1 and ACI-2 computers are designed for years of trouble free service. Their single board construction eliminates most of the internal connectors which have historically been a major source of microcomputer failures. All ALSPA computers, including drives, are burned in for more than 60 hours prior to shipment to eliminate infant mortality component failures.

WARRANTY:

For a period expiring 4 months from the date of consumer purchase or 6 months from the date of original shipment from the factory, whichever occurs first, Alspa warrants the product to be free of manufacturing defects in material and workmanship.

LANGUAGE

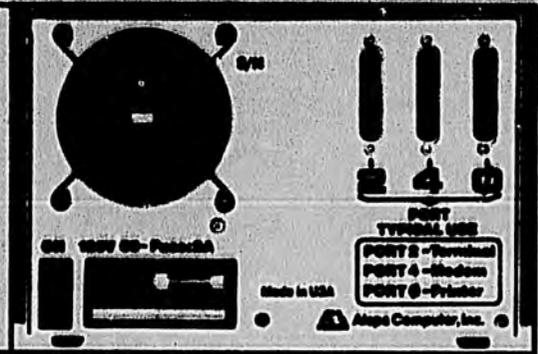
CBASIC-2™
 BASIC 80 Interpreter
 BASIC Compiler
 FORTRAN-80
 COBOL-80
 PASCAL MT+™
 PL/1-80™

**LANGUAGES
 INTERPRETER/
 COMPILER**

I/C
 I
 C
 C
 I/C
 C
 C

MANUFACTURER

Digital Research, Inc.
 Microsoft, Inc.
 Microsoft, Inc.
 Microsoft, Inc.
 Microsoft, Inc.
 MT Microsystems
 Digital Research, Inc.

**SPECIFICATIONS****ACI-1 and ACI-2****PROCESSOR:**

Z80A microprocessor, 4MHz clock

MEMORY:

64K Bytes of 200 nanosecond dynamic RAM
 2K Bytes of ROM, using a 2716 EPROM

I/O PORTS:

Three serial ports using 8251A USARTS, Baud rate is jumper selectable from 150 to 19.2K Baud
 One 34-pin parallel port configured for a Corvus** hard disk
 One 26-pin parallel port configured for a printer

OPERATING SYSTEM:

CP/M 2.2

ENVIRONMENTAL:

+10 to +40 Deg. Centigrade
 20 to 80% relative humidity, no condensation.

MECHANICAL:

Sheet Aluminum case
 Height - 5.75 In. (14.6 cm)
 Width - 8.6 In. (21.8 cm)
 Depth - 17.75 In. (45.1 cm)
 Weight - 19 Lbs. (8.6 KG)

POWER:

115 VAC, 60 Hz, 1.0 Amp.
 230 VAC, 50 Hz, 0.5 Amp.

DRIVE:

8-inch drive
 500K bits/sec. data transfer rate
 3ms. track to track seek time
 Phase lock loop clock recovery
 1X10⁻⁹ soft bit error rate

ACI-1/SS**DRIVE:**

Single sided, 8-inch drive
 596K Bytes when formatted double density
 241K Bytes when formatted single density (IBM-3740)

ACI-1/DS**DRIVE:**

Double sided, 8-inch drive
 1212K Bytes when formatted double density
 241K Bytes when formatted single density (IBM-3740).

ACI-2/SS**DRIVES:**

2 each, single sided, 8-inch drives
 596K Bytes per disk when formatted double density
 241K Bytes per disk when formatted single density (IBM-3740)

ACI-2/DS**DRIVES:**

2 each, double sided, 8-inch drives
 1212K Bytes per disk when formatted double density
 241K Bytes per disk when formatted single density (IBM-3740)

CLOCK CALENDAR (optional):

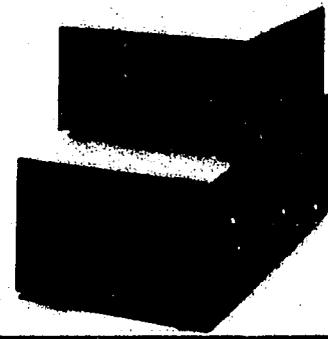
OKI MSM 5832 chip with a rechargeable battery back-up.
 Easy high level language or machine language software interface gives year, date, time of day to the second, etc.

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The HD-11M and HD-22M are hard disk drives specifically designed to interface with the ALSPA ACI-1 and ACI-2 computer. They are easy to install, typically 5 minutes or less, and significantly increase the speed and storage capacity of the ALSPA.

FEATURES:

- Integral Controller and Power Supply
- Small Size
- Easy To Install
- Quiet
- Low Cost



SPECIFICATIONS

HD-11M and HD-22M

CAPACITY:

HD-11M

Unformatted - 13.3 Mbytes.

Formatted - 10.8 Mbytes (2 logical drives of 5.4 Mbytes each).

HD-22M

Unformatted - 26.7 Mbytes.

Formatted - 21.6 Mbytes (3 logical drives of 7.2 Mbytes each).

INTERFACE:

ALSPA parallel port interface.

MECHANICAL:

Sheet Steel case.

Height - 4.62 In. (11.7 cm)

Width - 8.87 In. (22.5 cm)

Depth - 11.75 In. (29.8 cm)

Weight - 15 lbs. (6.8 Kg)

POWER:

115 VAC, 60 Hz, 0.5 Amp.

230 VAC, 50 Hz, 0.3 Amp.

ENVIRONMENTAL:

+10 to +40 Degrees Centigrade.

20 to 80% relative humidity, no condensation.

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Manasquan, NJ
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Santa Cruz, CA
(408) 429-6000

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ALTOS DELIVERS THE NEWEST 16-BIT MICROCOMPUTER FAMILY THAT REALLY MEANS BUSINESS.

Your authorized Altos representative:

Packed with fresh ideas for business



375 East Trimble Road, San Jose, California 95131
(408) 948-6700, Telex 171562 ALTOS SNJ or 470642 ALTO UI
800-538-7872 (In Calif., 800-662-6265)

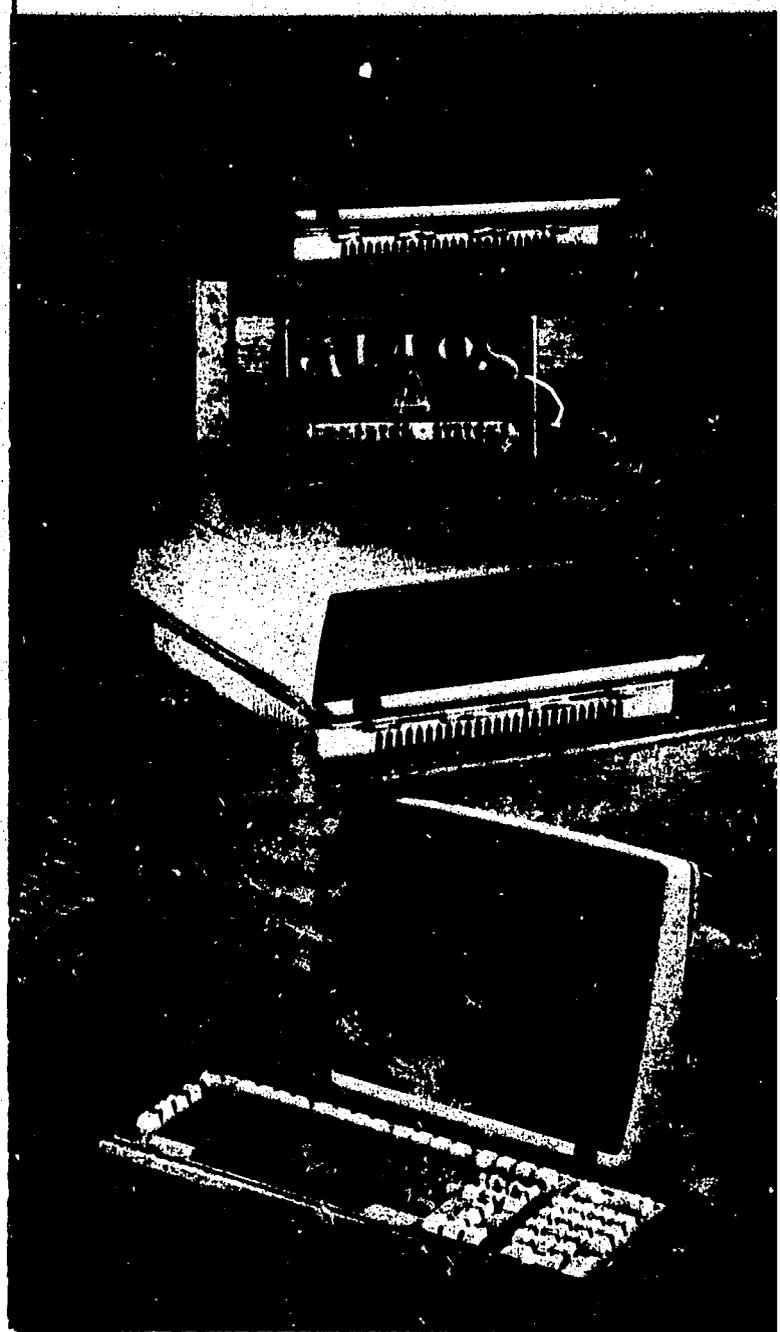
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**Introducing the
ALTOS® 586 Family—
The world's most
complete multi-user,
16-bit microcomputer.
Delivering higher
performance at a
lower cost per user.**

Here is the microcomputer that you can use throughout your business. Run bigger programs faster with a true 16-bit processor that transfers more data at one time and addresses up to one full megabyte of memory. Serve five to eight users without long waits. And do it all easily with menu-driven, business-oriented commands that make the powerful XENIX™/UNIX™ operating system accessible to your people—even first-time computer users.



Altos gives you more.

HARDWARE

FEATURES:	BENEFITS:
16-bit, 8086 CPU running at 10 MHz	Faster execution and response time
Multi-tasking, multi-user with six RS-232 ports, expandable to 10	Five users, expandable to eight, can perform different tasks at once
256K or 512K of RAM, expandable to one megabyte	Run large applications programs with fast response times
Intelligent disk controller and intelligent I/O	For faster multi-user performance
Data storage to 2, 10 or 20 megabytes using 5¼" floppy and Winchester disk drives, plus a 40MB option	Room for up to 10,000 pages of data
Proprietary memory management	Enhances UNIX performance
Real time clock	Automatically keeps track of time, even when system is turned off
Power fail detection	Saves files on disk, even if power suddenly fails
Service	Responsive, worldwide service and maintenance (Customer Service Division TRW, Inc. in U.S. only)

SOFTWARE

User-friendly interface to business applications	Utilizes the full potential of XENIX/UNIX operating system
Ready-to-run ABS/86 applications software	Integrated accounting, word processing and financial planning
ALTOS COMPUTER TUTOR	Built-in, on-screen tutorial helps users to learn and use the ABS/86
Choice of XENIX/UNIX, CP/M-86, MP/M-86, DASM-16, MS-DOS or PICK operating systems	Choice from the largest body of readily available, proven 16-bit applications
Altos 586 Operator's Guide	Makes installing and using the Altos 586 easy
Diagnostics	Standard with every system

COMMUNICATIONS

ALTOS-NET,™ ETHERNET™ and Electronic Mail	Local network for full office automation system
2760/2780, 2870, SNA/SOLC protocols	Communicate over modem to mainframe computers
Communications systems options	Includes auto-dial, auto-answer modem, two chip Ethernet interface, and four additional RS-232 ports for four more users—total of eight users

Computer power that gives you complete business solutions that you can use now.

The ALTOS 586 system can be delivered with advanced operating systems, user-friendly "business command menu" interfacing, and application software, such as the complete Altos ABS/86 package with ready-to-use accounting, word processing and financial planning applications. The 586 supports all of these applications under XENIX/UNIX, a powerful microcomputer implementation of the Bell Laboratories UNIX, Version 7 operating system.

The Altos "business command menu interface" makes XENIX/UNIX easier to use. This enables you to customize your own menus with separate menus for users, system administrators, and system designers. It provides extensive "help" facilities that guide usage. It simplifies user authorization procedures, enabling you to control access to sensitive information. It even lets you configure so that you can use most terminals with RS-232 ports.

Altos can also combine other industry-standard operating systems, languages, text processors, information handlers, and utilities in one package. This includes support in COBOL, BASIC, FORTRAN, PASCAL and C languages. Which means when your application changes or it's time to move to another Altos computer, it can easily be modified and transported.

The Altos Business Solutions (ABS/86) business applications software is integrated for use with the Altos 586 and is a ready to run, turnkey system. And to make it easy, the ALTOS COMPUTER TUTOR is a self-paced, step-by-step, on-screen tutorial that helps anyone learn to run

XENIX/UNIX Business command menu

ALTOS ACCOUNTANT

ALTOS EXECUTIVE WORD PROCESSOR

ALTOS EXECUTIVE FINANCIAL PLANNER

User-friendly, menu driven business applications

Seven modules business accounting with built-in ALTOS COMPUTER TUTOR

Word processing, forms letters, spelling checker with built-in ALTOS COMPUTER TUTOR

Financial planning

the ALTOS ACCOUNTANT, ALTOS EXECUTIVE WORD PROCESSOR and ALTOS EXECUTIVE FINANCIAL PLANNER.

The ALTOS ACCOUNTANT includes all major elements of a comprehensive accounting system, including general ledger, accounts payable, accounts receivable, payroll, inventory control, job costing and order processing.

The ALTOS EXECUTIVE WORD PROCESSOR makes word processing easy. Self-teaching modules, prompting menus and "help" aids optimize powerful word processing features. Computerized proofreading and mailing list management add extra efficiency, quality and convenience. Multi-user access makes it a more attractive investment than stand-alone word processors.

The ALTOS EXECUTIVE FINANCIAL PLANNER is one of the most powerful general business planning tools ever developed for microcomputers. It helps you model, estimate, budget and forecast. Simply enter numbers, titles or formulas. The Planner performs the computations. And when you change a number or formula, it automatically re-computes every dependent number throughout the spreadsheet.



The Altos 586—computer power for five to eight users.

Other operating systems. Altos also supports CP/M-86 and MP/M-86 operating systems from Digital Research, OASIS-16 from Phase One, PICK from Pick & Associates and MS-DOS from Microsoft.

Use your existing software. The Altos 586 family uses a 16-bit processor. But most 8-bit application packages can be re-compiled by a software engineer to run on the 16-bit configuration when source code is available. You can use the Altos file transfer program to move your 8-bit MP/M™ source and data files over to any 16-bit XENIX or MP/M-86-based Altos system. Or, if you already have your software running on the Altos ACS8600 family, all that's required is a simple transfer from the 8" ACS8600 to the 5¼"-based 586.

The Altos 586 is a 16-bit, multi-user system with multiple processors, up to one megabyte of memory, parity on RAM memory, and proprietary memory management design. It offers full communications support, intelligent disk controller, intelligent Z80-based serial I/O controller and integrated Winchester/floppy data storage. And all at a lower cost per user.

Powerful 16-bit processors. The proven 8086 16-bit microprocessor CPU operates at 2.5x the clock speed of

The Altos 586 lets you take your software with you.

If you've got ...

Then just ...

An application written in a high-level language with source code

CP/M® Programs

MP/M 8-bit software

IBM PC™ Programs*

Altos ACS8600 16-bit software

*Any standard 8086 program

Example

Use Altos CP/M emulation program to run XENIX

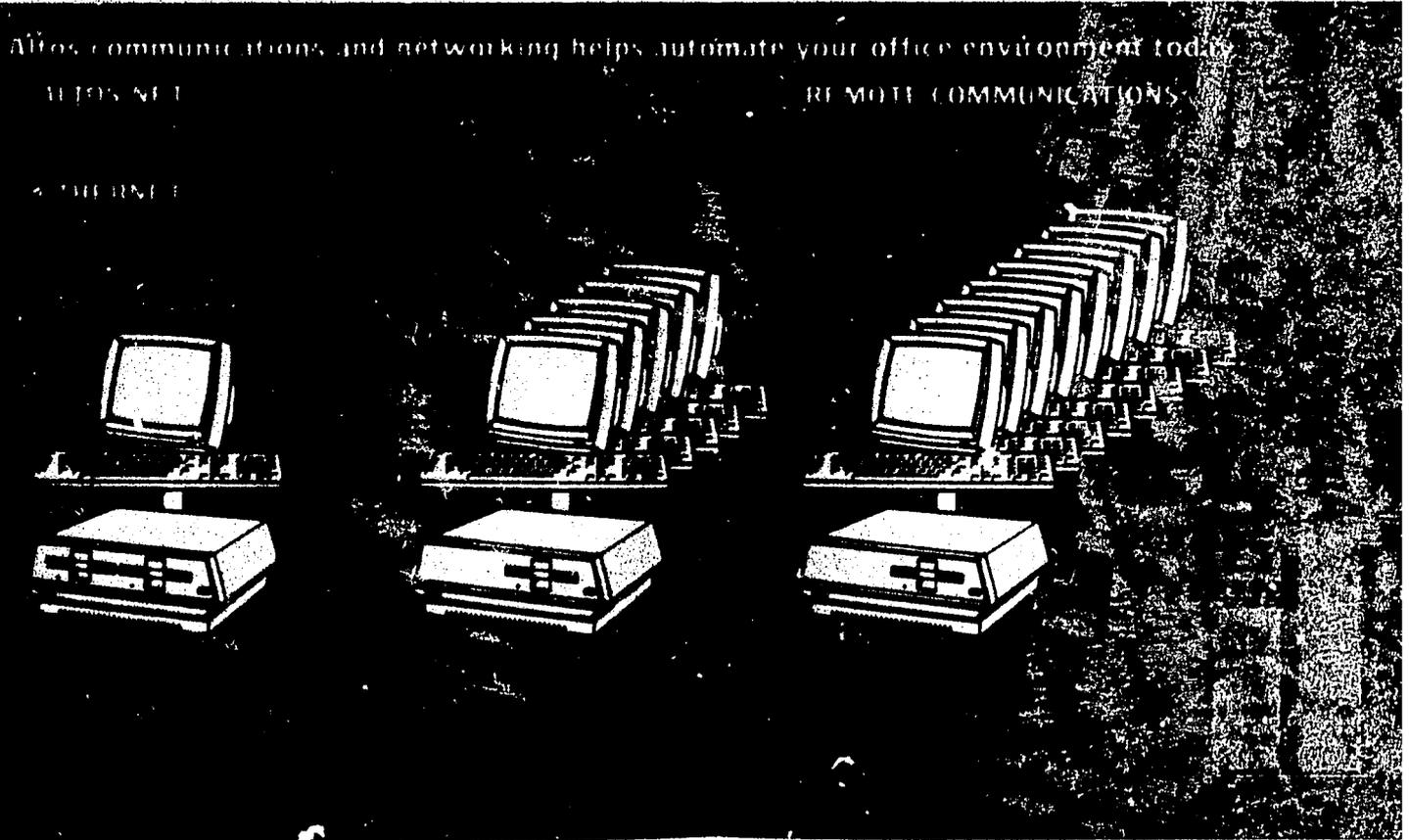
Port it over to XENIX/UNIX or MP/M-86 with an Altos file transfer program

Run it using our MS-DOS operating system

Port it over to your Altos Series 586 with an Altos file transfer program

the Z80—a fast 10 MHz. It performs 8 and 16-bit signed and unsigned addition and subtraction in binary or decimal, and has 16-bit multiplication and division instructions.

Unique memory management. The Altos 586 family uses a proprietary memory management system. This capability provides for efficient memory management and utilization, protection and security necessary in a multi-user environment.



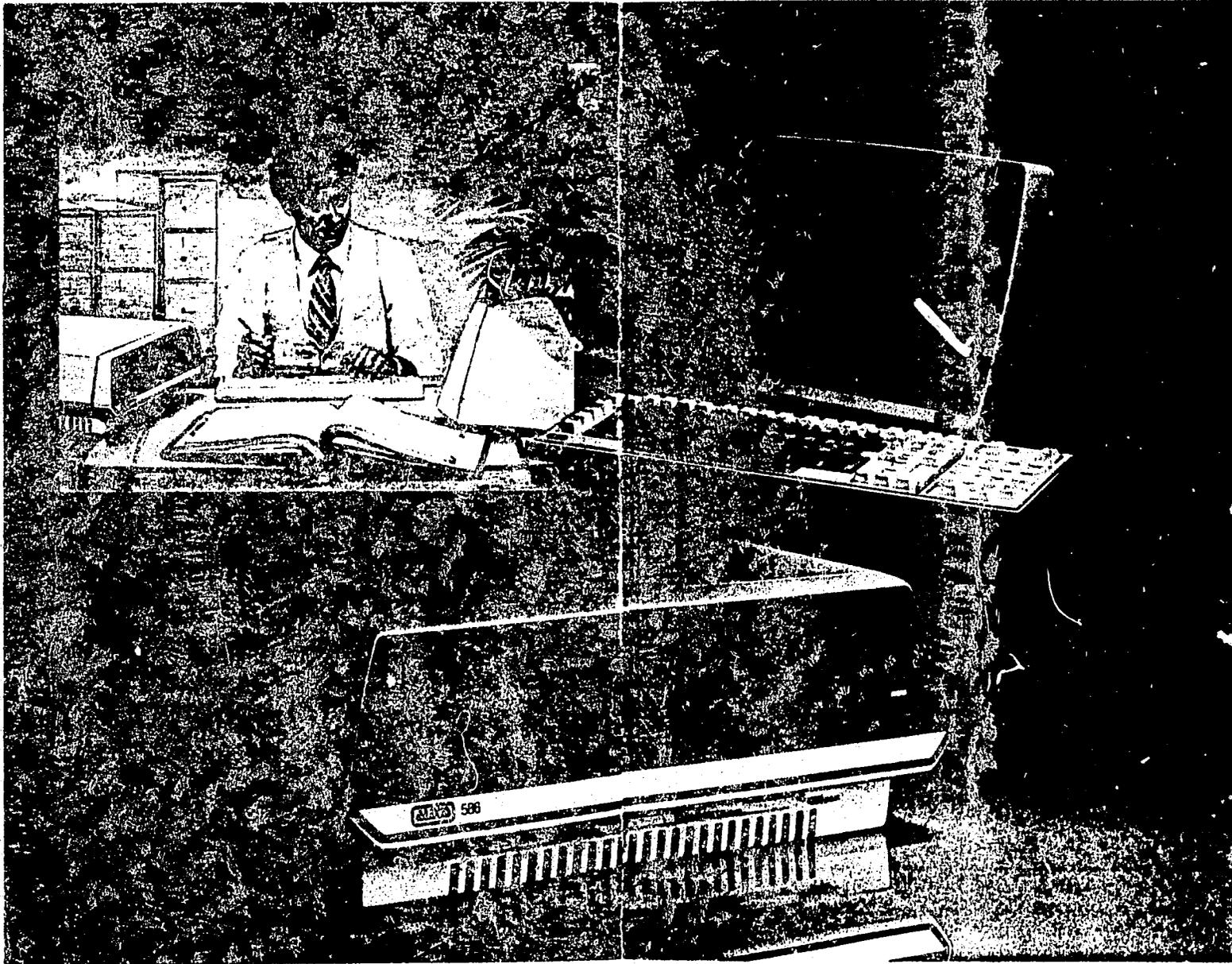
Memory expansion. The Altos 586 dual floppy configuration includes 256KB of RAM. All hard disk systems include 512KB, standard. Every system is expandable to one megabyte.

More data storage. All 586 systems come with at least one megabyte of floppy storage. Hard disk models are available with 10 MBytes, expandable to 20 MBytes, plus a 40 MByte option on Winchester disk drives.

Hard disk systems integrate an intelligent disk controller that takes full advantage of higher CPU speed and fast hard disk access. The controller supplies full track buffering, consecutive sector transfers, offloading of central processor, and enhanced throughput.

Magnetic tape back-up. Mag tape back-up copies from hard disk give you low-cost insurance for important files. The Altos MTU Series of high-capacity, high-performance tape drive provides this optional back-up at low cost.

Communicate with other systems. The Altos communications option includes an auto-dial, auto-answer modem, Ethernet interface, and four additional RS-232 ports. One port is configurable for 800KB, two may be configured for synchronous—2760/3760, 3270 or SNA/SDLC. Altos communications software supports asynchronous and synchronous protocols, and provides networking facilities.



You can count on Altos.

Altos microcomputers are the choice of business and computer professionals—Fortune 1000 companies, computer service organizations, major software developers, and even mainframe computer manufacturers. We have delivered more than 30,000 multi-user systems and participate in major OEM customers and systems integrators, worldwide.

Service and maintenance you can count on. For your convenience, authorized Altos service centers are strategically located throughout the United States. Spare parts are stocked locally in over 30 cities, allowing a quick exchange of system components. Nationwide independent service is available through the Customer Service Division of TRW, Inc. Your Altos dealer can arrange a service contract to fit your individual needs.

Ask your dealer to demonstrate the 16-bit microcomputer system that really means business—the Altos 386.

The Altos 386 Family

MODEL	CPU	MEM (KB)	DISK (MB)	FLOPPY (5.25)	LANG (KB)	MS-DOS
386-2	8086	10	2.25*	2	—	0
386-10	8086	10	5.25*	1	10	0
386-14	8086	10	5.25*	2	40	0

* Expandable to one megabyte.

† One port configurable for RS232C, two configurable for RS232C, or expandable to ten serial ports, modem and two other devices.

Systems Software Supported By Altos 386

Operating System	Language	Hardware
UNIX/UNIX	FORTRAN	IBM PC
MS-DOS	PASCAL	IBM PC
PICK	COBOL	IBM PC
CP/M-86	FORTRAN	IBM PC
MP/MS-86	C	IBM PC
QDOS-16		IBM PC

Eight-inch Winchester hard disk systems. A bumper crop.

The Altos family of 8-inch Winchester based systems.

We've integrated our proprietary single board computer and disk drive controller with Winchester disks to give you a powerful system that can handle mid-sized data bases and serve up to four work stations. The faster speed and bigger capacity of Winchester allows you to take full advantage of our high CPU speed. And you can't buy a true multi-user system for less money.

A better 8-inch Winchester. Choose from two fully integrated multi-user systems, each packaged in compact, stylish cabinets suitable for tabletop or rack-mount installation. Both come complete with 208 KBytes of RAM and six programmable serial ports. An RS-32 communications



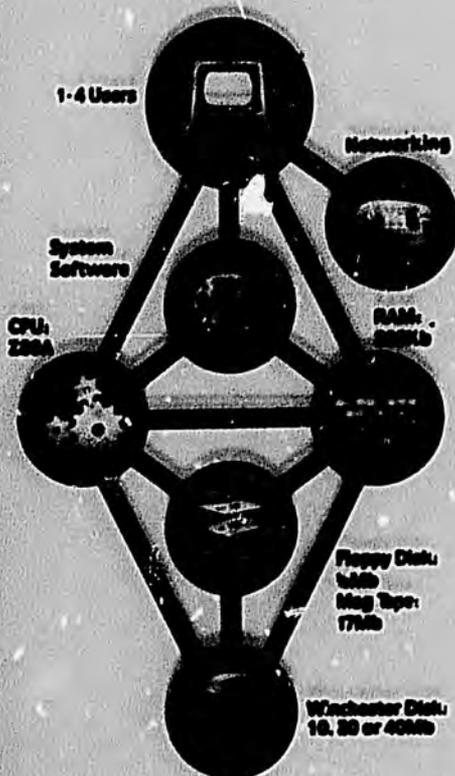
port is standard and supports 800 KBits for full networking. We also give you a choice of back-up media—floppy disk (single sided ACS8000-10 -12 or -14) or mag tape cartridge (MTU-2).

Why Winchester?

Winchester technology is a significant advancement in data storage. Sealing read/write heads and media away from external contamination protects data storage from smoke, dirt and careless

operators. It eliminates the interchangeability and misalignment problems inherent in removable disk drives. It offers greater capacities at lower cost per megabyte, faster access, greater reliability and less maintenance. These advantages have been proven in many disk drives from many manufacturers.

Why back-up? While Winchester provides better performance, greater reliability and bigger capacity, the disks aren't removable. For this reason, most users want the capability to copy important files and programs on transportable media. Using the floppy or mag tape cartridge, you can make copies to store, share with other users, etc. Limiting the use of your floppy drives to I/O and back-up also extends floppy media and drive life.



Multi-User 8-inch hard disk based systems

Model	ACS8000-10	ACS1000-12	ACS8000-14
CPU	Z80A (4 MHz)	Z80A (4 MHz)	Z80A (4 MHz)
RAM Memory	208 KBytes	208 KBytes	208 KBytes
Number of Users	1-4	1-4	1-4
Floppy controller density	Double	Double	Double
Floppy drive type	Single sided	Single sided	Single sided
I/O ports Serial Parallel	6 (Full RS232C) 1 (18 signal lines)	6 (Full RS232C) 1 (18 signal lines)	6 (Full RS232C) 1 (18 signal lines)
Number of drives Winchester Floppy	1 1	1 1	1 1
Total storage Winchester Floppy	10 MBytes ½ MByte	20 MBytes ½ MByte	40 MBytes ½ MByte

NOTE: Stand-alone magnetic tape cartridge back-up can be added to any hard disk based system (Model MTU-2). Winchester disk capacities are specified unformatted.
All systems can be expanded to a total of two Winchester disks.



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The ACS8600 family

The new 16-bit 8086 micro system

With CP/M-86, MP/M-86, OASIS-16 and UNIX.

Another first from Altos.
Minicomputer performance at a microcomputer price

Why you should consider the ACS8600 family.

More power. Our 8086-based family is designed to perform larger, more complex tasks for up to 8 users. Larger word size allows the use of more powerful instructions and direct addressing of more memory. This means the system requires fewer instructions and fewer computer cycles to accomplish the same job. It also means that it can handle complex mathematical problems, large data base searches and other demanding applications in far less time.

Serving more users. Altos has pioneered the development of microcomputer-based multi-user systems. Our 8-bit ACS8000 series systems can perform a wide range of tasks for up to four users. As more users are added to the system and the tasks become more complex, a 16-bit computer may be required.

More powerful processing capability, bigger memory, and special memory



management of the ACS8600 family extend multi-user capabilities and allows true multi-tasking. Up to eight users are served without long waits for service.

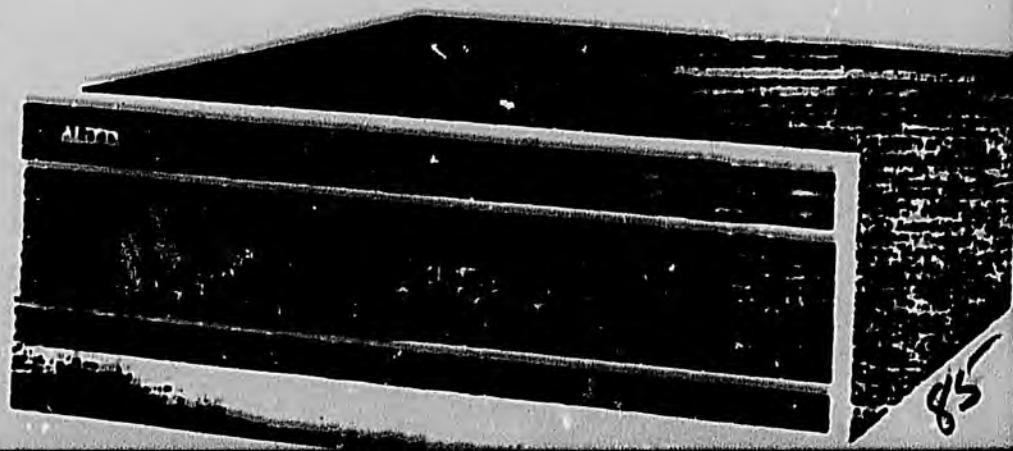
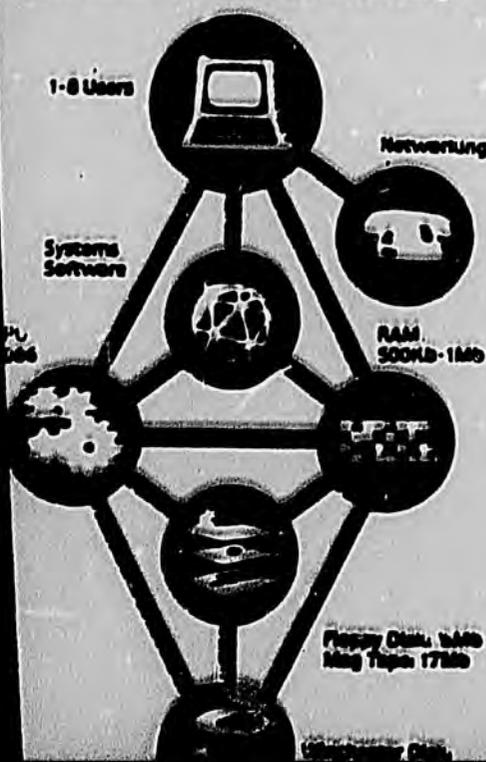
8086 16-bit multi-user features at an 8-bit system price.

- Multiple Processors (8086, 8089 and optional 8087)
- Error Correction On Memory
- Direct Addressing to One Megabyte of Memory.
- Proprietary Memory Management Design
- Full Communications Support (Async, Bisync, Networking)
- Integrated Winchester/Floppy or Mag Tape Data Storage
- Multibus™ Expansion Interface
- Up to 1 MByte of 64K MOS RAM Memory Chips
- CP/M-86,™ MP/M-86,™ OASIS-16 and UNIX™

Powerful 16-bit processors. The CPU is the proven 8086 16-bit HMOS microprocessor. The CPU operates at fast 5 MHz. It can directly address one megabyte of memory. It uses assembly language compatible with the 8080/8085. It performs 8- and 16-bit signed and unsigned arithmetic in binary or decimal, including multiply and divide.

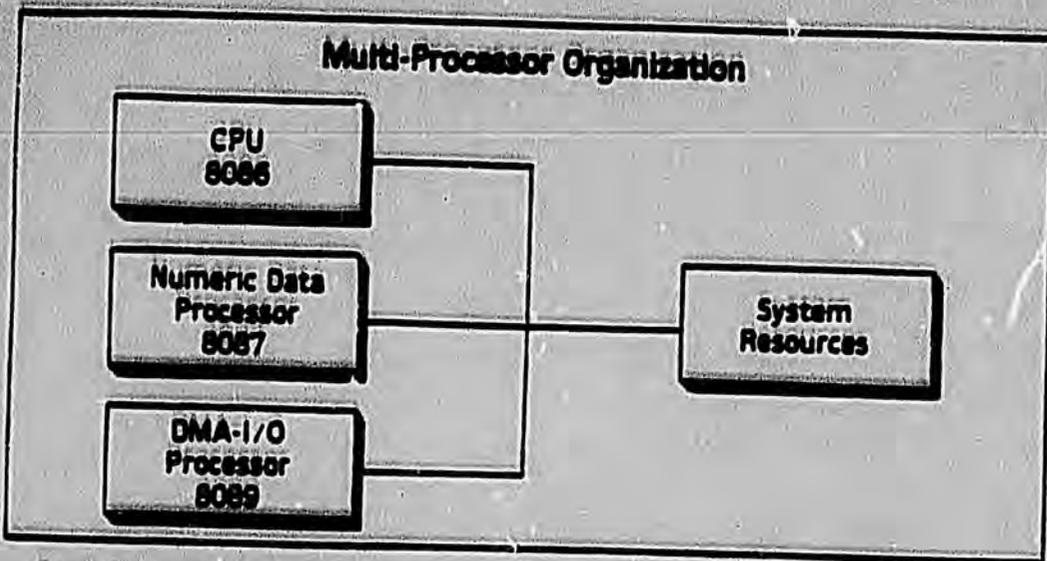
Multiple processors. The ACS8600 family uses more than one processor. While the 8086 serves as the master CPU, other "slave" processors are dedicated to special tasks. For example, a second processor (8089) handles direct memory access (DMA). An optional math processor (8087) handles math functions. While each processor is optimized for specific tasks, they work together to share the workload for faster execution and response time.

Error correction. While even many mid-sized minicomputer memories lack Error Correction Code (ECC), the ACS8600 family improves operational reliability with its own ECC. The memory has full error detection for single and double bit errors and correction of single bit errors. This reduces system errors that can lock up a system, because memory contents have changed.



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Multi-Processor Organization



Proprietary memory management design optimized for UNIX. The ACS8600 family' proprietary memory management system assigns a logical-to-physical address translation and various access attributes to each 4 KByte block within the 1 MByte maximum so that non-contiguous physical memory can be assigned to any given task. This capability reduces the need to swap users or tasks out to disk. The result is that data base sorting and other tasks, often best implemented in a UNIX-like environment and requiring large memory, are performed faster. The system also provides write and access protection to increase reliability and performance.

Choose from four of the most popular operating systems and eight high level languages. The ACS8600 family supports XENIX™ which is Bell Labs UNIX, version 7 adapted by Microsoft. Also supported are CP/M-86, MP/M-86 and GASIS-16 operating systems. This means that the more than 300,000 current users of CP/M, MP/M and GASIS can upgrade their systems to the ACS8600 and bring their application software with them.

And to assure the maximum transportability of applications software, every operating system is supported with the same high level languages: Microsoft versions of BASIC, COBOL, PASCAL and FORTRAN, as well as EIS-COBOL, RM-COBOL, PASCAL/M-86 and C-BASIC-86.

Altos supports complete communications. Every Altos 8- and 16-bit computer comes ready to support complete networking, including remote disk access, file transfer, spooled printer services, remote terminal access, communications gateways, and electronic

mail. Altos offers several communications packages that allow Altos systems to communicate with other computers. These software products enable asynchronous communications between an Altos and a remote computer, bisynchronous communications using IBM 2780/3780 protocols, and IBM 3270 terminal emulation for remote job entry from Altos computers.

Integral data storage. The system accommodates 8-inch floppy disks (double density, single sided) as well as 8-inch Winchester hard disk drives for large capacity storage (20 or 40 MBytes), I/O and backup. We've integrated our proprietary single board computer and disk drive controller with Winchester disks to give you a powerful system that can handle large data bases and serve up to eight users. The faster speed and bigger capacity of Winchester allows you to take full advantage of high CPU speed.

Eight-inch Winchester hard disk systems. Our multi-user eight-inch hard disk systems give you from 500 KBytes up to a full megabyte of RAM memory and a choice of 20 or 40 megabytes of ultra-reliable storage on Winchester hard disks plus a choice of floppy (single-sided) or magnetic tape cartridge

In addition, you can use up to 8-inch Winchester hard disks to your capacity, i.e. 20, 40 or 80 MBytes. Magnetic tape cartridge back-up. Many users like transportable magnetic tape to provide back-up for the hard disk. It's low-cost insurance for important files. Altos gives you magnetic tape back-up with an 8-inch Winchester. Or you can add mag tape backup with our MTU-2 — a stand-alone magnetic tape cartridge back-up. This can be added to any Altos hard disk system. All mag tape systems include complete mag tape back-up software.

Additional storage. If you need more data storage, you can plug in one or two add-on storage modules — 8-inch Winchester and mag tape cartridge 8-inch Winchester.

Multibus expansion interface. Multibus compatible expansion packages allow expansion beyond standard peripherals to tailor the system to special requirements.

Need more than 80 MBytes of Winchester? You can add a Multibus compatible expansion enclosure that permits interface to a Storage Module Drive (SMD) of up to 300 MBytes, 9-track tape for unlimited archival storage.

You can also add an Ethernet interface, array processors, A-to-D or D-to-A converters, IEEE-488 bus interface, digitizer or digital relay boards.

Memory expansion. The basic ACS8600 family configuration includes 256 KBytes of RAM. Memory is expandable to 1 MByte.

CPU — Intel 8086 16-bit Microprocessor

- Direct addressing capability, 20 MBytes of memory
- Assembly language compatible 8080, 8085

The Altos Software Compatibility Curve

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MP/M
CP/M
GASIS

8086
MP/M-86
CP/M-86
GASIS-16

- 8- and 16-bit signed and unsigned arithmetic in binary or decimal, including multiply and divide
- 5 MHz clock rate

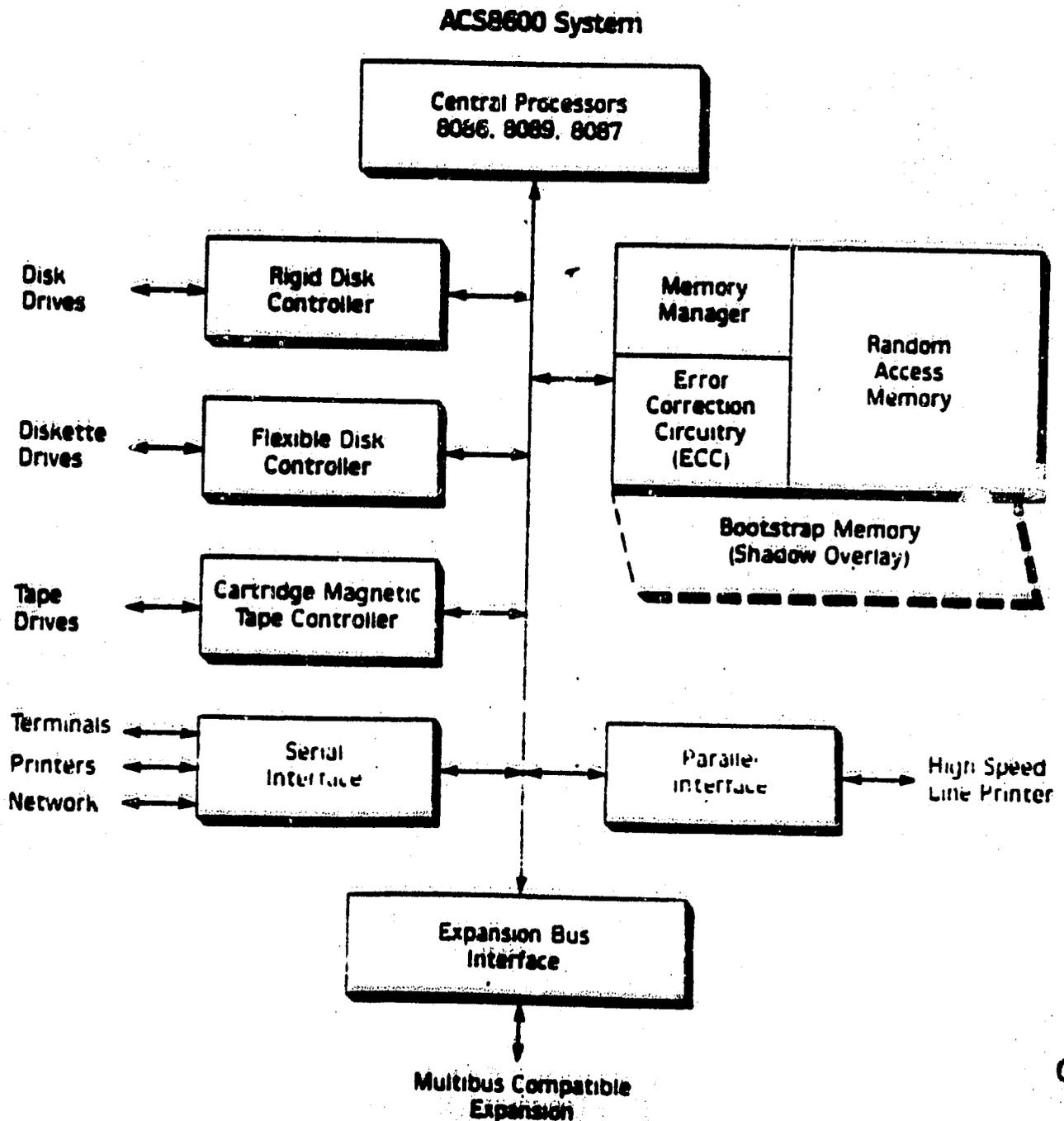
Unique Altos Design Characteristics

- Multiple processor strategy:
 - 8086 CPU
 - 8089 DMA
 - 8087 (Optional) Floating Point Math Processor (5 MHz only)
 - 8089 DMA-I/O Processor for rapid movement of large data blocks
- Supports up to 8 terminals

- ECC – Error Correction Code
 - Single bit correction
 - Double bit detection
 - Accomplished via LSI circuitry
 - Self diagnostics capability
- Proprietary Memory Management Design optimized for UNIX
 - Memory mapping in 4 KByte blocks
 - Write protection
 - Access protection
- Full Communications Support
 - Asynchronous (Async)
 - Synchronous (Bisync)
 - Networking
 - High speed (800 KBits) communications port

Multibus Compatible Expansion Port

- Ethernet Interface
- Array Processors
- A/D, D/A
- Tape Interface (9 track)
- Hard Disk Controllers (SMD interface included)
- Bubble Memory
- IEEE-488 Bus Interface
- Digitizer
- Digital Relay Boards



Multi-User 16-Bit Winchester Systems

Models	ACS8600-12	ACS8600-14
CPU	8086 (5 MHz)	8086 (5 MHz)
RAM Memory	500 KByte (upgradable to 1 MByte)	500 KByte (upgradable to 1 MByte)
Users	1-8	1-8
I/O ports		
Serial	8 (RS232)	8 (RS232)
Parallel	1 (24 programmable lines)	1 (24 programmable lines)
Winchester No. of drives	1	1
Total storage	20 MBytes	40 MBytes
Floppy	ACS8600-12	ACS8600-14
Controller density	Double	Double
Drive type	Single Sided	Single Sided
Number of drives	1	1
Storage capacity	½ MByte	½ MByte

IMPORTANT NOTES:

- Stand-alone magnetic tape cartridge back-up can be added to any hard disk based system (Model MTU-3)
- Any hard disk capacity can be doubled to 40 or 80 MBytes
- Winchester disk and mag tape cassette capacities are specified unformatted

CP/M is a registered trademark. CP/M-86, MP/M and MP/M-86 are trademarks of Digital Research, Inc. OASIS and OASIS-16 are products of Phase One Systems, Inc.

Z80 is a trademark of Zilog, Inc.

MuPlus is a trademark and 8086, 8087 and 8088 are products of Intel Corporation

XENIX is a trademark of Microsoft and is a microcomputer implementation of the UNIX operating system. UNIX is a trademark of Bell Laboratories

Ethernet is a trademark of XEROX Corporation



COMPUTER SYSTEMS

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Floppy and hard disk 5¼-inch multi-user systems.

The new Altos Series 5 Family of microcomputers

The Altos Series 5 family packs more data into a compact, stylish cabinet. We've integrated our proprietary single board computer with a choice of two data storage configurations:

- **Series 5-1SD** provides two double-sided 5¼-inch minifloppys, each carrying one megabyte.
- **Series 5-5D** replaces one minifloppy with a 5¼-inch micro-Winchester disk (5 megabytes).*

The bigger capacity of the 5¼-inch Winchester allows the user to take full advantage of the Z80's high CPU speed. Either one of these powerful systems can handle up to three work stations. And you can't buy a true multi-user, multi-tasking system for less money.



Field Upgradable. With the addition of a disk controller the twin floppy (Altos Series 5-1SD) can be converted to a hard disk model.

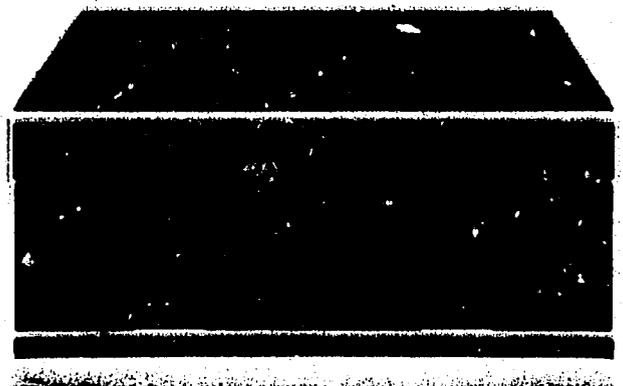
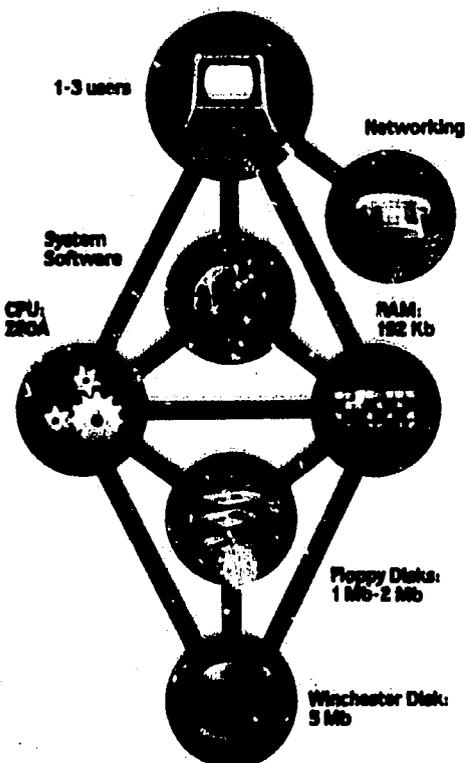
I/O Ports. Both models come with four serial (RS-232C) ports and one parallel port. One serial port can be reconfigured as a high speed (800 KBits), multi-drop network port, another can be reconfigured for bisynchronous communication operation. The serial ports have independently selectable baud rates.

Partitioned memory prevents contention. Altos' 5¼-inch systems feature a proprietary single board computer with a 4 kilobyte PROM for initial program loading and 192 kilobytes of dynamic RAM memory with parity checking.

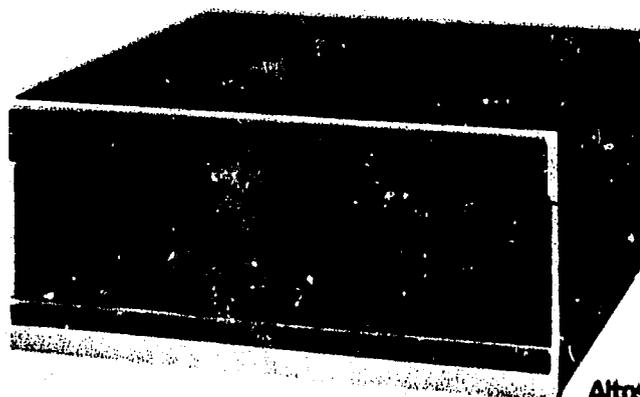
Three users can use the system without contending for memory. Each user has a partitioned block of 48 kilobytes. Another 48 kilobyte block is reserved for utility and operating system programs. With this partitioning Altos becomes a true multi-user, multi-tasking computer in which three separate applications can run at the same time (i.e. word processing, financial planning and accounts receivable).

Direct Memory Access (DMA) provides fast disk access speed to give multiple users data quickly and efficiently.

*Winchester disk capacities specified formatted.



Altos Series 5-1SD



Altos Series 5-5D

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Parity Checking automatically notifies the user of any problem with RAM in the system. The dynamic memory circuit adds a ninth bit to each byte for parity checking. The parity bit is updated with each memory write, then checked with each memory read. The user is notified of any RAM errors.

Micro-Winchester technology offers greater capacities at lower cost per megabyte, greater reliability and less maintenance. It is a significant advancement in data storage. Sealing read/write heads and media away from external contamination protects data storage from smoke, dirt and careless operators. It eliminates the interchangeability and misalignment problems inherent in removable disk drives.

Floppy disk back-up. While micro-Winchester provides better performance, greater reliability and bigger capacity, the disks aren't removable. For this reason, most users want the capability to copy important files and programs on transportable media. Using the minifloppy, copies can be stored for back-up or shared with other users.

A choice of three industry standard operating systems, a wide range of high level languages, and a selection of hundreds of application packages adds up to maximum utility in a small, powerful package.

Operating Systems

- CP/M[®] is the industry's standard, and most popular operating system from Digital Research, Inc.
- MP/M II[™] is the multi-user, multi-tasking version of CP/M.
- OASIS from Phase One Systems, Inc., is available in single and multi-user versions.

[®]CP/M is a registered trademark and [™]MP/M II is a trademark of Digital Research, Inc.

[™]Z80 is a trademark of Zilog, Inc.

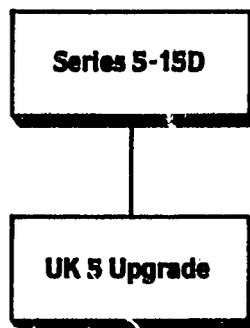
Multi-user 5¼-inch based systems

Model	Series 5-15D	Series 5-5D
Number of users	1—3	1—3
CPU	Z80A (4 MHz)	Z80A (4 MHz)
RAM memory	192 KBytes	192 KBytes
Floppy drive type	Double sided minifloppy	Double sided minifloppy
I/O ports		
Serial	4 (RS232C)	4 (RS232C)
Parallel	1 (18 signal lines)	1 (18 signal lines)
Number of drives		
Minifloppy	2	1
Winchester	—	1
Total storage*		
Minifloppy	2 MBytes	1 MBytes
Winchester	—	6 MBytes

*Disk capacities are specified unformatted.

Altos Series 5 Hard Disk Upgrade Kits

TO ADD 5 MB TO THE SERIES 5-15D



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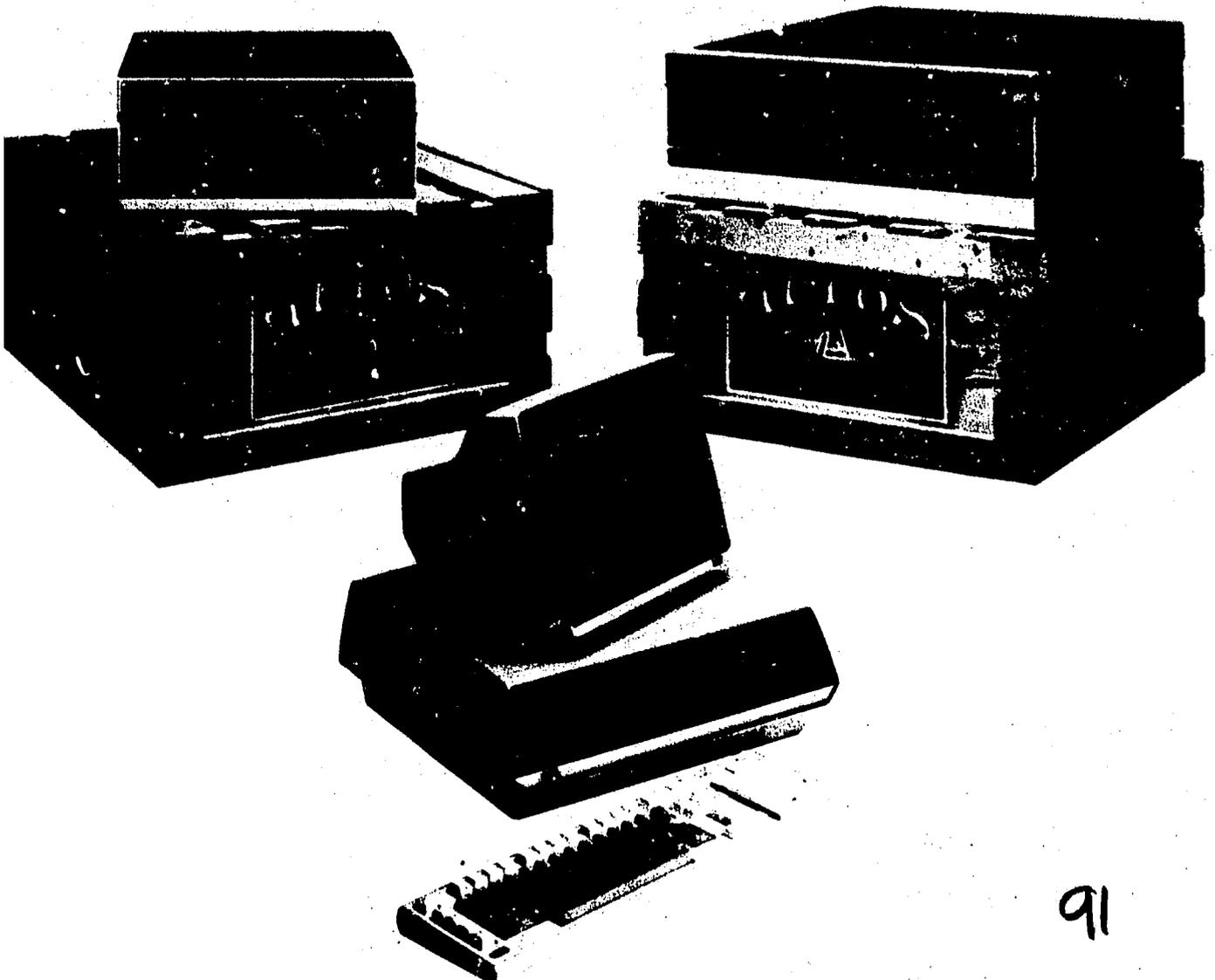
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San Jose	(408) 946-6700
Washington, D.C.	(703) 448-9087
Canada	(416) 864-0740
West Germany (European Headquarters)	(089) 871-1071
France	(33-1) 772-2662
United Kingdom	03446 77911



COMPUTER SYSTEMS

Product List

Effective February 1, 1983



8-Bit Systems

80TM-Based, Multi-User Winchester Hard Disk and Floppy Systems

INCLUDES MP/M IITM OPERATING SYSTEM



Altos Series 5-15D



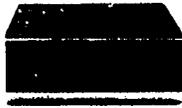
Altos Series 5-5D



Altos 580-10

Model No.	Number of Users	RAM Memory	CPU	Type of 5 1/4" Floppy Disk Drive	No. of Floppy Disks	I/O Ports		Floppy Disk Storage	5 1/4" Winchester Storage	Suggested List Price
						Ser	Par			
Series 5-15D	1-3	192Kb	Z80A	Double-sided	2	4	1	2 Mb	—	\$2,990
Series 5-5D	1-3	192Kb	Z80A	Double-sided	1	4	1	1 Mb	6 Mb	\$5,490
580-10	1-3	192Kb	Z80A	Double-sided	1	4	1	1 Mb	12 Mb	\$6,490

INCLUDES MP/M II OPERATING SYSTEM



ACS8000-15



ACS8000-10, -12 or -14

Model No.	Number of Users	RAM Memory	CPU	Floppy Disk Controller Density*	Type of 8" Floppy Disk Drive	No. of Floppy Disks	I/O Ports		Floppy Disk Storage	8" Winchester Storage	Suggested List Price
							Ser	Par			
ACS8000-15	1-4	208Kb	Z80A	Double	Single-sided	2	6	1	1 Mb	—	\$ 4,990
ACS8000-10	1-4	208Kb	Z80A	Double	Single-sided	1	6	1	1/2 Mb	10 Mb	\$ 7,490
ACS8000-12	1-4	208Kb	Z80A	Double	Single-sided	1	6	1	1/2 Mb	20 Mb	\$ 8,990
ACS8000-14	1-4	208Kb	Z80A	Double	Single-sided	1	6	1	1/2 Mb	40 Mb	\$10,990

*Floppy controller may operate in either single or double density modes.

16-Bit Systems

8086-Based, Multi-User Winchester Hard Disk and Floppy Systems

Model No.	Number of Users	RAM Memory	CPU	Floppy Disk Controller Density	Type of 5 1/4" Floppy Disk Drive	No. of Floppy Disks	I/O Ports		Floppy Disk Storage	5 1/4" Winchester Storage	Suggested List Price
							Ser	Par			
586-10	1-5	512Kb*	8086	Double	Double-sided	1	6	—	1 Mb	12 Mb	\$ 7,990

*RAM memory can be extended to 1 Mb by adding a 512Kb expansion board (RAM U/K-2) to the 586-10.



Altos 586-10

Model No.	Number of Users	RAM Memory	CPU	Floppy Disk Controller Density	Type of 8" Floppy Disk Drive	No. of Floppy Disks	I/O Ports		Floppy Disk Storage	8" Winchester Storage	Suggested List Price
							Ser	Par			
ACS8600-12	1-8	512Kb*	8086	Double	Single-sided	1	8	1	1/2Mb	20Mb	\$12,500
ACS8600-14	1-8	512Kb*	8086	Double	Single-sided	1	8	1	1/2Mb	40Mb	\$14,500

*RAM memory can be expanded to 1 Mb by adding a 512Kb expansion board (RAM U/K-1) to the ACS8600-12 or -14.



ACS8600-12 or -14

NOTE: 1) Prices, product offerings and availability dates are subject to change without notice.
2) Storage capacities of floppy disks and Winchester Disks denote unformatted capacities.

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Operating Systems

OPERATING SYSTEMS	Manufacturer	8-BIT	16-BIT	
		Series 5, 500 or ACS8000	ACS8000	500
CP/M®	Digital Research, Inc.	\$200	—	—
MP/M II™	Digital Research, Inc.	\$500	—	—
MP/M-90™	Digital Research, Inc.	—	\$ 650	\$ 650
OASIS (multi-user)	Phase One Systems, Inc.	\$850	—	—
OASIS-16 (multi-user)	Phase One Systems, Inc.	—	—	\$1,495*
XENIX™ (UNIX™) RUN TIME	Microsoft, Inc. (under license from Western Electric)	—	\$ 995	\$ 995
XENIX™ (UNIX™) EXTENDED UTILITIES PACKAGE	Includes: XENIX RUN TIME, C Compiler, Fortran 77 & major development utilities	—	\$1,995	\$1,995
PICK	Pick Systems 10-20 Mb systems	—	—	(To be Announced)
MS™-DOS	Microsoft, Inc.	—	—	\$ 200*

*Available 2Q '83

Altos Applications Software

Applications	Z80 Series 5, 500 or ACS8000 Price	8000 16-BIT XENIX 500 or ACS8000 Price
Altos Executive Word Processor*	\$ 295	\$ 295
Altos Executive Financial Planner	\$ 295	\$ 295
Altos Executive Word Processor and Financial Planner	\$ 495	\$ 495
Altos Accountant** (Includes Altos Computer Tutor (ACT) and seven accounting modules)	\$2,495	\$2,995 see ABS/86
Altos Data Base Management System—INFORMIX™ (XENIX only)	—	\$1,600
ABS/86—ALTOS Business Solutions for 8000 Based 16-BIT Systems Includes: XENIX/UNIX, user friendly shell and CP/M® emulator Altos Business Basic III ALTOS ACCOUNTANT with ALTOS COMPUTER TUTOR (ACT) and seven accounting modules ALTOS EXECUTIVE WORD PROCESSOR ALTOS EXECUTIVE FINANCIAL PLANNER	—	All for \$3,990
Altos File Management System (C-ISAM™) (for XENIX)	—	\$ 450

* Please refer to Altos Executive Word Processor capabilities sheet for details.

**The Altos Accountant is designed to run only with hard disk systems.

Upgrade Kits

Z80 Family	8000 Family	Description	Price
U/K 5	—	6 Mb HD for Series 5-15D and 5-5D	\$3,990
U/K-10	—	12 Mb HD and HD Controller (ACS8000-10 & -15)	\$5,000
U/K-14	U/K-14 8000	40 Mb HD (U/K-14 8000—ACS8000-12 & -14) (U/K-14—ACS8000-15, -12 & -14)	\$7,000
—	RAM U/K-1	512 Kb additional RAM (ACS8000 only)	\$1,990
—	RAM U/K-2	512 Kb additional RAM (500 only)	\$1,990
Add 2	—	Two Single-sided 8-inch drives	\$2,000
—	U/K-10 500	12 Mb HD and Intelligent HD Controller 500-10 only	\$5,000

NOTE: A maximum of one additional Winchester Disk Drive may be added to each computer.

Abbreviations:

HD = Winchester Hard Disk

Kb = Kilobytes

U/K = Upgrade Kit

Mb = Megabytes

MU = Multi-User

MTU = Magnetic Tape Unit

NOTE: 1) Prices, product offerings and availability dates are subject to change without notice.

2) Storage capacities of floppy disk and Winchester Disks denote unformatted capacities.

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STAND-ALONE MAGNETIC TAPE CARTRIDGE BACKUP UNIT

CAN BE ADDED TO ANY 8-INCH HARD DISK SYSTEM

—Each MTU Cassette will store 17 Mb unformatted



MTU-2 or
MTU-3

Model No.	For Add-ons to Model No.	Suggested List Price
MTU-2	For Model No. ACS8000-10, -12 & -14	\$2,995
MTU-3	For Model No. ACS8600-12 & -14	\$2,995

LANGUAGES	Z80-Series 5, 580 or ACS8000	Altos 586 or ACS8600		
	CP/M or MP/M II	MP/M-86	XENIX	MS-DOS* (586 ONLY)
Altos Business Basic II	\$ 495	—	—	—
Altos Business Basic III	—	—	\$ 495	—
CBASIC™	\$ 200	—	—	—
CBASIC-86™ (interpreter)	—	\$600	—	—
CBASIC-16™	—	—	\$ 750	—
CB-80™	\$ 500	—	—	—
MICROSOFT BASIC™	\$ 350	—	—	—
MICROSOFT BASIC COMPILER™	\$ 395	—	\$ 500	\$500*
MICROSOFT BASIC-86™	—	\$600	\$ 750	\$350*
MICROSOFT COBOL	\$ 750	—	—	\$750*
R/M COBOL™	\$ 750	\$995	\$ 995	—
R/M COBOL™ (RUN TIME ONLY)	\$ 275	\$400	—	—
CIS COBOL™	\$ 850	\$850	—	—
Level II CIS COBOL™	—	—	\$1,600	—
MT + PASCAL™	\$ 475	\$600	—	—
MICROSOFT PASCAL-86™	—	—	—	\$750*
MICROSOFT FORTRAN-80™	\$ 500	—	—	—
MICROSOFT FORTRAN-86™	—	—	—	\$750*
SOFTBOL™ COMPILER (DIBOL 11 COMPATIBLE)	\$2,500* (CP/M only)	—	\$2,500*	—
SOFTBOL (RUN TIME ONLY)	\$250 (CP/M only)	—	\$ 250	—

COMMUNICATIONS:	8-BIT	16-BIT XENIX only
ETHERNET™ (ALTOS implementation) (ACS 8600 only) Controller chassis and UNET™ software. Transceiver not included.	—	\$2,500
ALTOS-NET™ (586 only) Local inter-Altos network. (High speed twisted pair)	—	\$ 295
ASYN—Altos Asynchronous Communications Package	\$150	—
SYN—Altos 2780/3780 IBM BiSynchronous Package	\$500	\$ 500*
ALTOS 3270/3276—IBM Cluster Terminal Controller/Emulator	\$750	\$ 750*

*Available 2Q '83

NOTE: Prices, product offerings and availability dates are subject to change without notice.

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United Kingdom	03446 77911



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Telex: 470642 ALTO UI

Series F880 Microstreamer™ Tape Drive

Cipher's Microstreamer tape drive is the ideal data storage device for a wide variety of applications, including: backup and file organization for Winchester disks, input/output, archival storage, and real-time data generation for COM and graphics.

Automatic loading of the tape reel ensures smooth, easy operation and contributes to Microstreamer's design simplicity. With this special autoloader feature that threads the tape automatically once the reel has been inserted, Microstreamer delivers a powerful product advantage that minimizes operator training and expands reliability. And Microstreamer's autoloader operates on any size reel of tape, from 7 inches to 10.5 inches.

Microstreamer's two speeds of operation (25 and 100 inches per second) provide users with maximum flexibility. The lower 25 ips speed operates on software for traditional start/stop applications, and speeds can be switched easily without having to be at load point when requiring 100 ips for high-speed applications.

A large storage capacity of up to 46 megabytes of unformatted data on a standard, readily available 10.5-inch, 2400-foot reel of 1.5-mil. tape makes Microstreamer the perfect backup device. And on 1-mil. tape—which Microstreamer also readily accepts—the drive can store up to 61 megabytes of unformatted data.

Microstreamer's simplified mechanical design eliminates the need for large, complex rack spaces, and its unique, compact horizontal construction—only 8.75 inches high—allows the tape drive to fit easily and unobtrusively into even the smallest of spaces.

A key component in Microstreamer performance is its microprocessor intelligence. The tape drive's Z-80 microprocessor increases data reliability by implementing diagnostics efficiently and by handling all other data storage and drive functions with ease and precision.

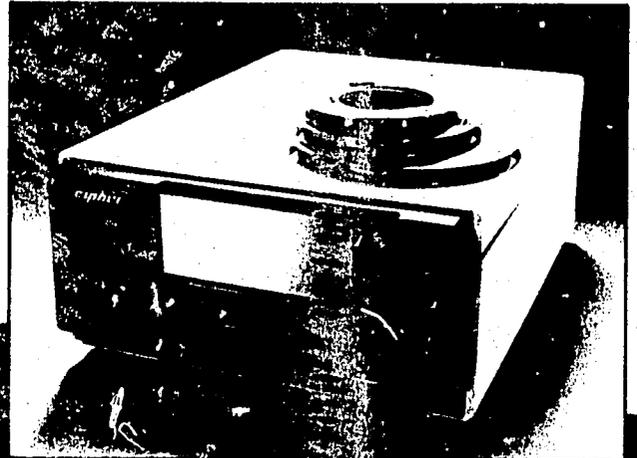
The Microstreamer dumps 46 megabytes in 4.8 minutes and rewinds the tape at an average speed of 180 inches per second which makes a perfect partner for today's Winchester disks.

Cipher's Microstreamer 2 provides up to 92 megabytes of storage at the higher density of 3200 bpi at 50 inches per second, while still providing the ANSI/IBM standard 1600 bpi at 25 and 100 ips speeds. This model provides users with a higher storage capacity for backup applications and with a basic 1600 bpi ANSI/IBM interchange device—all in one unit.

Both models of Cipher's Microstreamer are available in either a rack-mounted or a free-standing, desk-top cabinet design. This optional cabinet feature offers an attractive alternative where rack space is not available.

(See reverse side for complete specifications and information on built-in diagnostics, serviceability, and reliability.)

- fully automatic loading
- 25 ips for transactional applications and slow-speed streaming
- 100 ips for high-speed streaming disk dumps
- large storage capacity
- fully ANSI and IBM compatible
- built-in diagnostics
- compact size of 8.75 inches in height
- simple mechanics
- microprocessor electronics
- high speed data transfer
- high data reliability
- low cost
- serviceability and reliability



data products, inc.

10225 Willow Creek Road
San Diego, California 92131
Telephone: (714) 578-9100
TWX: 910-335-1251

10.5" (26.67cm) dia
8.5" (21.59cm) dia
7" (17.78cm) dia

Phase encoded (PE)
ANSI and IBM compatible
9 Track—1600 cpi (63 CPmm)

Streaming Applications
100 ips
Traditional Applications
25 ips
Rewind Speed
180 ips
Instantaneous Speed Variation
±2% max of long term
Low Speed Variation
±1% of nominal

25 ips
Read 40 milliseconds
Write 40 milliseconds
100 ips
Read 240 milliseconds
Write 240 milliseconds

Width
0.5 inch (1.27cm)
Thickness
1.5 mil (0.038mm)
Tension
7 oz. nominal (198.5 grams)
Type
Computer grade
ANSI x 3.40-1976
Head
Hard Surfaced
Tape Cleaner
Sapphire

Operating Temperature
2-37.8°C
Relative Humidity
15-95% noncondensing
Altitude
0-7500 ft (2286m)
0-10,000 ft (3048m) optional

Mounting
Standard EIA Rack
Height
8.75" (22.2cm)
Width
17.0" (43.2cm)

Depth, from mounting surface
22.0" (55.9cm)
Depth, overall
24.5" (62.2cm)
Weight
80 lbs (36.4kg)

Electronics
Silicon solid state low
power Schottky, TTL &
NMOS Microprocessor
Interface
Formatter compatible
interface (TTL low true)
Power
100, 120, 220, 240 VAC
+10, -15%, 49-61HZ
250 watts max
Regulatory Safety
UL approved
CSA approved as a
recognized component
Meets FCC requirements

46 megabytes of unformatted data

5,500 hours of use

Recording Mode
9 Track—3200 cpi (126 CPmm)
Tape Velocity
50 ips
Nominal Data Access Time
50 ips
Read 120 milliseconds
Write 120 milliseconds
Transfer Rate
160 kilobytes/sec
Capacity
92 megabytes of unformatted data

Physical Size
Height
10.59" (26.90cm)
Width
19.88" (50.49cm)
Depth
26.94" (68.43cm)
Weight
15 lbs (6.825kg)
without streamer
95 lbs (43.225kg)
with streamer (total weight)
Cable Definition
cable is supplied
Regulatory Safety
UL listed
CSA certified
Meets FCC requirements



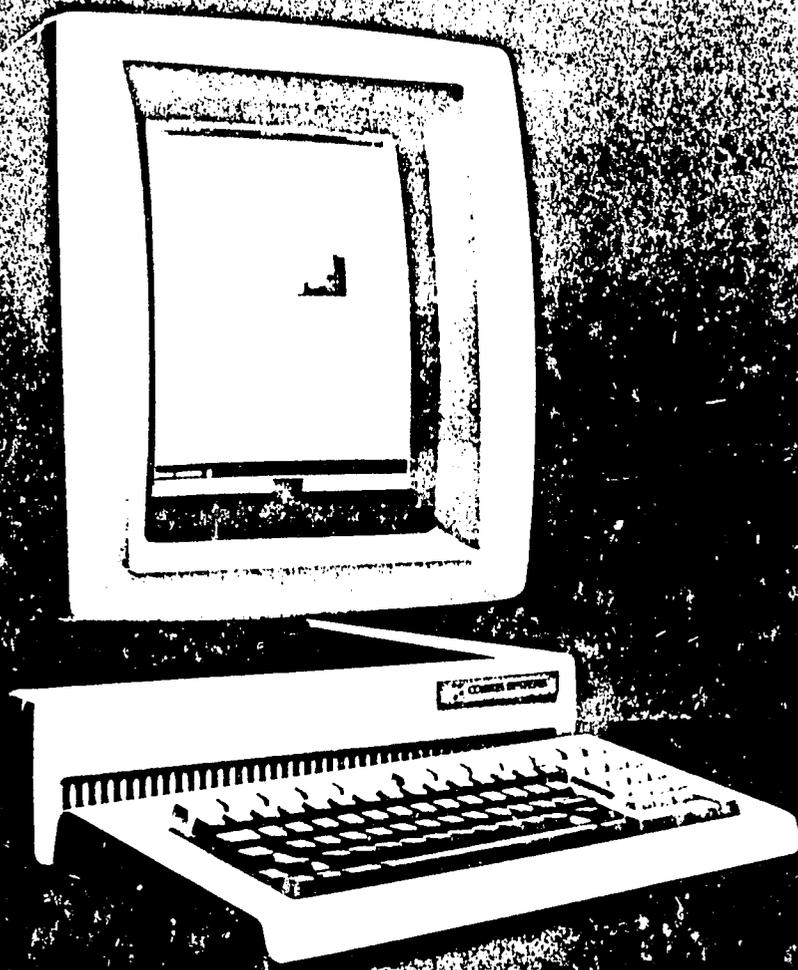
Cipher's Microstreamer tape drive features built-in diagnostics, which automatically self-tests its circuits every time you turn on the power. Also, a powerful set of selectable diagnostics—with a comprehensive fault isolation guide—greatly assists the service engineer in fault isolation.

Easy access is provided to any part of the drive without having to remove the Microstreamer from the rack, thus simplifying serviceability. Microstreamer's single-board circuitry reduces the parts count and eases assembly and maintenance. The drive's simple design and construction gives Microstreamer an MTTR (mean time to repair) of 15 minutes, thereby enhancing reliability.

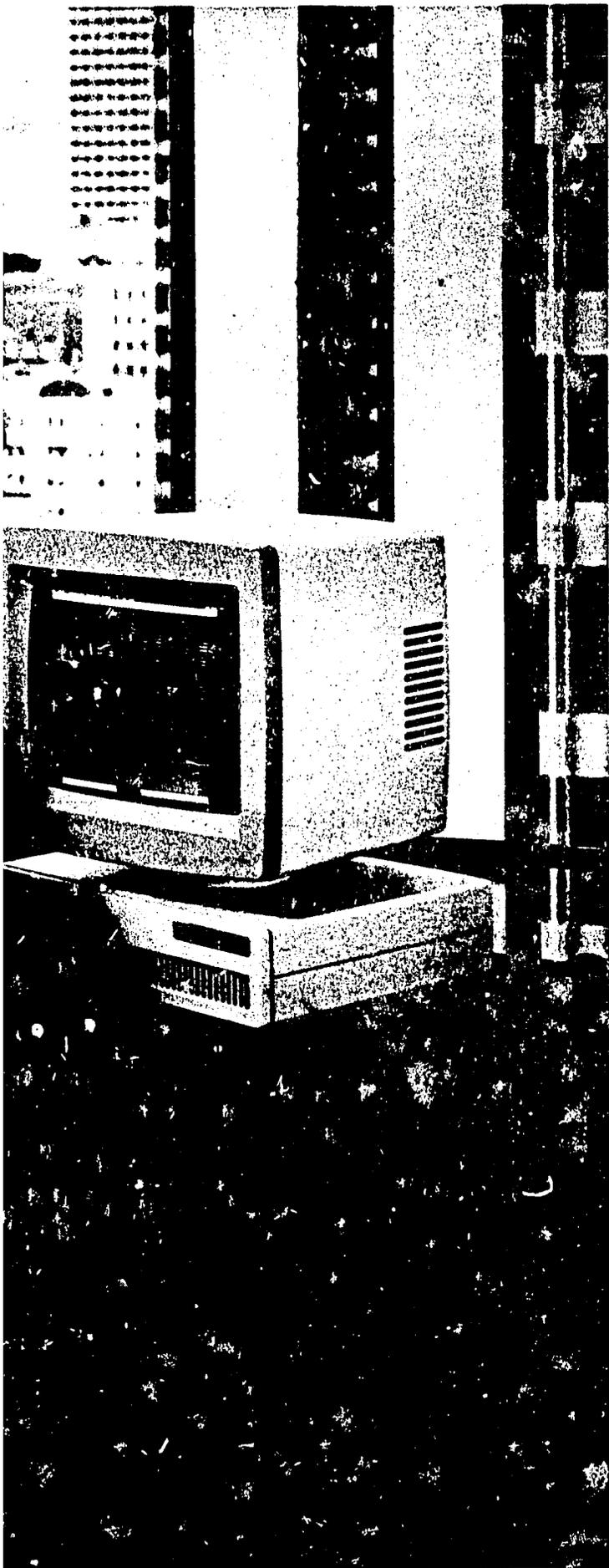
Built-in diagnostics, serviceability, and reliability are features that make Microstreamer the most cost-effective storage medium on the market today.

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THE NEXT GENERATION OF COMPUTING POWER



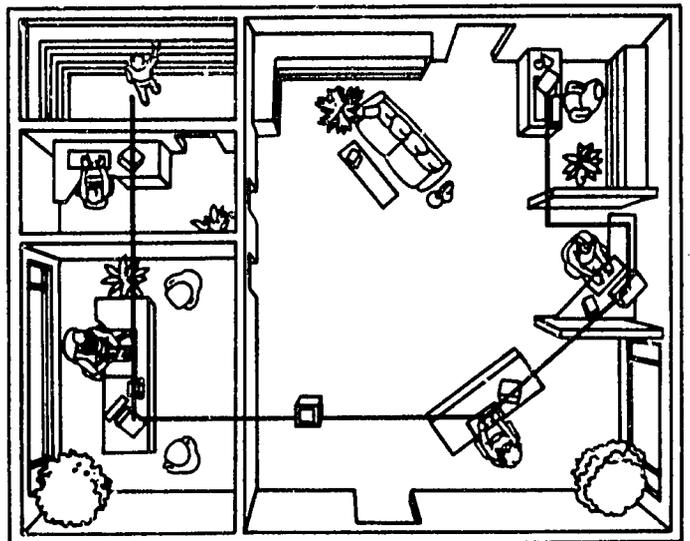
THE CORVUS CONCEPT™



he essence of the personal computer revolution is individual access to computing power at an affordable price. Particularly when linked with a Corvus local network, personal workstations in the office automation environment combine the benefits of distributed processing with the responsive interaction of a powerful local computer.

The Corvus Concept™ keeps this revolution alive and extends it into the next generation. It combines the latest in hardware with innovative software to function either as a versatile workstation in the Corvus Omninet™ local area network or as one of the most powerful stand-alone computers on the market today.

This new generation workstation is available now to help increase productivity in Fortune 1000 companies, small businesses, professional offices, and education.



Network ready, each Corvus Concept has a built-in Corvus Omninet interface. Adding a workstation to the network is as easy as connecting a stereo speaker.



Bi-directional screen. Concept's unique dual orientation display is made possible by the power of its 68000 microprocessor and large memory (256k RAM standard) which allows bit-mapping of the screen. Each dot on the screen is mapped bit by bit to form either vertical or horizontal characters.



Bit-mapping also allows mixing of text and graphics on the same screen. Another user-oriented feature is the choice of standard screen (white on black) or the newer letter-style screen (black on white) at the touch of a key.



Full-page display. The full 8½ x 11 inch high resolution screen lets you view an entire vertical page or a 13 column horizontal spread sheet. The white area shown above is the area displayed on many personal computers, one-seventh that of the Corvus Concept. In many applications, a full-page display can minimize the need for a local printer.



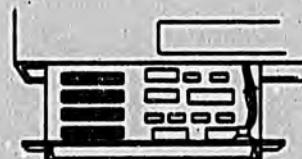
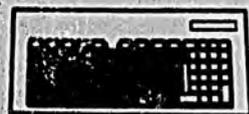
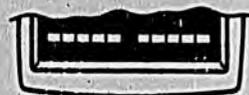
Tilt and swivel. Finger and swivel adjustments select the most comfortable screen angle to avoid posture strain problems. A full 13° down, plus 45° left or right, gives you complete control in both orientations.



4

From the beginning, the design goal of the Corvus Concept was to make the transition to an automated office as simple and appealing as possible. The Corvus Concept is easy to learn and easy to operate, even for the person with no computer experience. It capitalizes on the latest technology and industrial design to help executives, professional staff, and managers do their jobs better, faster, and more accurately.

Perhaps the most innovative user-oriented feature of the Corvus Concept is its unique dual-orientation display. By simply releasing a latch, the display can be changed from the portrait (vertical) to the landscape (horizontal) orientation and back again in just a few seconds. Furthermore, the display is finger-tip adjustable to allow it to be tilted and swiveled for the best viewing angle. Fully self-contained, the compact Corvus Concept fits easily on a desktop. Its detached Selectric-style keyboard can be placed anywhere on the desk for maximum convenience.



User friendly keyboard. For simplified learning and ease of operation, 10 multi-function "soft keys" control up to 40 different functions at one time. A function key map at the bottom of the display identifies the functions at all times. The detached, Selectric-style keyboard includes a 10-key accounting pad with double zero. All keys are programmable under software control.

Peripheral connectors. A pull-out drawer contains four expansion slots for peripherals such as diskette drives, modems, or printers. Additionally, connectors on the back panel are RS-232 compatible. Other user-oriented features include built-in calendar-clock with battery backup, two internal timers, speaker with flexible sound generator, diagnostics, power-on boot, and single power cord.

unctionally designed, easy-to-use software is vital to making the office of the future a reality today. Corvus has met this need with software that includes: EdWord™, a fast, powerful word processing system □ Corvus LogiCalc™, an electronic spread sheet for planning and forecasting □ Pascal and FORTRAN compilers for compatibility with existing programs and generation of new software in these popular languages □ Full featured operating system with multiple window capability □ New Corvus software, including electronic mail, accounting, data base manager, and several others now are in preparation.

EdWord Word Processor

EdWord text editing and word processing system was designed by Corvus to take advantage of the full power of the 68000 microprocessor and full-page Concept screen. It incorporates several features not found in personal computer word processing programs or even on some dedicated word processors. In many ways, EdWord represents as much of a jump ahead in word processing software as the Concept itself does in personal workstations.



EdWord includes all the standard word processing features such as automatic word wrap, paragraph adjust with hyphenation, page numbering and centering, right margin justification, insert and delete, cut and paste, and a host of others. One of its most unique features is:

Time Travel Editing™:

A first for personal workstations (and not even available with most dedicated word processors) is EdWord's undo/redo feature. It is totally forgiving, making it ideal for the new or occasional user. Time travel lets you undo not only the previous editing action, but all preceding ones as well, back to the original. Furthermore, you can reverse the undo with redo, going forward again through each of the edits, to return to the latest version. Undo/redo creates a threaded audit trail much like a sophisticated data base manager.

Corvus LogiCalc

This advanced electronic spread sheet program offers all the features of the most popular spread sheet programs and then some. By taking full advantage of Concept hardware, it can present a full 13 columns of data on the display in the landscape orientation, thereby letting you view an entire year's budget at one time. Advanced Corvus LogiCalc features include variable column width and variable decimal precision on a column by column basis as well as the capability to process logical functions as well as mathematics.

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Multiple Windows

This feature is like having several CRT's or displays on the same screen. It allows portions of several documents, graphs, or charts to be viewed simultaneously. For example, you might be writing a letter and decide to add a graph to the text. You simply end the word processing operation and open a new window on the screen. Then you calculate and plot the data, finally inserting the graph into the text at the appropriate spot.

SPECIFICATIONS

Microprocessor—Motorola MC-68000

- 24-bit data and address registers
- 14-bit memory address bus
- 16-bit data bus

Memory

- 640K RAM standard
- expandable to 3128K optional

Standard Input/Output

- 640Kbit asynchronous serial port
- RS-232C up to 115,200 baud
- Corvus Omninet local network interface
- 122.4Kbit/min parallel printer port
- 122.4Kbit/min parallel disk controller
- 122.4Kbit/min parallel tape controller
- 122.4Kbit/min parallel modem controller
- 122.4Kbit/min parallel calendar with battery
- On-board sound generator with speaker
- Fax controller interface

Winchester Disk Options

- 27.1 MB formatted Corvus disk
- 54.2 MB formatted Corvus disk
- 108.4 MB formatted Corvus disk
- 162.6 MB formatted Corvus disk

Diskette Drive Options

- 27.1 MB formatted 5.25-inch diskette
- IBM 5.25-inch diskette

Backup Option

- 27.1 MB formatted Verbit 1/2-inch Cassette Recorder

Video Display

- 300Kbit/sec 35MHz
- 8-bit mapped display—720 by 500 pixels
- Vertical tilt—15° to 90°
- Horizontal swivel—90°
- 12 character by 50 lines standard screen orientation
- 90 character by 72 lines horizontal orientation

Keyboard

- 91 key detachable keyboard
- Selectric-style keyboard
- 16 function keys
- programmable function keys
- cursor control keys

Local Network Interface—

Corvus Omninet

- 1 megabit/sec transfer rate
- 100 feet (1.22 km) total network length
- 64 network devices
- twisted pair cable transmission medium

Operating Systems/Software

- UCSD Pascal File Structure
- UCSD Pascal with UCSD extensions
- Microsoft compatible
- FORTRAN—native code compiled
- BASIC—Assemble
- Word—Word Processor
- Corvus Logical File Editor
- spreadsheet

Electrical Specifications

- 120V ac 22-24 AMP
- 1000W
- Humidity—5% to 95%

Physical Characteristics

	Height (in/cm)	Depth (in/cm)	Width (in/cm)	Weight (lbs/kg)
Standard Desktop	14 1/2/36.8	17 1/2/44.3	17 1/2/44.3	11 1/2/5.1
Desktop	14 1/2/36.8	17 1/2/44.3	17 1/2/44.3	21 1/2/9.6
Desktop II	14 1/2/36.8	17 1/2/44.3	17 1/2/44.3	17 1/2/7.8
Desktop III	21 1/2/54.3	17 1/2/44.3	17 1/2/44.3	45 1/2/20.5
Without Keyboard				

6/12/18 MEGABYTE Winchester Disk Systems for the APPLE II COMPUTER



Multiply The Power of Your Apple II

With the latest Winchester disk system technology from Corvus Systems, you can give your Apple II computer the power and speed it needs for today's demanding computer applications. With such features as thin-film plated media and superior head-positioning systems, the Model 6, Model 11 and Model 20 all offer the advantages of our compact, quiet 5¼ inch design. With all these systems, you can include the field-proven Corvus MIRROR® video tape backup system for simple, cost-effective Winchester backup.

Built-in Expandability

Corvus designs all its products with your future needs in mind. You can start with a single disk system, and as your needs grow,

let additional computers share the disk and peripherals by means of the Corvus OMNINET™ or Multiplexer local area networks. These systems allow more than 60 Apple II or other brands of computers to share the disk system as well as printers and other peripherals. If on the other hand, you need more data storage capacity, you can add on more disk systems. No matter where your data storage and distribution needs may lead, you'll be able to get there with Corvus. Your Corvus dealer can show you how.

Reliable Winchester Technology

The Corvus line of 5¼ inch Winchester disk systems sets new standards for reliability. Thin-film plated media on the Model 11 and Model 20 allow greater bit densities without sacrificing data integrity. The sealed environment

keeps dust, smoke, and other particles from reaching the disk surface, and an automatic spindle brake protects the drive during shipping and handling. The Corvus intelligent disk controller insures rapid, reliable data transfer with such features as read-after-write verify, automatic error retries, transparent formatting with CRC (Cyclic Redundancy Check) Error Detection, and high-speed data transfer using DMA (Direct Memory Access). Corvus disk systems require no preventive maintenance.

Corvus Software

Corvus provides all the software you'll need to support Apple DOS 3.3, Apple Pascal, and Apple CP/M. You can put data from any or all of these operating systems on a single disk system by dividing

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★ **CORVUS SYSTEMS**

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6/12/18 MEGABYTE

Winchester Disk Systems for the APPLE II COMPUTER

the disk space. The DOS 3.3 interface treats the disk system as multiple images of a standard diskette, and the DOS commands normally used to check volumes can be used with Corvus software to specify which volume to access. More than 130 separate volumes (up to a limit of 20 megabytes) can be on line at one time, and any of them can be write-protected at will.

The Apple Pascal interface allows you to create volumes of varying size on the system, and you can mount up to six of them at one time. The convenience of having several volumes on line of up to 20,000 blocks each cannot be overestimated. Best of all, this large increase in storage capacity is completely transparent to the operating system. If you wish, you

can even configure a system with volumes of up to 10 megabytes in size, up to a limit of 50 megabytes total. Corvus also provides several utilities for disk diagnostics, controller code update, and operation of the Corvus MIRROR.

Other Corvus Compatible Computers

When you pick a Corvus Winchester disk system for your Apple II, you're in good company. Corvus makes network-ready Winchester disk systems for most popular microcomputers, and we've been at it longer than anyone else. In addition to the Apple II, the list of Corvus compatibles includes the IBM Personal Computer, Apple III, TRS-80 Models I, II, and III, Xerox 820 and 820-II, Zenith Z89/90, NEC

PC-8000, Atari 800, Osborne 1, and such S-100 Bus computers as Vector Graphic and North Star. And of course, all Corvus disk systems connect to the revolutionary new Corvus Concept™ personal workstation. Ask your Corvus dealer for details.

Service

All Corvus disk systems come with a six (6) month parts and labor warranty. Warranty extensions of up to 24 additional months are available at a reasonable extra cost. If your Corvus disk system should ever require service, you can take it to one of our Authorized Service Centers throughout the world. In addition, on-site service is available in some areas. Check with your Corvus dealer for availability in your area.

SPECIFICATIONS

MODEL NUMBER	MODEL 6	MODEL 11	MODEL 20	PHYSICAL DIMENSIONS	MODEL 6, 11, and 20
Capacity (megabytes)				Height (inches/centimetres)	5.75/14.6
Unformatted	6.7	14.0	21.0	Width (inches/centimetres)	12.0/30.5
Formatted	5.7	12.1	18.4	Depth (inches/centimetres)	15.0/38.1
Disks				ENVIRONMENTAL SPECIFICATIONS	
Number	2	2	3	Temperature (°F/°C)	
Data Surfaces	4	4	6	Operating	50° to 120°/10° to 50°
Tracks per Surface	144	306	306	Non-Operating	-40° to 140°/-40° to 60°
Diameter (inches/centimetres)	5.25/13.3	5.25/13.3	5.25/13.3	Variation	18°/10° per hour
PERFORMANCE	MODEL 6	MODEL 11 and 20		Humidity (non-condensing)	
Access Time (milliseconds)				Operating	10% to 80%
Minimum	43	29		Non-Operating	10% to 90%
Maximum	240	135		Altitude, Operating (feet/metres)	-1,000 to 10,000/ -305 to 3,050
Average	125	72		POWER REQUIREMENTS	
Average Latency Time (milliseconds)	6.25	8.33		Voltage	100, 120, 220, or 240 volts (selectable)
Disk Rotational Speed (RPM)	4,800	3,600			50/60 Hz, single phase AC
Peak Transfer Rate (kilobytes/second)	960	687.5		Typical Consumption	150 volt amperes

Apple is a registered trademark and Apple Pascal is a trademark of Apple Computer, Inc.
CP/M is a registered trademark of Digital Research, Inc.
IBM is a registered trademark of International Business Machines Corporation.

TRS-80 is a registered trademark of Tandy Corporation.
Xerox is a registered trademark and 820 and 820-II are trademarks of the Xerox Corporation.
Atari is a registered trademark and Atari 800 is a trademark of Atari, Inc.
Osborne 1 is a trademark of the Osborne Computer Corporation.

North Star is a trademark of North Star Computers, Inc.
Corvus MIRROR (patent pending) is a registered trademark of Corvus Systems, Inc.
Corvus OMINISET, Corvus Concept, Corvus, and Corvus Systems are trademarks of Corvus Systems, Inc.

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2029 O'Toole Avenue, San Jose, California 95131
Telephone (408) 946-7700
TWX 910-338-0226 Telex: 278976

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6/12/18 MEGABYTE

Winchester Disk Systems for the IBM PERSONAL COMPUTER



Set Your IBM PC Free With a Corvus Winchester

Free your IBM Personal Computer from the restraints of its diskette drives with Corvus Winchester disk systems. The Model 6, Model 11, and Model 20 combine the latest in 5¼ inch Winchester technology with the experience gained from supplying tens of thousands of Winchester disk systems to microcomputer users around the world. All Corvus disk systems can be supplied with our MIRROR® Winchester backup system for economical backup and archival storage. Corvus disk systems are also network ready, offering an easy growth path as your needs expand.

The Disk System That Stays With You

As your data storage and communication needs expand, your Corvus disk system can expand with you. Because it's always network-ready, you can connect it to a Corvus OMNINET™ or Multiplexer local area network. These networks let more than 60 computers of the same or different brands share the disk system, printers, and other peripherals, and provide inter-computer communication. No matter where your needs may take you, you can't outgrow your Corvus.

Proven Technology at Your Fingertips

Corvus 5¼ inch disk systems set new reliability standards for mass data storage devices. Thin-film plated media on the Model 11 and Model 20 allow greater bit densities without sacrificing data integrity. The sealed environment keeps dust, smoke, and other particles from coming in contact with the read-write heads or the magnetic media. The built-in cooling fan and conservatively rated power supply help to assure hours of trouble-free operation. And the field-proven Corvus disk controller uses its own microprocessor to insure rapid, reliable data transfer

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Winchester Disk Systems for the IBM PERSONAL COMPUTER

with such features as read-after-write verify, automatic error retries, transparent formatting with CRC (Cyclic Redundancy Check) Error Detection, and high-speed data transfer using DMA (Direct Memory Access). Corvus disk systems have proven to be so reliable that they require no preventive maintenance.

Disk System Software

Corvus provides all the software you will need to use your disk system with the IBM Personal Computer. You receive drivers for PC-DOS 1.1 as well as a linkage program that attaches itself to this DOS. Total compatibility with all PC-DOS commands and utilities allows you to use your existing programs with little or no modifi-

cation. Corvus also provides support for Pascal IV.0, as well as several utilities for disk system diagnostics, controller code update, and operation of the MIRROR storage backup system. All software and utilities programs are supplied on 5¼ inch, single sided single density diskettes.

Other Corvus Compatible Computers

Back in 1979, Corvus pioneered the Winchester disk system for microcomputers, and over the years, the name "Corvus" has come to mean "mass storage." Today, we make Winchester disk systems for most popular microcomputers, and we've made more of them than anyone else in the world. In addition to the IBM Personal Com-

puter, the list of Corvus compatibles includes Apple II and III, TRS-80 Models I, II, and III, Xerox 820 and 820-II, Zenith Z89/90, NEC PC-8000, Atari 800, Osborne 1, and such S-100 Bus computers as Vector Graphic and North Star. And of course, all Corvus disk systems connect to the revolutionary Corvus Concept™ personal workstation.

Service

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SPECIFICATIONS

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PERFORMANCE	MODEL 6	MODEL 11 and 20		Humidity (non-condensing)	
Access Time (milliseconds)				Operating	10% to 80%
Minimum	43	29		Non-Operating	10% to 90%
Maximum	240	135		Altitude, Operating (feet/metres)	-1,000 to 10,000/ -305 to 3,050
Average	125	72		POWER REQUIREMENTS	
Average Latency Time (milliseconds)	6.25	8.33		Voltage	100, 120, 220, or 240 volts (selectable)
Disk Rotational Speed (RPM)	4,800	3,600			50/60 Hz, single phase AC
Peak Transfer Rate (kilobytes/second)	960	687.5		Typical Consumption	150 volt amperes

IBM is a registered trademark and PC-DOS is a trade name of International Business Machines Corporation.
Apple is a registered trademark of Apple Computer, Inc.
TRS-80 is a registered trademark of the Tandy Corporation.

Xerox is a registered trademark and 820 and 820-II are trademarks of the Xerox Corporation.
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CORVUS OMNINET FOR THE IBM PERSONAL COMPUTER

Corvus OMNINETTM, the advanced local area network for microcomputers, is just the tool you need to expand the performance and versatility of your IBM PCs. Instead of working as isolated, stand-alone computers, your PCs can be turned into an integrated network of workstations. Using the network, workstations can share files, Corvus Winchester disk mass storage systems, printers, and other peripherals.

WHY CORVUS?

These days, a number of companies are planning to offer a network for the IBM PC. So, why go with Corvus? Simple. We're the leader. We've been at it longer than just about anyone else in the business. There are far more microcomputers (more than 25,000) connected to Corvus network systems than to any other brand of system. And we aren't just planning networks for the PC--we're shipping them.

WHY IS CORVUS SO POPULAR?

Corvus is known the world over for bringing state-of-the-art technology to the market at an affordable price. We established the market for Winchester disk systems for microcomputers back in 1979. We offered our first local area network in 1980. And we started shipping Corvus OMNINET in 1981. With almost three years of local area networking experience, we have the proven components you need to make a reliable, affordable network.

HOW DOES OMNINET WORK?

OMNINET uses simple twisted pair cable to connect microcomputers to each other and to shared disk systems and printers. The OMNINET transporter card plugs into any available expansion slot in your IBM PC, and a simple tap cable connects it to the OMNINET network. OMNINET uses a "bus topology", which simply means that you can add stations anywhere along the network by just tapping into the network "trunk" wire. And, you can do it yourself when the time comes, because there are no bulky or expensive coaxial cables to run or tap into. You can make your OMNINET network up to 4,000 feet long. Almost all OMNINET networks share a Corvus Winchester disk mass storage system. Available in three models, these systems can offer you the storage capacity of more than 100 standard IBM single density floppy diskettes. With the sophisticated Corvus Constellation[®] network management software, you can also share programs, send files between workstations, and send files to a single printer from any station on the network. With Corvus OMNINET, you can even put other brands of computers, like the powerful Corvus CONCEPTTM personal workstation, on the same network.

WHAT DOES ALL OF THIS COST?

Here's the best news of all. Corvus OMNINET is affordable. At around \$500, the OMNINET transporter card for the IBM PC is only half the cost of other brands of network connections. With a Corvus Model 6 Winchester disk system and an OMNINET disk server, a complete two station network costs less than \$4,500. As you expand, you can add more than 60 additional stations to the network for just the cost of an OMNINET transporter card. You don't have to stop after 15 or 20 stations to add another expensive piece of network hardware. That's just one more reason to go with Corvus OMNINET. It's the emerging industry standard in cost-effective, high-performance networks, and the field-proven answer to your IBM PC networking needs.

=====

CORVUS OMNINET SPECIFICATIONS

TOTAL NETWORK LENGTH:
4,000 feet (1.219 metres)

NETWORK TRANSMISSION MEDIUM:
RS-422 twisted pair cable

DATA TRANSMISSION RATE:
1 megabit per second (mb/s)

TOTAL NODES PER NETWORK SYSTEM:
Up to 64

AVAILABLE WINCHESTER DISK
MASS STORAGE SYSTEMS:
Corvus Model 6 (5.7 mb)
Corvus Model 11 (12.1 mb)
Corvus Model 20 (18.4 mb)

AVAILABLE NETWORK BACKUP:

Corvus MIRROR[®] Video Tape
Winchester backup system

Corvus Systems reserves the right to change specifications without notice or obligation.

IBM is a registered trademark of International Business Machines Corporation.

Corvus, Corvus OMNINET, Corvus CONCEPT, and Corvus Systems are all trademarks of Corvus Systems, Inc.

Corvus MIRROR (patent pending) and Corvus CONSTELLATION are registered trademarks of Corvus Systems, Inc.

CORVUS SYSTEMS, INC.
2029 O'Toole Ave.
San Jose, CA 95131
(408) 946-7700

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CORVUS MIRROR

Corvus makes two versions of the MIRROR. A built-in MIRROR comes with a Corvus disk system as an option. An add-on version can be purchased and is supplied in its own container (as illustrated).

Low Error Rate

The Corvus MIRROR uses a sophisticated error-detection system. Each block of data is written four times. If an error occurs during the recording process, only the error-free blocks are used on playback.

Video Format

The MIRROR uses the NTSC video signal format standard in the USA. A version which uses the European PAL or SECAM format is also available. Data is stored in a start-stop stream of five bytes per horizontal line. This makes for a data transfer rate of 1.1 megabaud.

Service

All Corvus products are supplied with a six month parts and labor warranty. An extended warranty is available at a reasonable extra cost. If your Corvus product should ever require service, it may be taken to any one of our Authorized Service Centers throughout the world.

DATA STORAGE CAPACITY

30 minute VHS	18 megabytes
60 minute VHS	36 megabytes
90 minute VHS	55 megabytes
120 minute VHS	73 megabytes

DATA TRANSFER RATE

Transfer rate	12,000 bytes per second
Backup time: 5.7 megabytes in 11 minutes	
12.1 megabytes in 23 minutes	
18.4 megabytes in 34 minutes	

PHYSICAL DIMENSIONS (Add-on Version)

Height (inches/centimeters)	3.25/8.3
Width (inches/centimeters)	7.75/19.7
Depth (inches/centimeters)	13.75/34.7
Weight (lbs/kg)	2.5/1.2

ENVIRONMENTAL SPECIFICATIONS

Temperature (F/C)	
Operating	-50F to +120F / +10C to +50C
Non-operating	-40F to +140F / -40C to +60C
Variation	+18/10 per hour
Relative Humidity (Non-condensing)	
Operating	20% to 80%
Non-operating	10% to 90%
Operating Altitude (feet/meters):	
	-1,000 to +10,000 / -305 to 3,050

VIDEO CONNECTIONS

RCA Phono Jacks

VIDEO FORMAT

NTSC, SECAM or PAL non-interlaced
1 volt peak to peak
75 Ohm termination

POWER REQUIREMENTS

Voltage 50 or 60 Hz versions available.
Consumption 1 Watt (supplied by disk drive power supply)

COMPATIBLE VCR'S

The Corvus MIRROR is compatible with a number of popular video cassette recorders. Check with your dealer for current compatible models.

Atari 800 is a trademark of Atari, Inc.
Apple is a registered trademark of Apple Computers, Inc.
Kamin and QDS are trademarks of Kamin Corporation

IBM-PC is a registered trademark of the Tandy Corporation
IBM is a trademark of IBM Corporation.
NBC PCBM is a trademark of NBC Corporation.

Osborne 1 is a trademark of the Osborne Computer Corporation
Zenith Z300 and Z30 are trademarks of the Zenith Corporation

CORVUS SYSTEMS

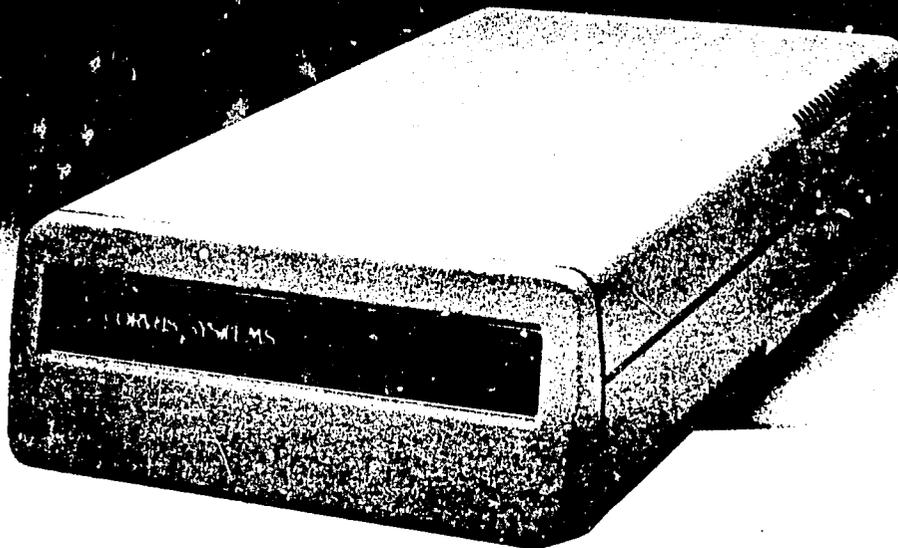
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Telephone (408) 946-7700
TWX 910-333-0226 Telex: 278976

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CORVUS MIRROR®

Low-Cost Backup for
Corvus Disks on Video Tape



Backup Security

The Corvus MIRROR® lets you copy data from a Corvus disk onto inexpensive video tape cassettes using a standard video cassette recorder. Within minutes, you can transfer the entire contents of any Corvus disk onto a tape cassette.

This creates a backup of your data on a removable medium.

The MIRROR Creates a Reflection

The MIRROR lets you create a perfect reflection of your data on a video tape cassette. This exact image is made by the MIRROR's controlling program that functions as an intelligent interface between your Corvus disk system and the video cassette recorder. Software in the host computer allows you to

copy an entire disk or a part of a disk. The host computer handles four commands: *Backup*, *Restore*, *Verify* and *Identify*.

Backup transfers data from disk to tape.

Restore transfers data from tape to disk.

Verify detects errors. Ensures normal operation.

Identify identifies the image on the tape.

Low-cost Archival Storage

The MIRROR provides a means of creating efficient and inexpensive archival storage for large databases. The video cassettes allow for quick and easy retrieval of files.

Automatic Operation

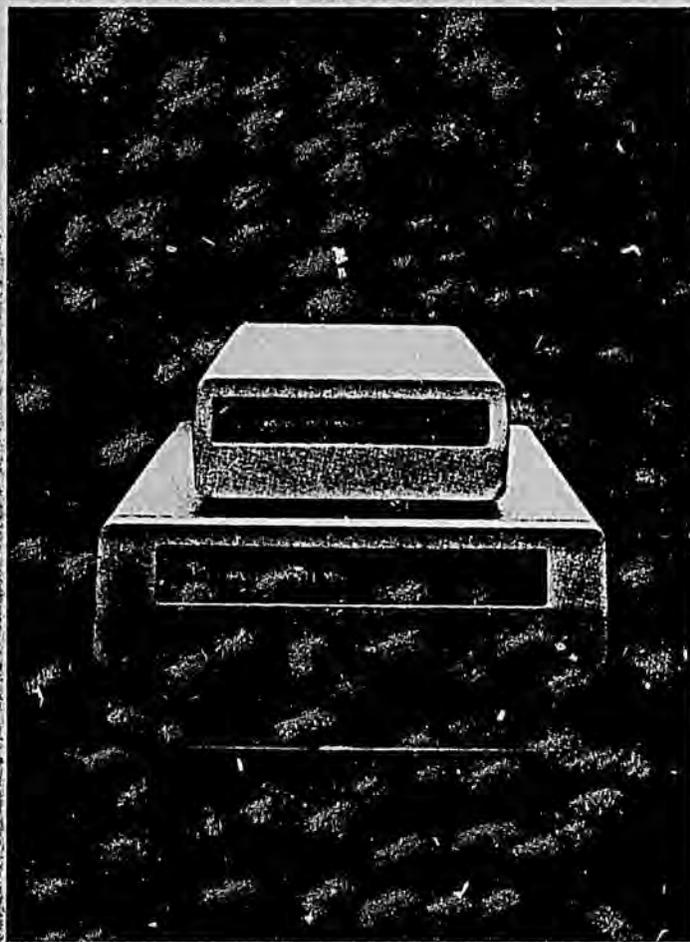
With the *Remote* option, the MIRROR can operate the Panasonic NV 8200 without operator intervention. The MIRROR creates backup copies on cassettes automatically at the end of a work period.

Intelligent Controller and Bus

The MIRROR uses the intelligent controller in the Corvus disk, making it compatible with all Corvus products. This interface ensures compatibility with future Corvus systems as well as the computers currently interfacing with Corvus disks. These include Apple II and III, IBM Personal Computer, Xerox 820, TRS-80—Models I, II, and III, NEC PC8001, S-100 Bus, Zenith Z89/90, the Atari 800, Osborne 1, and others.

★★
★ ★ **CORVUS SYSTEMS**

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\$1.00

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INTRODUCTION

This directory provides a sampling of the software programs which can be used with the Corvus Winchester Hard Disk Drives. Most of the non-copy protected software written to run under the CP/M, TRSDOS 2.0 for TRS-80 MOD II, NEWDOS/80 ver. 2.0, Apple DOS 3.3 and Apple Pascal operating systems will load easily from a floppy diskette and run on the Corvus Hard Disk. Some software packages that are copy protected, like DB Master, will reside in the floppy drive while utilizing the increased storage capacity and access speed of our hard disk drives in the storage and retrieval of data.

The software packages whose names are followed by three asterisks "****" have special hard disk versions available. Many of these hard disk versions have extra convenience features added to take advantage of the vastly increased access speed and mass storage provided by the Corvus Winchester Hard Disks.

The following software packages listed in this directory have been verified by computer dealers and Corvus Hard Disk users to be Corvus compatible.

Responsibilities Statement

These software programs were developed by independent software suppliers. Each supplier is solely responsible for its software and support services. Corvus Systems is not the manufacturer or co-developer of such software or support. Corvus Systems disclaims any and all liabilities for and makes no warranties, expressed or implied, with respect to this software. Distribution of information concerning this product does not constitute endorsement of the product, the supplier, or support services. The customer is responsible for selection of the software it purchases.

LogiCalc

Financial modeling system with variable columns. What-if processing includes conditional expressions and report generator. Integrated with other SPI packages. Apple II & IBM PC/UCSD Pascal 4.0. Available from: *Software Products International, 10343 Roselle St., Suite A, San Diego, CA 92121. Phone: (714) 450-1526.*

Micro DSS/Finance

Financial modeling package that provides budgeting, financial planning, and analysis with report generator and color graphics. Apple II/Pascal. Available from: *Addison-Wesley Publishing Company, Jacob Way, Reading, MA 01867. Phone: (617) 944-3700.*

Desk Top Plan

Financial analysis/modeling package. Less interactive than VISIcalc but includes a report writer. Apple III/SOS. Available from: *Personal Software, 2895 Zanker Road, San Jose, CA 95131. Phone: (408) 946-9000.*

SuperCalc

Electronic spreadsheet for planning and forecasting. CP/M compatible systems. Available from: *Sorcim Corporation, P.O. Box 32505, San Jose, CA 95152. Phone: (408) 727-7634.*

DB Master***

Very popular data base built for quick and easy access to large amounts of data. Apple II/DOS 3.3. Available from: *Stoneware, Inc., 50 Belvedere St., San Rafael, CA 94901. Phone: (415) 454-6500.*

Data Dex***

Powerful data base for up to 50,000 records. Screen and report formatter as well as data entry integrity check. Apple II/DOS 3.3, Applesoft Basic. Available from: *Information Unlimited Software, Inc., 281 Arlington Ave., Berkeley, CA 94707. Phone: (415) 525-9452.*

DataKEYper***

Data Manager built for quick and simple access to up to 800 data files. Apple II/DOS 3.3, Applesoft Basic. Available from: *ESP Computer Resources, Inc., 9 Ash Street, Hollis, NH 03049. Phone: (603) 465-7264.*

The Data Reporter***

General purpose data base with report generator and a plotter/analyzer for statistical analysis and the production of graphs. Apple II/DOS 3.3, Applesoft Basic. Available from: *Synergistic Software, 5221 120th Ave., S.E., Bellevue, WA 98006. Phone: (206) 226-3216.*

CCA Data Base Management System***

Simple first-time-user data base. Apple II/DOS 3.3. Available from: *Ledgerton International, 23422 Lyons Avenue, Newhall, CA 91321. Phone: (805) 254-0556.*

TDM (The Data Machine)

General data management system for large files. Calculates time between dates. Apple II & III/UCSD Pascal. Supports multiple users. Available from: *Pascal Systems, Inc., 830 Menlo Avenue, Suite 109, Menlo Park, CA 94025. Phone: (415) 321-0761.*

Flexware***

Powerful menu-driven relational database/applications program generator. Supports multiple users. Apple II & III/UCSD Pascal. Available from: *Micro Financial Systems, 1504 East Valley Blvd., Industry, CA 91746. Phone (213) 961-0237.*

LogiQuest III

Multi-file relational database includes capabilities to restructure files, define automatic queries, and full report generator. Apple II & IBM PC/UCSD Pascal 4.0. Available from: *Software Products International, 10343 Roselle St., Suite A, San Diego, CA 92121. Phone: (714) 450-1526.*

Versa Form***

Forms writer for producing invoices, quotations, purchase orders and other documents. Apple II & III/UCSD Pascal. Available from: *Applied Software Technology, 15985 Greenwood Road, Monte Sereno, CA 95030. Phone: (408) 354-4689.*

DBASE II

Full data base functions including the ability to define menus and screens—some programming experience. CP/M compatible systems. Available from: *Ashton-Tate, 9929 West Jefferson, Culver City, CA 90230. Phone: (213) 204-5570.*

FMS-80

Data base management—use-definable screens, math functions. CP/M compatible systems. Available from: *Systems Plus, Inc., 1120 San Antonio Rd., Palo Alto, CA 94303. Phone: (415) 969-7047.*

Data Star

Forms entry and display system that is part of the MicroPro line of software. CP/M compatible systems. Available from: *Micropro International, 1299 Fourth St., Suite 400, San Rafael, CA 94901. Phone: (415) 457-8990.*

Profile

Simple file system capable of 99 files, five screen and five print formats per file, merge capability with Scripsit. TRS-80 MOD I & III/NEWDOS 80 ver. 2.0, TRS-80 MOD II/CORDOS. Available from: *Radio Shack, Division of Tandy, Fort Worth, Texas 76102. Phone: (817) 390-3011.*

Accounting Plus II***

Accounting package for the Apple II. Includes G/L, A/P, A/R, and Inventory with Purchasing. Apple II/DOS 3.3, Applesoft Basic. Available from: *Systems Plus, Inc.*, 1120 San Antonio Road, Palo Alto, CA 94303. Phone: (415) 969-7047.

Business Accounting Package***

Performs accounting functions with a package of nine Interactive Modules—G/L, A/R, A/P, Inv. Banking, Disbursements, Payroll, Fixed Assets, Order Processing. Apple II/DOS 3.3, Applesoft Basic. Available from: *GOCI*, 7710 Computer Ave., Suite 115, Edina, MN 55435. Phone: (612) 835-4271.

Retail Management System***

Interactive A/R, A/P and Payroll. 2800 items; no overflow between volumes. Apple II, Applesoft Basic/DOS 3.3. Available from: *Irving Computers*, 1704 W. Irving Blvd., Suite 4, Irving TX 75061. Phone: (214) 254-6850.

Payroll Manager

Payroll system—280 employees/volume. Applesoft Basic, Apple II/DOS 3.3. Available from: *Computer Research*, 1879 S. Main St., Salt Lake City, UT 84115. Phone: (801) 484-7316.

The Hardisk Accounting System***

Specially designed accounting system for the Corvus hard disk—includes G/L, A/R, A/P, Inventory, Payroll, Fixed Asset, Mailing Labels. Supports multiple users. Apple II/UCSD Pascal. Available from: *Great Plains Software*, 123 15th Street, North Fargo, ND 58102. Phone: (701) 293-8483.

Flexware***

Integrated accounting system designed to be modified to customer specs. A/R, A/P, G/L, Inventory/Purchasing, Order Process-Payroll, Sales Analysis. Supports multiple users. Apple II & III/UCSD Pascal. Available from: *Micro Financial Systems*, 15404 East Valley Blvd., Industry, CA 91746. Phone: (213) 961-0237.

General Accounting***

General Accounting, A/P and A/R with Accounts Aging. Apple II/UCSD Pascal. Available from: *Status Systems Corporation*, 2010 Notre Dame Avenue, Winnipeg, Canada R3H 0J8. Phone: (204) 632-9130

Broderbund Software Payroll Package

Up to 300 employees in 65 divisions; can establish tax formula for 50 states. Handles multiple wage, piece, and commission rates. Apple II/UCSD Pascal. Available from: *Broderbund Software*, 1938 Fourth St., San Rafael, CA 94901. Phone: (415) 456-6424.

Accounting Plus***

Accounting Plus is a fully integrated, menu driven accounting package consisting of eight modules essential to running a business. CPM compatible systems. Available from: *Systems Plus*, 1120 San Antonio Rd., Palo Alto, CA 94303. Phone: (415) 969-7047.

A.I.S. Accounting System

A/R, A/P, G/P, Inventory, Sales/Order Entry. End of month closings are unlocked by serial number so customer can try each module before buying. Support multiple users. CPM compatible systems. Available from: *American Integrity Systems*, 1415 E. McFadden, Suite A, Santa Ana, CA 92075. Phone: (714) 973-4756.

Tiny Systems Applications

A/R, A/P, G/L, Inventory, Payroll, Order Entry, Job Costing, Time Accounting and Sales Analysis for manufacturer's reps. Source code available to qualified dealers. CPM compatible systems. Available from: *Tiny Systems*, 6660 N. Glenville Dr., Richardson, TX 75081. Phone: (214) 669-0262.

Foresight

Sales order system that manages A/R, inventories and pricing. CPM compatible systems. Available from: *Interactive Computer Systems*, 6707 Whitestone Road, Baltimore, MD 21207. Phone: (301) 944-7230.

Coordinated Business Systems***

Total accounting package including: A/R, A/P, G/L, Payroll, Invoicing and Inventory. TRS-80 MOD I & III/NEWDOS/80 ver. 2.0. Available from: *Small Business Systems Group, Inc.*, 6 Carlisle Road, Westford, MA 01886. Phone: (617) 692-3800.

MAS—80

General accounting package including G/L, A/R, A/P, and Check Register. TRS-80 MOD I & III/NEWDOS/80 ver. 2.0. Available from: *Micro Accounting Systems*, Box 128-R2, Ottawa, KS 66061. Phone: (913) 242-2674.

Asset

Full accounting package including G/L, A/R, A/P, and Inventory. Apple II & IBM PC/UCSD Pascal 4.0. Available from: *Software Products International*, 10343 Roselle St., Suite A, San Diego, CA 92121. Phone: (714) 450-1526.

Medical Billing Accounts Receivable***

Multi-user, on-line superbill, recall notices, built-in group incentive plan, report queuing for after-hours printing; expandable. Apple II/DOS 3.3, Applesoft Basic. Available from: *Johnson Associates, Inc.*, P.O. Box 1870, Phoenix, AZ 85001. Phone: (602) 979-4554.

P.M.S. Medical Billing System***

A/R system of up to five physicians, up to 20,000 accounts, RVS lookup, insurance forms, 14 different reports. Apple II/DOS 3.3, Applesoft Basic. Available from: *Professional Medical Systems, Inc.*, 3604 Foothill Blvd., La Crescenta, CA 91214. Phone: (213) 248-2411.

D.O.C.S.***

A/R, G/L and insurance claims. Preformatted insurance forms available for many states. Apple II/DOS 3.3, Applesoft Basic. Available from: *Doctors Office Computer Systems*, 2501 Williamson Rd., Roanoke, VA 24012. Phone: (703) 366-5200.

M.O.S. Medical Packages***

Single or multi-user billing and A/R system with insurance forms. Special application packages for physicians, dentists and psychiatrists. Apple II/DOS 3.3, Applesoft Basic. Available from: *Medical Office Systems, Inc.*, 205 N. Frederick, Gaithersburg, MD 20760. Phone: (301) 840-0440.

Doctors Office Companion***

Patient billing system for up to nine doctors. A/R, Super Bills, Insurance forms, CPT code lookup. Apple II/DOS 3.3, Applesoft Basic. Available from: *High Technology Software Products, Inc.*, P.O. Box 14665, 2201 N.E. 63rd, Oklahoma City, OK 73113. Phone: (405) 478-2105.

Physician's Business Application Package***

Medical application billing system that prints insurance forms, initial and monthly statements; up to four insurance companies per patient. Apple II/DOS 3.3, Applesoft Basic. Available from: *HMS Systems, Inc.*, P.O. Box 4633, SFA, Nacogdoches, TX 75962. Phone: (713) 560-1504.

MedPac***

Generates patient and insurance statements. Ability to suspend transaction for patient record look-up. Multi-user for up to 26 doctors or dentists. Apple II/DOS 3.3. Available from: *Med-Data*, 108 Allen Rd., N.E., Suite 210, Atlanta, GA 30328. Phone: (404) 252-6681.

Softcare

Automates patient billing, insurance claims, and A/R. Apple II/DOS 3.3. Available from: *Professional Business Systems, 119 Fremont St., San Francisco, CA 94901. Phone: (415) 546-1596.*

Medical Practice Management Systems***

A/R for up to nine doctors, query by name or sound, research by procedure or DX, management reports by doctor and clinic S-100 systems/UCSD Pascal. Available from: *Professional Software Associates, North 9515 Division, Suite 1, Spokane, WA 99218. Phone: (509) 446-0396.*

Micro Med

Billing, multiple insurance forms, patient look-up, profitability analysis, mailing list, appointment book system for up to 20 doctors or dentists. CP/M compatible systems. Available from: *Software Hows, P.O. Box 36275, Los Angeles, CA 90036. Phone: (213) 829-6782.*

Veterinary Billing

Accounts receivable, multi-user, recall notices, report queuing for after-hours printing, data diagnostics. Apple II/DOS 3.3, Applesoft Basic. Available from: *Johnson Associates, Inc., P.O. Box 1870, Phoenix, AZ 85001. Phone: (602) 979-4554.*

VMS-Veterinary Management System

Complete package including billing, recall reminders, tracing of drugs administered, profit analysis by procedure. CP/M compatible systems. Available from: *Innovative Business Software, 710 Williams, Richardson, TX. Phone: (214) 699-9088.*

Dental Practice Management System***

A/R for up to nine dentists, query by name or sound, research by procedure or DX, management reports by doctor and clinic disbursements, payroll, fixed assets, order processing. S-100 Systems/UCSD Pascal. Apple II/DOS 3.3, Applesoft Basic. Available from: *Professional Software Associates, North 9515 Division, Suite 1, Spokane, WA 99218. Phone: (509) 446-0396.*

Dental Lab IV

On-line case entry, work orders, invoices, inquiry. CP/M compatible systems. Available from: *Compusol, Inc., 5455 Buford Hwy., N. Court Square B223, Doraville, GA 30340. Phone: (404) 451-1033.*

STSS***

Student tracking and scheduling system supports grade reporting, distributions by grade and teacher load. Apple II/DOS 3.3, Applesoft Basic. Available from: *Olensky Brothers, Inc., 3763 Airport Blvd., Mobile, AL 36600. Phone: (205) 344-7447.*

The School Attendance System***

A centralized integrated computer system designed to keep and report attendance on a school wide basis. Supports SCANTRON Optical Mark Reader. Apple II/DOS 3.3, Applesoft Basic. Available from: *Educational Admin. Data Sys., 2241 Greenbriar Dr., Springfield, IL 62704. Phone: (217) 787-7190.*

CAI-Manager***

Provides central management for instructional software which can be loaded onto hard disk. Unlimited record storage. Apple II/DOS 3.3, Applesoft Basic. Available from: *Mathware, 919 14th St., Hermosa Beach, CA 90254. Phone: (213) 379-1570.*

Classroom Monitor***

Acts as a shared disk interface supporting up to 64 Apple Computers connected on Corvus Omninet Systems. Apple II/DOS 3.3, Applesoft Basic & Pascal. Available from: *Software Connections, 1800 Wyatt Drive, Suite 17, Santa Clara, CA 95054. Phone: (408) 988-3704*

FASCOM***

Financial aid estimator and management system with form letter word processing. Apple II/DOS 3.3, Applesoft Basic. Available from: *Financial Analysis Service, P.O. Box 1937, Hiram, OH 44234. Phone: (216) 569-3201.*

Wordsearch

Creates a wordsearch puzzle after the teacher enters a list of words. Answer key is printed, also. Apple II/DOS 3.3, Applesoft Basic. Available from: *Hartley Courseware, Inc., P.O. Box 431, Dimondale, MI 48821. Phone: (616) 942-8987.*

Clock

Teaches and drills on time concepts—reading a clock, setting the hands, etc. Apple II/DOS 3.3, Applesoft Basic. Available from: *Hartley Courseware, Inc., P.O. Box 431, Dimondale, MI 48821. Phone: (616) 942-8987.*

Word Families

Beginning consonants, ending consonants, medial vowels. Apple II/DOS 3.3, Applesoft Basic. Available from: *Hartley Courseware, Inc., P.O. Box 431, Dimondale, MI 48821. Phone: (616) 942-8987.*

The Elementary Mathematics

Classroom learning system to teach basic math skills for whole numbers or fractions/decimals. Apple II/DOS 3.3, Applesoft Basic. Available from: *Sterling Swift Publishing Co., 1600 Fortview Rd., Austin, TX 78704. Phone: (512) 444-7570.*

Executive Secretary***

Professional word processor with built-in index system, mail merge, and electronic mail (DB Master compatible). Apple II/DOS 3.3. Available from: *Soft/Sys, Inc.*, 4306 Upton Avenue, South, Minneapolis, MN 55410. Phone: (612) 929-7104.

Word Star

The most popular CP/M word processor. Provides virtually every word processing function. Mail merge capability from separate package. CP/M compatible systems. Available from: *MicroPro International*, 1299 Fourth St., Suite 400, San Rafael, CA 94901. Phone: (415) 457-8990.

Spellguard

Checks spelling against a 20,000 word dictionary. CP/M compatible systems (Except Lifeboat CP/M). Available from: *Innovative Software Applications*, Box 2797, Menlo Park, CA 94025. Phone: (415) 326-0805.

Larrywriter

Professional word processor that is both powerful and easy to use. TRS-80 MOD II & III/NEWDOS/80 ver. 2.0. Available from: *Soft Sector Marketing*, P.O. Box 33948, Detroit, MI 48232. Phone: (313) 425-4020.

Scipsit

Popular TRS-80 word processor. TRS-80 MOD I & III/NEWDOS/80 ver. 2.0, TRS-80 MOD II/CORDOS. Available from: *Radio Shack, Division of Tandy*, Fort Worth, TX.

WP System

General business word processor. TRS-80 MOD I, II, & III/Oasis. Available from: *Diamond Systems, Inc.*, P.O. Box 48301, Chicago, IL 60648. Phone: (312) 763-1722.

Mailing List Package

Maintains a mailing list for the WP system above. TRS-80 MOD I, II, & III/Oasis. Available from: *Diamond Systems, Inc.*, P.O. Box 48301, Chicago, IL 60648. Phone: (312) 763-1722.

Computer Card Catalog (Library)***

Computerized substitute for card catalog. Patron can search for a book by subject, author, or title with a response time of less than 3 seconds. Apple II/DOS 3.3. Available from: *Computer CAT*, 3005 West 74th Avenue, Westminster, CO 80030. Phone: (303) 426-5880.

Job Control System

Management tool to monitor productivity and profitability. Tracks time, personnel and inventory. Apple II/DOS 3.3, Applesoft Basic. Available from: *High Technology Software Products, Inc.*, P.O. Box 14665, 2201 N.E. 63rd, Oklahoma City, OK 73113. Phone: (405) 478-2105.

The Tool

Application program generator that includes Screen Formatter, Database and Report Generator. Translates into Apple machine code. Apple II/DOS 3.3, Applesoft Basic. Available from: *High Technology Software Products, Inc.*, P.O. Box 14665, 2201 N.E. 63rd, Oklahoma City, OK 73113. Phone: (405) 478-2105.

SMART

Analysis and graphics of stocks, options, commodities, bonds, and related market economic indexes. Automatic securities update and portfolio monitoring available. Apple II/DOS 3.3, Applesoft Basic. Available from: *Software Resources, Inc.*, 186 Alewife Brook, Suite 310, Cambridge, MA 02138. Phone: (617) 497-5900.

Commodities Package

Software for the stock and commodities trader, numerous technical analyses program, complete editing and book-keeping functions. Apple II/DOS 3.3, Applesoft Basic. Available from: *Computrac/Technical Analysis Group*, P.O. Box 15951, New Orleans, LA 70175. Phone: (800) 535-7990.

Cascade II***

Industrial quality computer-aided drafting and design system for electrical, architectural, mechanical and process industries. 68000 co-processor available. Apple II/UCSD Pascal. Available from: *Cascade Graphics Development*, 1000 S. Grand, Santa Ana, CA 92705. Phone: (714) 558-3318.

LETS***

Provides an interactive graphics dialogue to plan and estimate computer-aided manufacturing for machine shops. Apple II/UCSD Pascal. Available from: *Tipnis Associates*, P.O. Box 42001, Cincinnati, OH 45242. Phone: (513) 791-3805.

Flexware***

Table-driven program generator and maintenance facility for the creation of custom and vertical market software. Integrated data base and report writer with data dictionary. Multi-user with record lockout. Apple II & III/UCSD Pascal. Available from: *Micro Financial Systems*, 15404 East Valley Blvd., Industry, CA 91746. Phone: (213) 961-0237.

P.A.C.E.***

Flexible application program for estimating and appraising equipment, labor, material and general project needs. Apple II/UCSD Pascal. Available from: *High Technology Software Products, Inc.*, P.O. Box 14665, 2201 N.E. 63rd, Oklahoma City, OK 73113. Phone: (405) 478-2105.

Statpro

Sophisticated statistical analysis and plotting package. Reads DIF and ASCII files for integration with data bases. Works with OMNINET. Apple II & III UCSD Pascal. Available from: *Blue Lakes Software*, 3240 W. University Ave., Madison, WI 53705. Phone: (608) 233-6502.

Synopsis***

Reads and maintains a catalogue of the first four lines of all files on the disk. Almost a necessity for word processing on CP/M compatible systems. Available from: *Pro/Tem*, 814 Tolman Drive, Stanford, CA 94305. Phone: (415) 497-3573.

Retail Sales System***

Complete Point-of-Sale system including cash drawer, invoices, sales reports, and inventory module. Interfaces with TCS accounting system. CP/M compatible systems. Available from: *Xtra Soft, Inc.*, P.O. Box 91063, Louisville, KY 40291. Phone: (502) 499-1533.

Milestone

Project management/scheduling—a PERT chart maker. CP/M compatible systems. Available from: *Organic Software*, 1492 Windsor Way, Livermore, CA 94550. Phone: (415) 455-4034.

Analyst/Advisor

Stock and bond portfolio charting and management system. Command-driven like a word processor. Automatic updates. CP/M compatible systems. Available from: *Kate's Computers Distributing Corp.*, P.O. Box 927, Pacifica, CA 94044. Phone: (415) 332-9434.

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CIS COBOL

A compiler for COBOL—the most popular mainframe and minicomputer business computer language. CP/M compatible systems. Available from: *Micro Focus, 1601 Civic Center Drive, Santa Clara, CA 95050. Phone: (408) 496-0176.*

Strom-Finite Element Structural Analysis***

Analyzes stress and displacement in building structures—or any other design work where a body frame is subject to stress. CP/M compatible. Available from: *McClintock Corp., Box 430980, Miami, FL 33143. Phone: (305) 666-1300.*

TRS-80-III

Top of the line communications package. Used with modem to communicate with any ASCII computer—IBM 370, DEC 2060, etc., TRS-80 MOD I & III/ NEWDOS/80 ver. 2.0. Available from: *Small Business Systems Group, Inc., 6 Carlisle Road, Westford, MA 01886. Phone: (617) 692-3800.*

Forum 80—Electronic Mail

Electronic message system, on-line order entry, data distribution and collection system. TRS-80 MOD I & III/ NEWDOS/80 ver. 2.0. Available from: *Small Business Systems Group, Inc., 6 Carlisle Road, Westford, MA 01886. Phone: (617) 692-3800.*

TR-80-X10—Host System

Allows software developers to run a Corvus system from a remote computer and see the screen as the client sees it. Great for long distance software support. TRS-80 MOD I & III/ NEWDOS/80 ver. 2.0. Available from: *Small Business Systems Group, Inc., 6 Carlisle Road, Westford, MA 01886. Phone: (617) 692-3800.*

CORDOS 1.2***

Hard disk operating system for TRS-80 MOD II that runs TRSDOS 2.0 programs. TRS-80 MOD II/CORDOS. Available from: *Computerism Developers, P.O. Box 182, Clinton, KY 42031. Phone: (502) 353-8212.*

HSDS***

Hard disk operating system for TRS-80 MOD II that runs TRSDOS 2.0 programs. Racal also sells a large assortment of TRSDOS utilities that work with HSDS. TRS-80 MOD II/HSDS. Available from: *Racal, 1330 North Glassell, Suite M, Orange, CA 92667. Phone: (714) 997-4950.*

NEWDOS/80 ver. 2.0

The operating system required to run the Corvus Hard Disk on a TRS-80 MOD I or II. TRS-80 MOD I & III/ NEWDOS/80 ver. 2.0. Available from: *Apparat, 4401 South Tamarac, Denver, CO 80237. Phone: (303) 741-1778.*

Most non-copy protected software runs on the Corvus Hard Disk Drive. There are a few exceptions; rules of thumb that have been compiled are listed below by operating system.

CP/M

Virtually all software written to run under the CP/M operating system will run without problems on the Corvus Hard Disk Drive. The only CP/M software found to require modification is old (pre CP/M 1.4) utilities and language compilers that have built-in limitations that prevent access to files greater than 500 K or require loading at a specific address on top of the operating system, thus destroying the Corvus patch to CP/M.

A Corvus compatible CP/M is available for the TRS-80 MOD III from: *Hurricane Labs, 5149 Moorpark, San Jose, CA 95129. Phone: (408) 257-8676.*

TRSDOS and NEWDOS/80 ver. 2.0

Virtually all software written to run under the TRSDOS 2.0 operating system for the TRS-80 Model II runs on the Corvus Hard Disk Drives under the CORDOS 1.2 or HSDS operating systems mentioned above. The one notable exception to this rule is the SCRIPSIT word processor that requires the low version of CORDOS. (While CORDOS and HSDS were both written specifically to run TRSDOS programs on the Corvus Hard Disk, they are supported by their developers).

Software written to run under TRSDOS for the TRS-80 MOD I & III, PMC-80, and LNW80 will not run on the Corvus Hard Disk Drive. Virtually all software written to run under NEWDOS/80 ver. 2.0 for these machines will run on the Corvus Hard Disk Drive. (NEWDOS/80 ver. 2.0 is supported by Apparat).

Apple DOS 3.3

Three types of problems with Corvus software compatibility under Apple DOS 3.3 have come to light.

1. Software compatibility problems stem mostly from the addition of 80-column cards, communication cards, memory boards, interface cards and any of the large number of printed circuit cards available to plug into the slots inside the Apple computer. Some of these cards have been found to compete with our Corvus Hard Disk interface card for the same few memory spaces in low memory not used by the operating system. More information on specific cards which interfere with the Corvus interface will be available in the next edition of the CORVUS SYSTEMS SOFTWARE DIRECTORY.

2. Software designed to access multiple floppy diskettes may not work if the developer did not take into account the Corvus simulation of floppy diskettes through volume numbers.

3. There are a few software packages that require booting from a diskette in slot #6 (where the Corvus interface card must reside). Switching the diskette and Corvus Hard Disk interface cards is bothersome and risks damage to the computer and the cards should one forget to turn off the computer before switching the cards. There are two very good accessory cards designed to alleviate this problem:

a) The Johnson SLOT SWAPPERS available from Johnson Associates will swap slot #6 with any other slot with the flick of a toggle switch. Available from: *Johnson Associates, 6525 W. Villa Theresa, Glendale, AZ 85308. Phone: (602) 979-4554.*

b) The SLOT SWAPPER J6 4X6 from Microbyte swaps slots 4 and 6 in software via a poke command. Available from: *Microbyte, Nazas 10-2, Col. Chahiemoc, Mexico City, Mexico 06400. Phone: (905) 591-0321.*

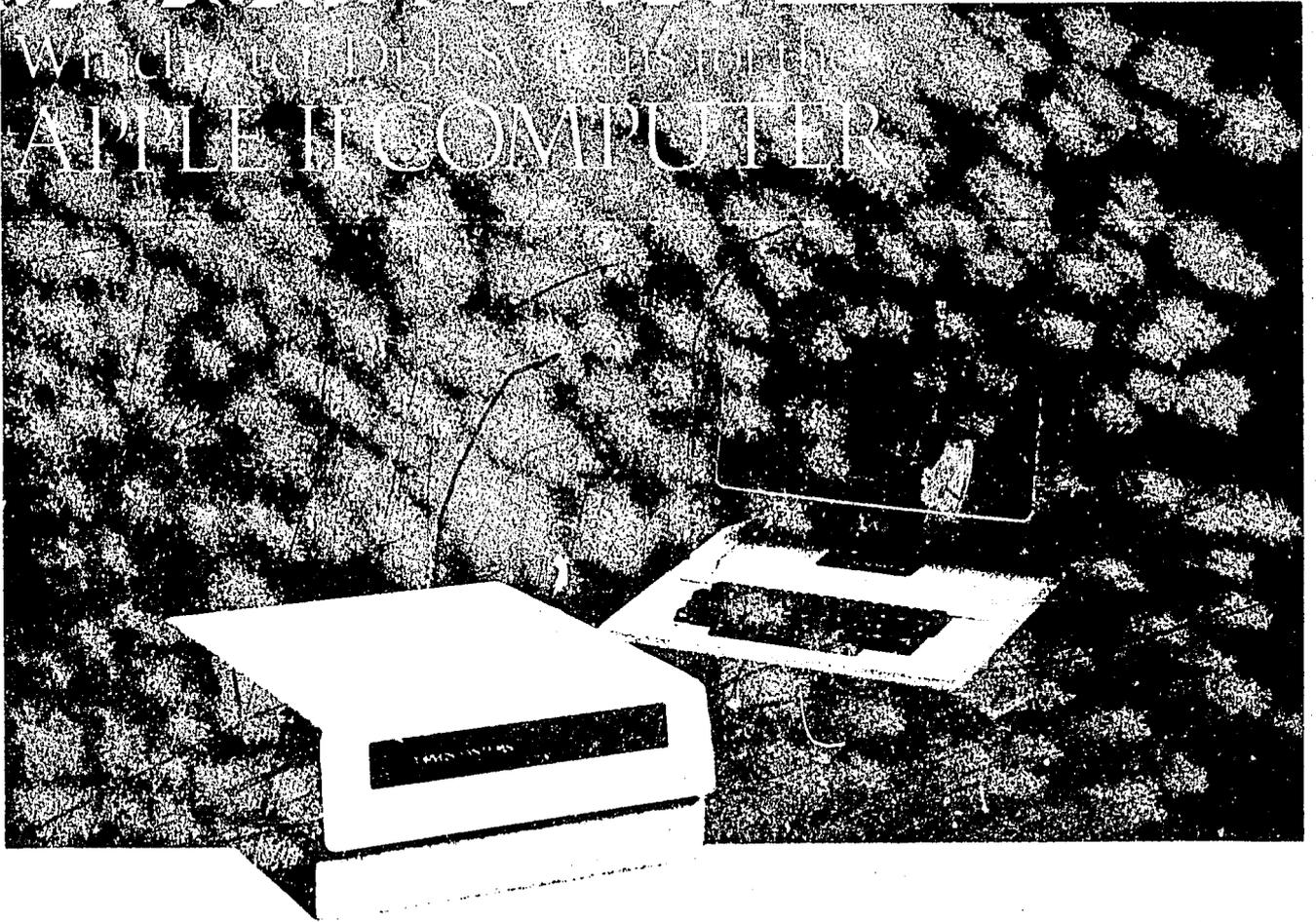
Apple II and Apple II UCSD Pascal

Virtually all software written in UCSD Pascal for the Apple II & Apple III works on Corvus Hard Disk Drives.

Apple III SOS

Virtually all software written to run under the SOS operating system for the Apple III will run on the Corvus Hard Disk Drive.

6/12/18 MEGABYTE WINCHESTER SYSTEMS APPLE II COMPUTER



• Multiply The Power of Your Apple II

With the latest Winchester disk system technology from Corvus Systems, you can give your Apple II computer the power and speed it needs for today's demanding computer applications. With such features as thin-film plated media and superior head-positioning systems, the Model 6, Model 11 and Model 20 all offer the advantages of our compact, quiet 5¼ inch design. With all these systems, you can include the field-proven Corvus MIRROR® video tape backup system for simple, cost-effective Winchester backup.

Built-in Expandability

Corvus designs all its products with your future needs in mind. You can start with a single disk system, and as your needs grow,

let additional computers share the disk and peripherals by means of the Corvus OMNINET™ or Multiplexer local area networks. These systems allow more than 60 Apple II or other brands of computers to share the disk system as well as printers and other peripherals. If on the other hand, you need more data storage capacity, you can add on more disk systems. No matter where your data storage and distribution needs may lead, you'll be able to get there with Corvus. Your Corvus dealer can show you how.

Reliable Winchester Technology

The Corvus line of 5¼ inch Winchester disk systems sets new standards for reliability. Thin-film plated media on the Model 11 and Model 20 allow greater bit densities without sacrificing data integrity. The sealed environment

keeps dust, smoke, and other particles from reaching the disk surface, and an automatic spindle brake protects the drive during shipping and handling. The Corvus intelligent disk controller insures rapid, reliable data transfer with such features as read-after-write verify, automatic error retries, transparent formatting with CRC (Cyclic Redundancy Check) Error Detection, and high-speed data transfer using DMA (Direct Memory Access). Corvus disk systems require no preventive maintenance.

Corvus Software

Corvus provides all the software you'll need to support Apple DOS 3.3, Apple Pascal, and Apple CP/M. You can put data from any or all of these operating systems on a single disk system by dividing

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CORVUS SYSTEMS

6/12/18 MEGABYTE

Winchester Disk Systems for the APPLE II COMPUTER

the disk space. The DOS 3.3 interface treats the disk system as multiple images of a standard diskette, and the DOS commands normally used to check volumes can be used with Corvus software to specify which volume to access. More than 130 separate volumes (up to a limit of 20 megabytes) can be on line at one time, and any of them can be write-protected at will.

The Apple Pascal interface allows you to create volumes of varying size on the system, and you can mount up to six of them at one time. The convenience of having several volumes on line of up to 20,000 blocks each cannot be overestimated. Best of all, this large increase in storage capacity is completely transparent to the operating system. If you wish, you

can even configure a system with volumes of up to 10 megabytes in size, up to a limit of 50 megabytes total. Corvus also provides several utilities for disk diagnostics, controller code update, and operation of the Corvus MIRROR.

Other Corvus Compatible Computers

When you pick a Corvus Winchester disk system for your Apple II, you're in good company. Corvus makes network-ready Winchester disk systems for most popular microcomputers, and we've been at it longer than anyone else. In addition to the Apple II, the list of Corvus compatibles includes the IBM Personal Computer, Apple III, TRS-80 Models I, II, and III, Xerox 820 and 820-II, Zenith Z89/90, NEC

PC-8000, Atari 800, Osborne 1, and such S-100 Bus computers as Vector Graphic and North Star. And of course, all Corvus disk systems connect to the revolutionary new Corvus Concept™ personal workstation. Ask your Corvus dealer for details.

Service

All Corvus disk systems come with a six (6) month parts and labor warranty. Warranty extensions of up to 24 additional months are available at a reasonable extra cost. If your Corvus disk system should ever require service, you can take it to one of our Authorized Service Centers throughout the world. In addition, on-site service is available in some areas. Check with your Corvus dealer for availability in your area.

SPECIFICATIONS

MODEL NUMBER	MODEL 6	MODEL 11	MODEL 20	PHYSICAL DIMENSIONS	MODEL 6, 11, and 20
Capacity (megabytes)				Height (inches/centimetres)	5.75/14.6
Unformatted	6.7	14.0	21.0	Width (inches/centimetres)	12.0/30.5
Formatted	5.7	12.1	18.4	Depth (inches/centimetres)	15.0/38.1
Disks				ENVIRONMENTAL SPECIFICATIONS	
Number	2	2	3	Temperature (°F/°C)	
Data Surfaces	4	4	6	Operating	50° to 120°/10° to 50°
Tracks per Surface	144	306	306	Non-Operating	-40° to 140°/-40° to 60°
Diameter (inches/centimetres)	5.25/13.3	5.25/13.3	5.25/13.3	Variation	18°/10° per hour
PERFORMANCE	MODEL 6	MODEL 11 and 20		Humidity (non-condensing)	
Access Time (milliseconds)				Operating	10% to 80%
Minimum	43		29	Non-Operating	10% to 90%
Maximum	240		135	Altitude, Operating (feet/metres)	-1,000 to 10,000/ -305 to 3,050
Average	125		72	POWER REQUIREMENTS	
Average Latency Time (milliseconds)	6.25		8.33	Voltage	100, 120, 220, or 240 volts (selectable)
Disk Rotational Speed (RPM)	4,800		3,600		50/60 Hz, single phase AC
Peak Transfer Rate (kilobytes/second)	960		687.5	Typical Consumption	150 volt amperes

Apple is a registered trademark and Apple Pascal is a trademark of Apple Computer, Inc.
CP/M is a registered trademark of Digital Research, Inc.
IBM is a registered trademark of International Business Machines Corporation.

TRS-80 is a registered trademark of the Tandy Corporation.
Xerox is a registered trademark and 820 and 820-II are trademarks of the Xerox Corporation.
Atari is a registered trademark and Atari 800 is a trademark of Atari, Inc.
Osborne 1 is a trademark of the Osborne Computer Corporation.

North Star is a trademark of North Star Computers, Inc.
Corvus MIRROR (patent pending) is a registered trademark of Corvus Systems, Inc.
Corvus OMNINET, Corvus Concept, Corvus, and Corvus Systems are trademarks of Corvus Systems, Inc.

CORVUS SYSTEMS

Corvus Systems, Inc. reserves the right to change specifications without notice or obligation.

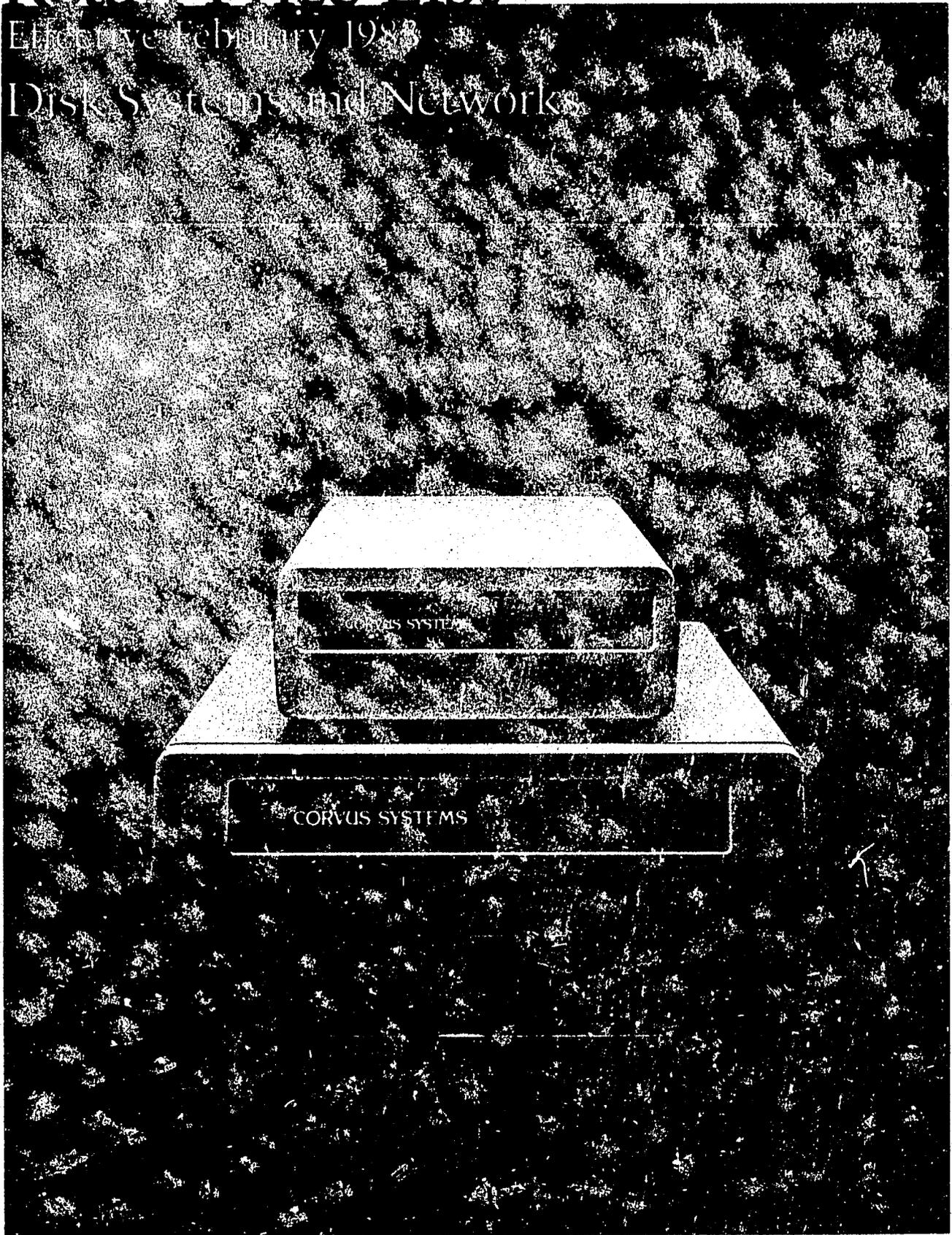
2029 O'Toole Avenue, San Jose, California 95131
Telephone (408) 946-7700
TWX 910-338-0226 Telex: 278976

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Retail Price List

Effective February 1983

Disk Systems and Networks



★★
★ **CORVUS SYSTEMS**

CORVUS WINCHESTER DISK SYSTEMS

Complete Disk System

A Corvus Winchester disk system provides 5.7 (Model 6), 12.1 (Model 11), or 18.4 (Model 20) megabytes (MB) of formatted storage. The price includes a single enclosure containing a Winchester disk drive, power supply

and intelligent controller. The disk system price also includes a disk interface kit (interface card with a 5-foot cable, system software and manuals). Specify either a 120 or 220 volt model.

Model Number	Disk System Description	Suggested Retail Price
6	Model 6 disk system for IBM PC (PC DOS)	2495
11	Model 11	3495
20	Model 20	4495
6C	Model 6 disk system for IBM PC (PC DOS)	2495
11C	Model 11	3495
20C	Model 20	4495
6LS	Model 6 disk system for DEC LSI-11 (RL01)	2825
11LS	Model 11 (RL01 or RL02)	3825
20LS	Model 20 (RL01 or RL02)	4825
6NC	Model 6 disk system for NEC PC-8000 (NEC CP/M 2.2)	2495
11NC	Model 11	3495
20NC	Model 20	4495
6OSB	Model 6 disk system for Osborne 01 (CP/M)	2495
11OSB	Model 11	3495
20OSB	Model 20	4495
6S	Model 6 disk system for S-100 bus computers (CP/M)	2495
11S	Model 11	3495
20S	Model 20	4495
6T1	Model 6 disk system for TRS-80 Model I (NEWDOS80 ver 2.0)	2495
11T1	Model 11	3495
20T1	Model 20	4495
6T2	Model 6 disk system for TRS-80 Model II (CP/M)	2495
11T2	Model 11	3495
20T2	Model 20	4495
6T3	Model 6 disk system for TRS-80 Model III (NEWDOS80 ver 2.0)	2495
11T3	Model 11	3495
20T3	Model 20	4495
6VG1	Model 6 disk system for Vector Graphic (CP/M)	2495
11VG1	Model 11	3495
20VG1	Model 20	4495
6XR5	Model 6 disk system for Xerox 820 and 820-II (5 1/4" diskettes) (Xerox CP/M 2.2)	2495
11XR5	Model 11	3495
20XR5	Model 20	4495
6XR8	Model 6 disk system for Xerox 820 and 820-II (8" diskettes) (Xerox CP/M 2.2)	2495
11XR8	Model 11	3495
20XR8	Model 20	4495
6ZN	Model 6 disk system for Zenith Z89 (Zenith CP/M)	2495
11ZN	Model 11	3495
20ZN	Model 20	4495
6Z9	Model 6 disk system for Zenith Z90 (Zenith CP/M)	2495
11Z9	Model 11	3495
20Z9	Model 20	4495

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Corvus Disk System with MIRROR

Any Corvus disk system can be ordered with a built-in MIRROR. The MIRROR allows the disk system to interface to a standard video cassette recorder (VCR) for disk backup. The VCR must be purchased separately and is not available from Corvus. The built-in MIRROR option includes a VCR interface controller in the disk

system enclosure. Video cables to connect to a VCR are included. The model number for a Corvus disk system with a built-in MIRROR is the disk model number followed with a/M (for example, 11AP/M for Apple II disk system with built-in MIRROR). Built-in MIRROR may be field-installed ONLY by a Corvus Authorized Service Center. Specify either a 120 or 220 volt model.

Model Number	Description	Suggested Retail Price
6xx/M	Model 6 disk system with built-in MIRROR	Disk price + \$790
11xx/M	Model 11 disk system with built-in MIRROR	Disk price + \$790
20xx/M	Model 20 disk system with built-in MIRROR	Disk price + \$790

xx = Disk system model designation (see disk systems prices at left)

External MIRROR

This separately packaged MIRROR backup system is compatible with all Corvus disk systems. It allows the disk system to interface with a standard video cassette recorder (VCR) for disk backup. The VCR must be purchased separately and is not available from Corvus.

The External MIRROR price includes a VCR interface controller in an attractive enclosure and video cables to connect to a VCR. MIRROR backup software is included with each disk system. Specify either a 120 or 220 volt model.

Model Number	Description	Suggested Retail Price
M/xx	External MIRROR backup system	\$790

xx = Disk system model designation (see disk systems prices at left)

Add-on Disk Drive

An add-on disk provides an additional 5.7, 12.1 or 18.4 megabytes (MB) of formatted storage. The price includes a special 3-foot add-on cable and a single enclosure containing a Winchester disk drive, power supply

and intelligent controller. A maximum of four drives may be daisy chained. NOT ALL COMPUTERS OR OPERATING SYSTEMS SUPPORT ADD-ON DISK DRIVES—CHECK WITH YOUR DEALER FOR DETAILS. Specify either a 120 or 220 volt model.

Model Number	Description	Suggested Retail Price
6D	Model 6 add-on disk drive	\$2295
11D	Model 11 add-on disk drive	3295
20D	Model 20 add-on disk drive	4295

Corvus Disk Interface Kit

A Corvus disk Interface Kit provides the hardware and software to use a Corvus Winchester disk system with the selected computer. The price includes a 5-foot cable and interface card. Software utilities and manuals are included. The complete disk systems on the opposite

page already include an interface kit for the specified computer. An additional interface kit can be ordered to use the Corvus disk with a different computer, or a kit can be used with a Corvus Model 6N, 11N, or 20N (next page) to convert one of those units into a single-user system.

Model Number	Description	Suggested Retail Price
D/AP	Apple II (DOS 3.3 and Pascal 1.1)	\$300
D/A3	Apple III (SOS 1.1)	300
D/AT	Atari 800 (Atari DOS 2.0)	300
D/DR	DEC VT180 (CP/M)	300
D/IB	IBM Personal Computer (PC DOS)	300
D/LS	DEC LSI-11	630
D/NC	NEC PC-8000 (NEC CP/M ver 2.2)	300
D/OSB	Osborne 01 (CP/M)	300
D/S	S-100 Bus computers (CP/M)	300
D/T1	TRS-80 Model I (NEWDOS80 ver 2.0)	300
D/T2	TRS-80 Model II (CP/M)	300
D/T3	TRS-80 Model III (NEWDOS80 ver 2.0)	300
D/VG1	Vector Graphic (CP/M)	300
D/XR5	Xerox 820 and 820-II (Xerox CP/M 2.2) (5 1/4" diskettes)	300
D/XR8	Xerox 820 and 820-II (Xerox CP/M 2.2) (8" diskettes)	300
D/ZN	Zenith Z-89 (Zenith CP/M)	300
D/Z9	Zenith Z-90 (Zenith CP/M)	300

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OMNINET™ NETWORK

An OMNINET disk system provides 5.7 (Model 6), 12.1 (Model 11) or 18.4 (Model 20) megabytes (MB) of formatted storage. The price includes a single enclosure

containing a Winchester disk drive, power supply, and intelligent controller. A Disk Server Pack is required to attach the OMNINET disk system to the network. Specify either a 120 or 220 volt model.

Model Number	Description	Suggested Retail Price

OMNINET Disk System with MIRROR

An OMNINET disk system can be ordered with a built-in MIRROR. The MIRROR allows the disk system to interface to a standard video cassette recorder (VCR) for disk backup. The VCR must be purchased separately

and is not available from Corvus. The built-in MIRROR option includes a VCR interface controller in the disk system enclosure. Video cables to connect to a VCR are included. Specify either a 120 or 220 volt model.

Model Number	Description	Suggested Retail Price
Model 6	OMNINET disk system with built-in MIRROR	\$385
Model 11	OMNINET disk system with built-in MIRROR	\$485
Model 20	OMNINET disk system with built-in MIRROR	\$585

OMNINET Disk Server Pack

An OMNINET Disk Server is used to connect a Corvus Disk System to the OMNINET local area network. The Disk Server Pack includes a Disk Server, Corvus CONSTELLATION® software, a network system manual,

and installation kit. The installation kit includes a 15-foot tap cable, 3 Tap Boxes™, and a 3-foot flat cable to connect the Disk Server to a Corvus Disk System, and network terminators. Specify either a 120 or 220 volt model.

Model Number	Description	Suggested Retail Price
DSAP	Disk Server for Apple II (DOS 3.3 and Pascal 1.1)	\$ 990
DSIB	Disk Server for IBM Personal Computer (PC DOS)	990

OMNINET Transporter Pack

An OMNINET interface card, called a Transporter, is used to connect a computer to OMNINET. The OMNINET Transporter Pack is a local network starter

package. It includes four OMNINET interface cards for the specified computer type, four 15-foot tap cables, four tap boxes and an installation guide.

Model Number	Description	Suggested Retail Price
TRANAP	OMNINET transporter pack for Apple II	\$1895
TRANIB	OMNINET transporter pack for IBM PC	1895

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OMNINET Transporter

An Add-On Transporter is used to connect a computer to OMNINET. Included is one OMNINET interface card,

a 15-foot tap cable, one OMNINET tap box, and an OMNINET installation guide.

Model Number	Description	Suggested Retail Price

OMNINET DisketteShare Network System

The DisketteShare Network System for the Apple II includes three Apple OMNINET Transporter cards,

3 15-foot tap cables and 3 Tap Boxes. Also included are installation and user manuals, and the software to allow the sharing of DOS 3.3 diskettes.

Model Number	Description	Suggested Retail Price
APSN	OMNINET DisketteShare network system for Apple II	\$1495

OMNINET Network Cable

OMNINET Network Cable is available in 1000-foot lengths. The Network Cable is a pair of 20-gauge insu-

lated conductors twisted together inside a common insulated cover.

Model Number	Description	Suggested Retail Price
ENOME	1000-foot OMNINET network cable	\$250

OMNINET Active Junction Box

The OMNINET Active Junction Box is a signal booster which allows network devices to communicate over ex-

tended distances within the network. Included is the Active Junction Box, power supply, network terminator, and installation instructions.

Model Number	Description	Suggested Retail Price
AJBOMNI	One Active Junction Box	\$150

OMNINET Tap Box Pack

OMNINET Tap Boxes are used to connect OMNINET devices (such as a computer with a Transporter card or

Corvus Disk System with a Disk Server) to the OMNINET network cable.

Model Number	Description	Suggested Retail Price
TP/OMNI	Four tap boxes	\$39

CORVUS MULTIPLEXER NETWORK SYSTEMS

A Corvus Host Multiplexer allows up to eight computers to share a Corvus disk system. The price includes

the Host Multiplexer hardware and network system manual. Specify either a 120 or 220 volt model.

Model Number	Description	Suggested Retail Price
AP-100	Apple II (DOS 3.3 and Pascal 1.1)	300
AP-110	Apple III (SOS 1.1)	300
AT-800	Atari 800 (Atari DOS 2.0)	300
TR-801	TRS-80 Model I (NEWDOS80 ver. 2.0)	300
TR-802	TRS-80 Model II (CP/M)	300
TR-803	TRS-80 Model III (NEWDOS80 ver. 2.0)	300
OS-01	Osborne 01	300
S-100	S-100 computer	300
PC-9000	NEC PC-9000	300
Z80	Zenith Z80	300
Z90	Zenith Z90	300

Master Multiplexer & Generic

The Corvus Master Multiplexer supports up to eight Host multiplexers or computers, allowing up to 64 computers to share a Corvus disk system. The price includes the Master Multiplexer hardware. The generic Master Multiplexer will work with any of the following computers:

Apple II (DOS 3.3 and Pascal 1.1)
 Apple III (SOS 1.1)
 Atari 800 (Atari DOS 2.0)
 TRS-80 Model I (NEWDOS80 ver. 2.0)
 TRS-80 Model III (NEWDOS80 ver. 2.0)
 Specify either a 120 or 220 volt model.

Model Number	Description	Suggested Retail Price
MM-100	Generic Corvus Master Multiplexer	275

Multiplexer Network Interface Cards

A multiplexer network interface card is used to attach a computer to a Corvus Multiplexer. One interface card

is required for each computer on the Multiplexer network. Available with network cables.

Model	Computer Type	card only	card w 5' cable	card w 15' cable	card w 30' cable	card w 50' cable
AP-100	Apple II	220	235	250	275	300
AP-110	Apple III	220	235	250	275	300
AT-800	Atari 800	220	235	250	275	300
TR-801	TRS-80 Model I	220	235	250	275	300
TR-802	TRS-80 Model II	220	235	250	275	300
TR-803	TRS-80 Model III	220	235	250	275	300
OS-01	Osborne 01	—	235	250	275	300
S-100	S-100 computer	220	235	250	275	300
PC-9000	NEC PC-9000	220	235	250	275	300
Z80	Zenith Z80	220	235	250	275	300
Z90	Zenith Z90	220	235	250	275	300

— length of cable (0, 5, 15, 30, or 50). Example: AP-5

Multiplexer Network Cable

Flat cables are used to connect Host Multiplexers to the Master Multiplexer and computer interface cards to multiplexers.

Model	Description	5 ft cable	15 ft cable	30 ft cable	50 ft cable

CORVUS SOFTWARE

Complete disk systems and disk interface kits already include disk software. Individual items may be ordered as listed below.

Model Number	Description	Suggested Retail Price
CS/AP	CONSTELLATION software with User Guide. Provides CONSTELLATION multi-user software for any Apple II compatible disk or network system.	\$100
UA3	Software to upgrade an Apple II Corvus Disk System for use with an Apple III computer.	\$100
AP/CPM	Software to upgrade an Apple II Corvus disk system to support Apple CPM using Microsoft card.	\$100
APS	DisketteShare software utilities for Apple II.	\$100
DSWT (ver 2)	Disk NEWDOS80-C ver 2.0 utilities for TRS-80 Model II. Provides CONSTELLATION multi-user features for use in either single user or network environments.	\$100
DSWT3 (ver 2)	Disk NEWDOS80-C ver 2.0 utilities for TRS-80 Model III. Provides CONSTELLATION multi-user features for use in either single user or network environments.	\$100
RM1/AP	Remote MIRROR Option for Apple II	\$75
SM/IB	Software and manual to extend existing non-IBM PC disk system to include an IBM PC	\$100
DSW _{xx}	Disk CPM utilities for specified computers. xx = Computer product code NC = NEC PC 8000 OSB = Osborne 01 S = S-100 Bus T2 = TRS-80 Model II VG1 = Vector Graphic XR5 = Xerox 820 and 820-II (5 1/4" diskettes) XR8 = Xerox 820 and 820-II (8" diskettes) ZN = Zenith Z89 Z9 = Zenith Z90	\$50

CORVUS MANUALS

Complete disk systems, interface kits, and OMNINET disk servers already include appropriate manuals. Individual items may be ordered as listed below.

Model Number	Description	Suggested Retail Price
W6x	Model 6 drive WIF & MIRROR	395
W11x	Model 11 drive WIF & MIRROR	495
W20x	Model 20 drive WIF & MIRROR	595
WNETH*	Network Package	125
WNETx*	OMNINET Network package	25

EXTENDED WARRANTY

Extends the standard six month warranty (parts and labor) by an additional 6 or 24 months. If the 24 month extension is selected, the warranty covers a full 30

months. If a 6 month extension is selected, it can be renewed two times for a total warranty period of 24 months. To indicate length of extended warranty, substitute 6 or 24 for the 'x' in the model number.

Model Number	Description	6 Month Renewable	24 Month Full term
W6x	Model 6 drive WIF & MIRROR	395	\$ 995
W11x	Model 11 drive WIF & MIRROR	495	1295
W20x	Model 20 drive WIF & MIRROR	595	1595
WNETH*	Network Package	125	395

*Multiplexer Network package
- Host or Master Mux
- 8 Interface cards

*OMNINET Network package
- Disk Server
- 4 Transmitters

Terms and Conditions of Sale

WARRANTY: All Corvus products include a six (6) month limited parts and labor warranty. Initially defective materials will be repaired by the nearest Corvus Authorized Service Center.

PRICES AND PRODUCT SPECIFICATIONS: All prices are subject to change without notice and without express or implied price protection. All product specifications are based

upon authorized information and are believed correct at the time of publication. Due to the Corvus policy of continually improving its products, Corvus reserves the right to make changes from time to time without notice or obligation in specifications, colors, or materials, and to change or discontinue products.

SHIPPING TERMS: All products are FOB origin, freight collect.

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DIB is a registered trademark of Digital Equipment Corporation.
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TRS-80 is a registered trademark of the Tandy Corporation.
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Xerox is a registered trademark of the Xerox Corporation.

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Corvus MIRROR® (patent pending) and CONSTELLATION® are registered trademarks of Corvus Systems, Inc.

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CORVUS SYSTEMS

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XEROX

Diablo 620 Printer/Terminal



Diablo 620 Printer/Terminal

Since 1972 when Diablo first introduced daisywheel printer technology to the world, Diablo has always been the pioneer in the industry. In keeping with that tradition, Diablo has once again gone into new avenues of firmware and hardware design to develop the Diablo 620 Printer and Terminal. The third-generation 620 is a low-cost, low-speed desktop printer/terminal for use with word and data processing business systems and personal computers. Its low cost to own and operate offers users an economical means of obtaining the letter-quality printing found only in higher-priced units. The 620 prints fully formed character output at speeds up to 25 characters per second. Additionally, the 620 is the only daisywheel printer offering such innovative time- and cost-saving features as:

- Drop-in printwheels encoded with language and pitch information
- Automatic printwheel code sensing

These unique features make the 620 easy to own and operate. Minimum operator training and time is required to set up and use the printer. And unlike many other low-speed printers that offer a low price, the 620 quality has not been sacrificed to achieve that low cost. The 620 retains the high print quality, reliability and maintainability for which Diablo products are noted.

Automatic Printwheel Sensing

The Diablo 620 is the first daisywheel printer to include the capability to read printwheel language and pitch information automatically. The 620 printwheels are encoded with language, pitch and

font information which the printer firmware reads to determine the proper carriage motion, ribbon motion and hammer energy for the selected wheel. Operators do not have to set dials or switches to select printwheel characteristics. Not only can the printer sense the information encoded on the printwheel, but it can also transmit this data to a host computer or terminal. Under program control, the host can interrogate the printer to determine the type of printwheel present and prompt the operator to continue or change printwheels.

Improved Printwheels

The printwheels for the 620 are constructed of a highly durable plastic which gives the 620 printwheels a lifetime of about 15 million characters. The wheels are easily inserted into an

Paper Feed Assembly

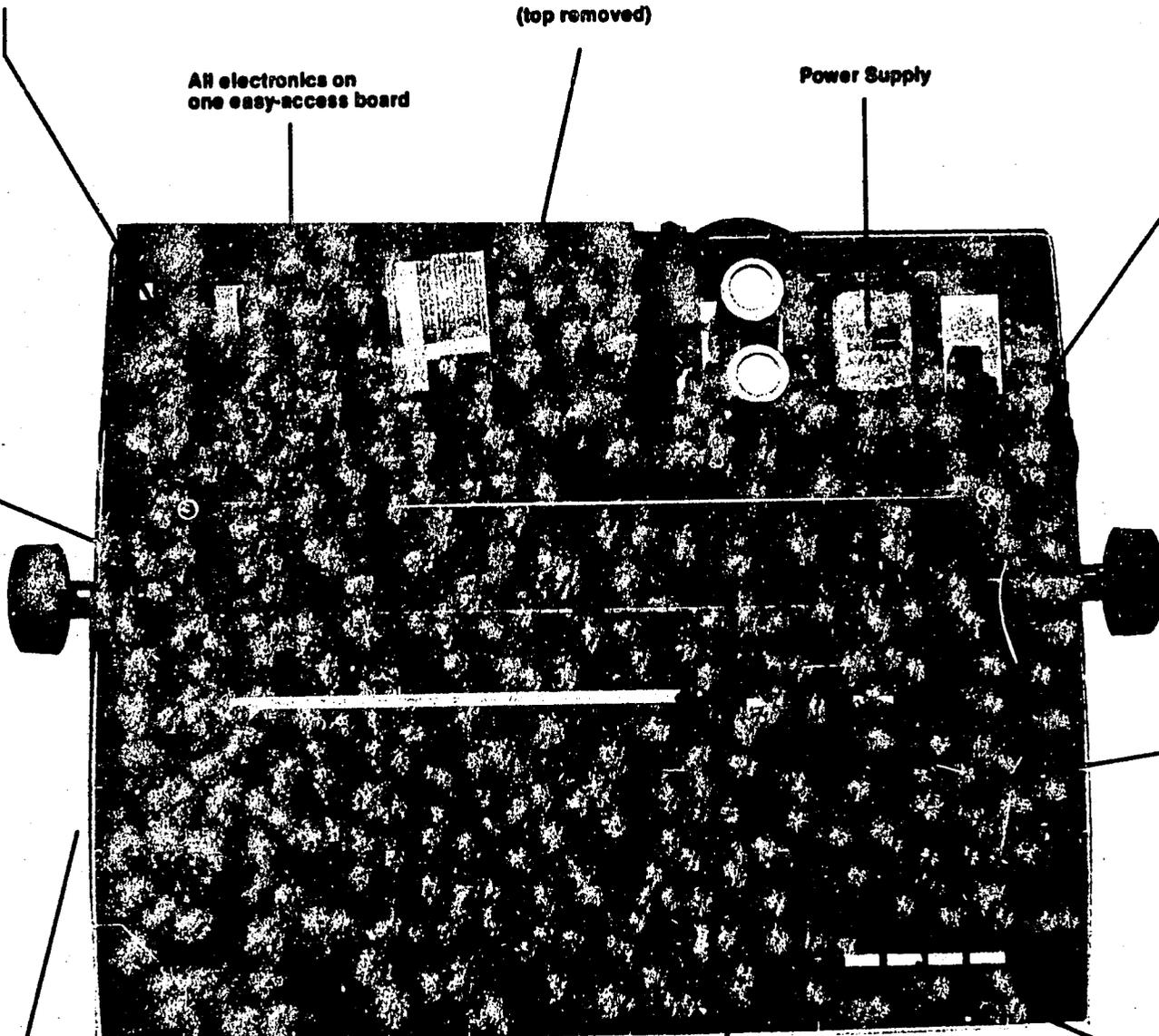
EMI/ESD Shield
(top removed)

Printwheel Mechanism

All electronics on
one easy-access board

Power Supply

Platen



Ribbon Deck

Integral bottom cover;
vented top cover (not shown)
provides cooling

Carriage Drive Motor

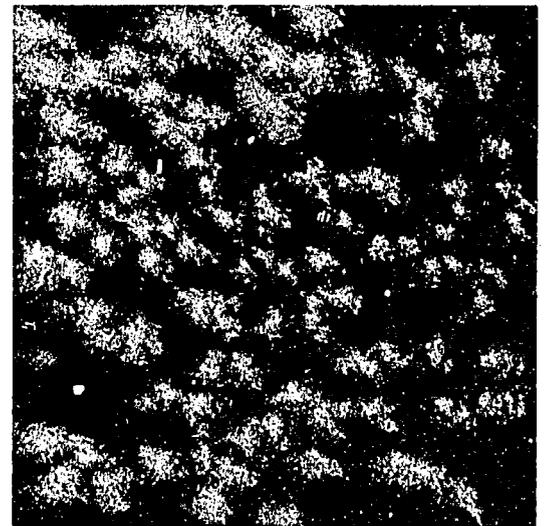
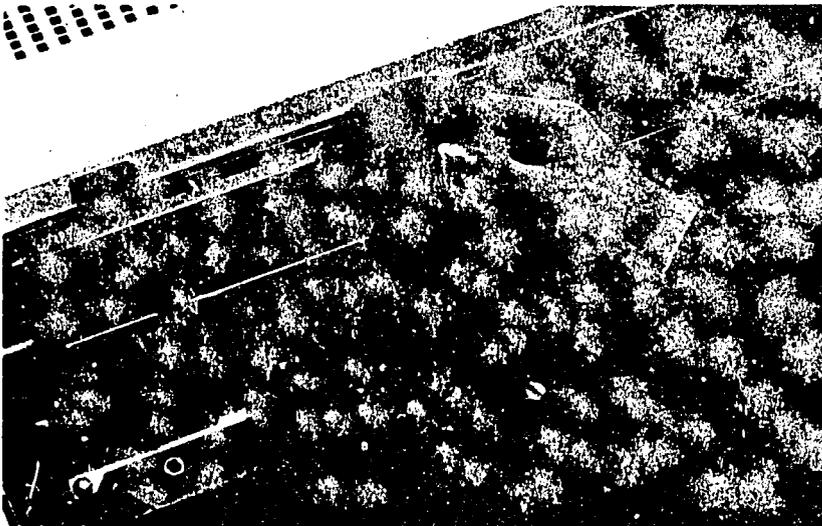
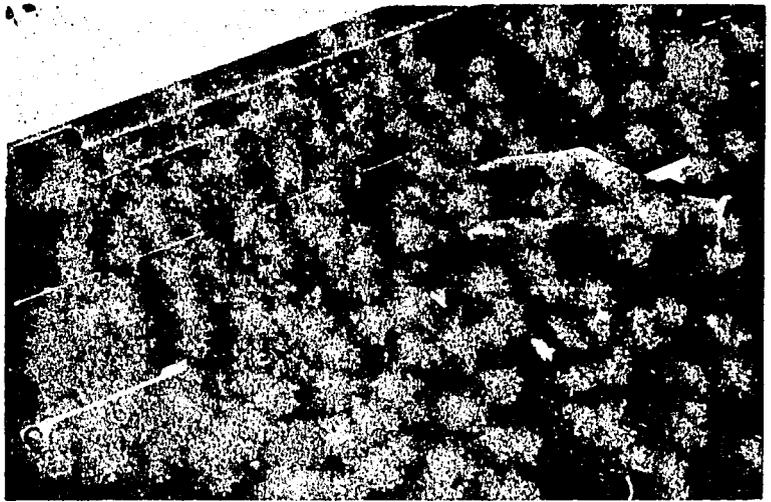
Internal Operational
Mode Switches

External Control Panel

Innovations in Model 620 ribbon cartridges and encoded printwheels reduce operator time and provide superior print quality and extended printwheel life.

Ribbon cartridge snaps in and out easily without moving printwheel or access covers.

Encoded printwheel can be inserted without removing ribbon cartridge.



envelope-like printwheel compartment of the 620 carriage assembly, where they are held securely in place once the holding mechanism has been snapped shut. Since the wheels are notchless and hubless, no positioning or aligning of the printwheel is required.

Printwheels for the 620 have 98-characters. A selection of printwheels is available for 10-, 12- or 15-pitch and proportionally spaced printing in English and many other languages.

New Ribbon System

The design of the ribbon cartridge and its holding mechanism permits the ribbon to remain in place during printwheel changes, a significant improvement over other methods and one which will reduce operator time to change printwheels. The ribbon has a lifetime of up to 450,000 character impressions.

Letter-Quality Printing

The 620 continues in the Diablo tradition of providing top-quality output,

and now, at a low cost. Printwheel and ribbon cartridge innovations not only reduce operator time, but continue to provide a crispness of print quality found only in Diablo products. Precise alignment of the carriage assembly to the platen maintains print registration at a high quality. The intensity of the hammer energy is controlled to provide uniform printing of the various characters. All of these factors combine to provide superior print quality and extended printwheel life.

Modular in Design for Reliability and Maintainability

The Diablo 620 offers high reliability and quick low-cost maintenance. This is accomplished through the use of a modular design and simplified electronics. Its single plug-in printed circuit board contains all printer and interface electronics and is vertically positioned to provide ease of access. Machine parts are combined into integral assemblies which are field replaceable for reduced repair downtime and simplified sparing. A two-bolt cover permits fast, easy access to printer assemblies.

This modularity translates not just into high reliability and ease of maintenance, but into more printer up-time. As a result, the 620 provides a 2500-hour MTBF under typical office usage. This means the printer will normally provide approximately 14 months' high-quality, low-cost output without maintenance downtime. When service is required, the MTTR is just 15 minutes. These reliability statistics are what the user can expect from Diablo as an industry leader in printer design.

The modularity of the 620 also permits a very compact unit weighing less than 50 pounds, including packaging. This meets weight limitations of most express shipping systems, significantly reducing related costs.

System Architecture

The 620 serial interface is compatible with most host computers and terminals with an RS-232-C port and operates at switch-selectable transmission speeds of 110, 300 and 1200 baud. Information can be transmitted over telephone lines or through direct cable connection to the host. The inter-

face is compatible with Bell 103A modems or their equivalent. A 1536-byte input print buffer is standard.

A parallel interface is available as an option.

User Friendly

The 620 offers many features which make it very versatile in a typical word processing or office environment. These include bidirectional printing and switch-selectable page setting for 11-inch U.S. or 12-inch European paper. Bidirectional paper and carriage movement permits plotting and graphics programs. Host program control via escape sequences provides forms control, including horizontal and vertical motion indexing, super- and subscripts, margin controls, full and one-half space positive/negative line feed and more. The 620 also includes diagnostics for self-testing its subsystems.

Operator Convenience

The 620 is designed for operator convenience. Printwheels can be inserted without removing ribbons or access covers. With no dials or switches to set, operator time to replace printwheels is greatly reduced. Ribbons also snap in and out easily and do not have to be removed to replace a printwheel. No adjustment for forms thickness is necessary. Pushbutton-type control switches respond to finger-tip touch, and the access cover lifts off easily to permit quick access to other switches under the front cover. The 620 also features a high degree of protection from electrostatic discharge.

Diablo 630 Compatibility

The standard RS-232-C interface offered with the 620 is identical to the serial interface offered in Diablo's 630. This permits the interchangeability or

compatible use of Diablo 620 and 630 printers at numerous system levels or on identical systems with varying output requirements. Both printers are 100 per cent pin-for-pin, plug-to-plug compatible.

Complete Safety Compliance

Available in both U.S. and European configurations, the Diablo 620 meets UL, CSA and VDE 0730, 0804 and 0875 safety standards. It also meets VDE 0871 and FCC Classes A and B EMI requirements. This means the 620 is acceptable in application environments where strict regulations govern electronic frequency interference.

Accessories

Available paper handling accessories include a bidirectional tractor and a cut-sheet feeder.

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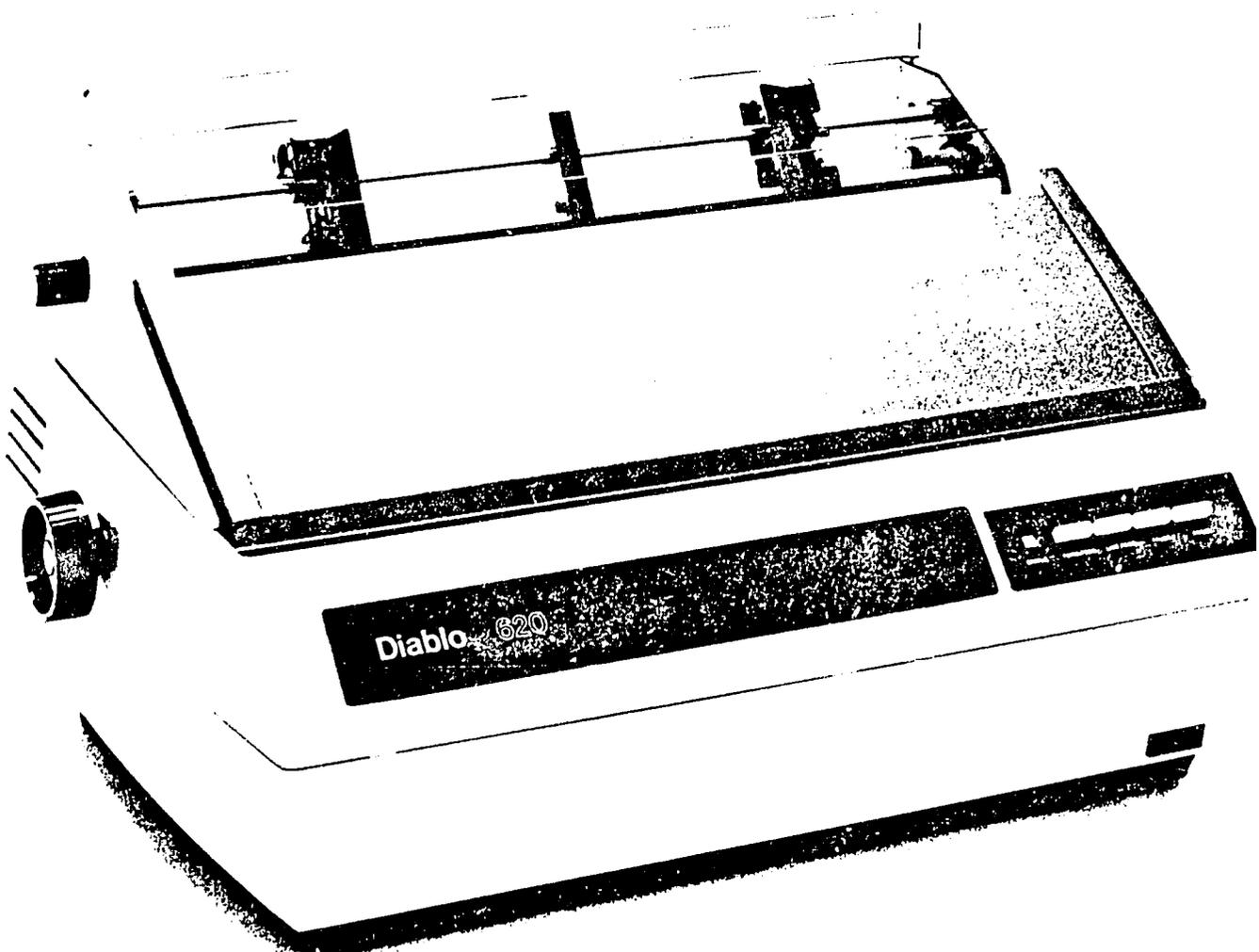
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Diablo

Diablo Model T20 Bidirectional Tractor

**Low-Priced Bidirectional Tractor
For
Diablo 620**



Diablo now offers a new low-priced bidirectional tractor for continuous forms feeding. With this tractor, Diablo 620 printers can feed single or multipart forms in either a forward or reverse direction (bidirectional).

Diablo tractors offer many excellent features, such as:

- Specifically designed by Diablo for the Diablo 620.
- Easily installed and removed.

- Accepts up to 6-part forms.
- Bidirectional capability offers additional flexibility to the printer, including plotting and graphics applications.
- Paper tension adjustment.
- Precision paper positioning adjustment.
- Handles a wide variety of paper.

Specifications

Physical Dimensions:

Height: 6.0 in.
Width: 22.5 in.
Depth: 11.0 in.
Weight: 4.0 lbs.

Forms Capacity:

Width: 3.25 in. to 15.25 in.
Thickness: .0035 in. to .027 in.
Weight: Up to 24 lb. paper

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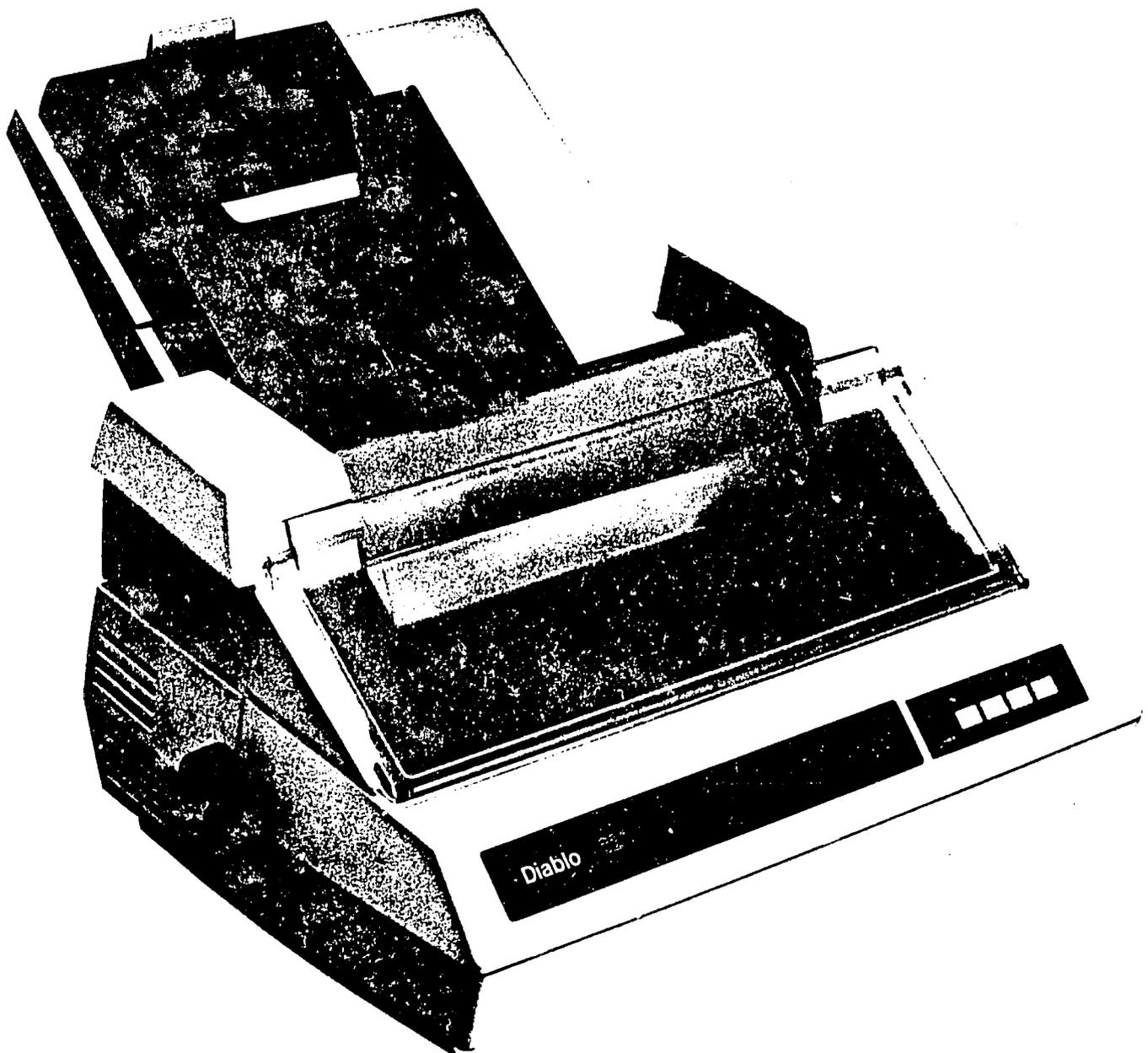
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Diablo

Diablo Model F21/F31 Cut Sheet Feeder

**Single-Tray Automatic Sheet Feeder
For
Personal Computers
Small Business Systems
Word Processing Systems**



The Diablo single-tray cut sheet feeder automatically feeds single sheets of paper into a Diablo 600-series printer or terminal. The feeder is designed to increase productivity by eliminating manual feeding of paper. It is operator-installable and easy to use.

Features

- Automatically feeds cut sheet paper under control of the host.
- Printed pages are automatically ejected into an output tray.
- Accommodates both U.S. and European size paper: 8.5 x 11 inches or 8.27 x 11.69 inches, in either portrait or landscape orientation.
- Feeder Interface Kits for Diablo printers provide power and control directly from the printer.
- Individual paper trays enhance paper alignment and reduce misfeeds. One standard 8.5 x 11 inch tray is provided. Other sizes are optionally available.
- Installed unit allows easy accessibility of internal printer switches, printwheel and ribbon.

- Designed for a five-year lifetime in normal office environment.
- Microprocessor provides accurate paper positioning, error detection and synchronization.
- Feeder installation does not degrade printer safety or static discharge performance.
- Will accept paper with cleanly punched or drilled holes.
- Host feeder commands can be unique character strings imbedded in the text to be printed or can be escape sequences, offering the advantage of feeder integration without host software change, or the opportunity to create unique feeder control.
- Unit available for Diablo 620, 630 and 630 ECS printers.

Service

Diablo distributors provide maintenance service for their customers, either through their own service department or through a Diablo-selected third party organization. Ask your distributor or local Diablo sales office for information.

Specifications

Paper Tray Sizes:

Portrait: 8.5 x 11 in. (standard); 8.27 x 11.69 in. (European)

Landscape: 11 x 8.5 in.; 11.69 x 8.27 in. (European)

Paper Tray Capacity:

0.4 in. (approx. 100 sheets 24 lb. bond)

Paper Thickness:

0.003 in. to 0.005 in.

Paper Weight:

18 to 24 lb. single sheets

Smoothness:

80 to 250 Sheffield

Paper Feed:

Forward: 1/48 in. (.53mm) increments; 2.85 in./sec. maximum

Reverse: 2 lines maximum at 6 lines/in. format

Physical Dimensions:

Height: 10.0 in. (approx.)

Width: 16.0 in. (approx.)

Depth: 20.0 in. approx. (w/tray inserted)

Weight: less than 20 lbs. w/tray

Power:

Supplied by the printer

Interface:

Requires Feeder Interface Kit for appropriate printer

Temperature and Humidity:

Operating: +45°F to +105°F (+7°C to +40°C); 10 to 80% relative humidity, non-condensing

Storage: -20°F to +135°F (-29°C to +57°C); 0 to 90% relative humidity, non-condensing

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Authorized Distributor:

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MP/M-86™**MP/M-86 OVERVIEW**

MP/M-86 is a multi-user, multi-tasking operating system designed for microcomputers that use the Intel 8086/8088 microprocessors.

MP/M-86 is compact and powerful. It has a time-tested, modular design which includes:

- **TMP** — (Terminal Message Process), the human interface of the system, reads the user's command line.
- **SUP** — (SUPERvisor) manages the intermodule, network and user interfaces. SUP includes the Command Line Interpreter (CLI), program LOAD and program CHAIN.
- **BDOS** — (Basic Disk Operating System), the portion of the system that manages files and directories.
- **RTM** — (Real Time Monitor), the real-time nucleus of MP/M-86, which provides dispatching, process, queue, flag and time-base management.
- **CIO** — (Character Input/Output) handles character devices such as consoles and printers, designed for future expansion to support Standard I/O.
- **MEM** — (MEMory Manager) provides flexible memory management with the ability to support hardware memory management as it becomes available.
- **XIOS** — (eXtended Input/Output System), the variant portion of the operating system that contains all physical hardware-dependent code such as Input/Output device handlers.

MP/M-86 is small, residing in less than 36K bytes of memory. Total size is dependent on the XIOS and the number of Resident System Processes (RSP) included when the system is generated (GENSYS). The size of the XIOS is determined by the number and type of peripherals supported.

MP/M-86 FEATURES

- Upward Compatible with CP/M®, MP/M II™ and CP/M-86™
- Offers multi-user capability with multi-programming for each user
- Supports up to 16 Logical Drives managing up to 512 Megabytes each
- Manages up to one megabyte of memory
- Supports up to 254 logical character devices such as consoles and printers
- Real-time capability
- Record and File locking
- Date and Time Stamps and Password Protection on Files
- Extensive error-handling and reporting
- Network Compatibility

CP/M COMPATIBILITY

The MP/M-86 file system is upward compatible with CP/M 1.4, CP/M 2.2 and CP/M-86 files. All files generated by CP/M systems may be read under MP/M-86. In addition, the MP/M-86 file system allows larger files and supports file password protection.

Executable CP/M-86 (CMD) files will run under MP/M-86 when sufficient memory is available and when the program communicates with the operating system only through CP/M-86 BDOS calls.

To the end user, MP/M-86 commands are a superset of CP/M-86 commands. Familiar CP/M commands such as DIR, ERA, TYPE, PIP and STAT respond similarly in MP/M-86.

RECORD AND FILE LOCKING

File integrity is enhanced with the MP/M-86 extended file system. MP/M-86 allows files to be opened in one of three modes: locked; unlocked; and read-only. These three modes are set by the Open File commands through a BDOS call.

Locked mode may be used when it is necessary to assure that only one user may open a specific file at a given time. Once a file is opened in the locked mode, other user requests for that file are denied.

In the unlocked mode, multiple open file requests may be serviced. If a file is opened in the unlocked mode, individual records or groups of records within that file may be temporarily locked by a user. Alternately, a record may be updated with a TEST AND WRITE RECORD command. In this case, before an update is performed an unaltered copy of the record in memory is compared with the record on the disk. If the disk copy has been altered, an error message is returned to the application program.

Finally, the read-only mode allows more than one process to open a file. Attempts to write to a file opened in this mode are denied.

PASSWORD PROTECTION ON DIRECTORIES AND FILES

Protection for user files and directories is enhanced through the optional use of passwords. MP/M-86 allows a user to assign passwords to files and directory labels. Application programs may employ a password checking procedure to determine access authorization before opening files. Passwords are encrypted to provide additional security.

DATE AND TIME STAMPING

MP/M-86's extended directory entries provide a facility for date and time stamping files. Each file may have up to two date and time stamps. This feature is controlled by an attribute in the directory label, which may be set by the system manager, and provides the ability to automatically add date and time of last update and either last access or file creation. The SDIR utility displays date and time stamp information.

MULTI-PROGRAMMING CAPABILITY

In addition to multi-user support, MP/M-86 permits each user to detach programs from his or her console, allowing a user to execute multiple programs simultaneously.

DISK MANAGEMENT

MP/M-86 can support up to 16 logical drives, each containing up to 512 Megabytes, for a maximum of four Gigabytes of on-line storage. Any one file can be up to 32 Megabytes in size, with space dynamically allocated and released. Each drive has a directory which maps each file's physical locations on the disk. Disk definition tables in the XIOS translate the logical drive, directory and file structure to the physical characteristics of the disk. One physical disk can be treated as one or more logical drives by MP/M-86.

ERROR HANDLING AND REPORTING

MP/M-86 can handle errors in three modes: (1) it can display an error message and terminate the user's program; (2) it can display an error message and return to the user's program; or (3) it can return to the user's program without displaying an error message. In modes (2) and (3) the BDOS returns an error code which may be trapped by the application program. The application program can then provide more specific error handling and information.

NETWORK INTERFACE

The MP/M-86 SUPervisor was designed with network interfacing in mind. Digital Research's network operating systems are essentially Resident System Processes (RSP). These network interface processes may be included in an MP/M-86 system at system generation.

MEMORY MANAGEMENT

MP/M-86 can manage up to one megabyte of RAM. This memory may be partitioned at the time of system generation into an arbitrary number of partitions, each ranging in size from sixteen bytes to one megabyte. Memory requests are satisfied on a best-fit basis by forming a Memory Allocation Unit from one or more contiguous partitions. Depending on the most common applications to be run on the MP/M-86 system, the system manager may create many small partitions for essentially dynamic memory allocation or a few large partitions for a traditional fixed-partition model. The MEMORY Manager module is designed for ease in updating as hardware memory management becomes available.

MP/M-86 DISPATCHER

The MP/M-86 Dispatcher, that portion of the Real Time Monitor which changes the currently executing task, requires from 400-600 microseconds to switch tasks (5MHZ 8086). This low overhead leads to greater system throughput. For real-time applications, the interrupt mechanism is disabled for less than 150 microseconds during a dispatch. Thus, high priority interrupts may be serviced in a timely fashion.

MULTIPLE PRINTER AND CONSOLE SUPPORT

MP/M-86 supports up to 254 Character-I/O devices, typically printers and consoles. At the application program level, MP/M-86 system calls allow the selection of a current console or list device. Additionally, list devices may be assigned dynamically by using the PRINTER utility.

CUSTOMIZATION

MP/M-86 may be transported to a specific 8086/8088 hardware environment by tailoring its loader and hardware-dependent module (XIOS). CP/M-86 must first be implemented on the target machine.

The MP/M Loader (MPMLDR) may be executed under CP/M, or following reconfiguration, it may be loaded from the system tracks of the disk by the cold start loader. The MPMLDR is specially configured for a particular environment by inserting the BIOS code from CP/M-86 into the MPMLDR BIOS.

The hardware-dependent module of MP/M-86 (XIOS) must also be reconfigured. Most of the device handling code, including the Disk Drive Definition tables, may be copied from the CP/M-86 BIOS. Once a simple system is running, support for additional consoles, the system clock and interrupt-driven devices may be introduced. MP/M-86 can be loaded and run under the CP/M-86 debugger (DDT86™). A minimum of 128K of memory is required to run MP/M-86 and CP/M-86 with DDT86.

MP/M-86 UTILITIES

ABORT

The ABORT utility allows a user to terminate a running program.

ATTACH

The ATTACH utility attaches a program to a console.

ASM86™

The latest version of the CP/M-86 "code-macro" assembler, supports most Intel mnemonics.

CONSOLE

The CONSOLE utility displays the system console number of the requesting console.

DDT86

The latest version of the CP/M-86 Dynamic Debugging Tool allows the user to test and debug programs interactively. Users may trace and execute programs with full register and status display. DDT86 contains an integral assembler/disassembler.

DIR

The DIR utility displays a disk directory for the currently logged user; by setting the SYS attribute, files may be made invisible to this utility.

DSKRESET

The DSKRESET utility resets the allocation map of a drive after the insertion of a new diskette. This allows a write to the new diskette.

ED

The latest version of the CP/M-86 editor.

ERA

The ERA utility erases a file or files.

ERAQ

The ERAQ utility queries the user for confirmation before erasing each specified file.

MPMSTAT

The MPMSTAT utility displays the run-time system status of MP/M-86.

PIP

The Peripheral Interchange Program supports the movement of files among the various logical devices and drives of the system. PIP also concatenates files or extracts portions of ASCII files. Options in PIP allow for archiving files that have been updated and for moving files between different directories.

PRINTER

The PRINTER utility sets the list device for a particular console. Several consoles may share the same list device, but only one can "own" it at a time.

REN

The REN utility RENames files.

SDIR

The SDIR utility displays all types of MP/M-86 files as well as their size, time and date stamps and a notation as to whether or not the file is password protected.

SET

The SET utility allows the setting of various file attributes and passwords. These attributes include Read-Only, SYS (invisible to DIR), and user defined attributes.

SHOW

The SHOW utility displays information about the characteristics of a logical drive such as capacity, number of directory entries and directory label information.

SPOOL

The SPOOL utility sends files to the spool queue for proper handling by the list device.

STAT

The STAT utility displays the space, attribute and directory status of drives and files.

STOPSPLR

The STOPSPLR utility stops the spooling operation in progress and empties the spool queue.

SUBMIT

The SUBMIT utility executes files of commands, each of which may be a program.

TOD

The TOD utility displays or sets the system date and time.

TYPE

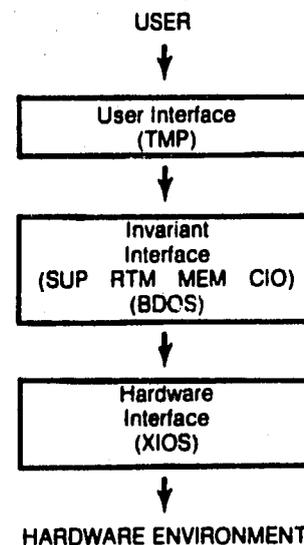
The TYPE utility types the specified ASCII file on the console.

USER

The USER utility displays or sets the current user (directory) number.

Any or all of the above utilities may be password protected for increased system security.

MP/M-86 INTERFACE



THE MP/M-86 PACKAGE

MP/M-86 is shipped on two single-sided, single-density, 8-inch diskettes with an IBM-compatible physical format. These diskettes contain the following machine-readable files:

Distribution Disk 1

BDOS.MPM
CIO.MPM
CLOCK.RSP
DEBLOCK.LIB
ECHO.A86
ECHO.RSP
GENDEF.CMD
GENSYS.CMD
LDBDOS.H86
LDBIOS.A86
LDBIOS.H86
LDMPM.H86
MEM.MPM
MPM.SYS
MPMLDR.CMD
MPMSTAT.RSP
ROM.A86
RTM.MPM
SINGLES.DEF
SINGLES.LIB
SUP.MPM
SYSDAT.LIB
SYSDAT.MPM
SYSTEM.LIB
TMP.A86
TMP.RSP
XIOS.A86
XIOS.MPM

Distribution Disk 2

ATTACH.CMD
ABORT.CMD
ASM86.CMD
CONSOLE.CMD
DDT86.CMD
DIR.CMD
DSKRESET.CMD
ED.CMD
ERA.CMD
ERAQ.CMD
GENCMD.CMD
MPMSTAT.CMD
PIP.CMD
REN.CMD
SDIR.CMD
SET.CMD
SHOW.CMD
SPOOL.CMD
STAT.CMD
STOPSPLR.CMD
SUBMIT.CMD
TOD.CMD
TYPE.CMD

HARDWARE REQUIREMENTS

- 8086/8088 microprocessor, 1 to 16 disk drives of up to 512 Megabytes capacity each, at least one ASCII console, and a real-time clock.
- 64K of RAM
- CP/M-86 must be implemented on target machine.

DIGITAL RESEARCH

Digital Research, Pacific Grove, CA is the leading producer of microcomputer operating systems and utilities. For eight years Digital Research has been involved with the design, development and support of microcomputer software. The single user operating system, CP/M, multi-user MP/M II and software network CP/NET™, form the basis of a family of operating system software products spanning 8 and 16 bit microcomputers. Digital Research users include over 300,000 systems, 400 OEMs and 500 independent software houses.

ORDERING INFORMATION

Product	Order Description
MP/M-86 System	Two 8" single-density, single-sided diskettes and three manuals.
MP/M-86 Documentation	Three manuals: MP/M-86 User's Guide; MP/M-86 Programmer's Guide and MP/M-86 System Guide.

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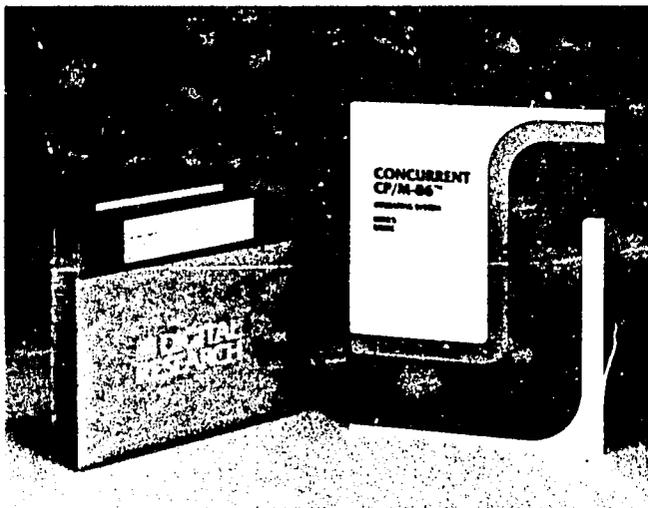
SYSTEMS PERFORMANCE REPORTING

MP/M-86 is supported by Digital Research's Software Performance Reporting (SPR) system. This service provides a prompt response to technical problems associated with MP/M-86. Users are provided with SPR forms which serve as a communications device to inform the Digital Research Product Support staff of user identified problems. The SPR STATUS REPORT, published periodically by Digital Research, informs MP/M-86 users of product updates and revisions.

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Concurrent CP/M-86™



Concurrent CP/M-86 OVERVIEW

Concurrent CP/M-86 is a single-user, multi-tasking operating system, designed for microcomputers that use the Intel 8086/8088 based microprocessors. Concurrency means the user can accomplish several tasks at the same time; one task need not complete before another starts. Concurrent CP/M-86 increases user productivity and hardware efficiency by utilizing the time that single-user operating systems lose to I/O bound processes. Multiple list devices are supported, with up to 16 drives managing up to 512 Megabytes each. File integrity is insured under Concurrent CP/M-86 with the Record and File Locking functions. Protection for user files and directories is enhanced through the optional use of passwords. Concurrent CP/M-86 features can be used to monitor real-time events. Process synchronization and communication are supported under Concurrent CP/M-86 by queues.

Two principal functions of a multi-tasking operating system are the ease with which tasks are run in the background and the ability to examine the results of a background task; Concurrent CP/M-86 accomplishes both with one keystroke. The Concurrent CP/M-86 extensions to the familiar CP/M® user interface are few and easy to master.

Concurrent CP/M-86 FEATURES

- Virtual Console Environment
- Compatibility with the CP/M-86™ and MP/M-86™ Operating Systems
- Manages up to One Megabyte of Memory
- Supports Shared Code
- Manages Files with Date and Time Stamps and Password Protection
- Real-Time Operating System

VIRTUAL CONSOLE ENVIRONMENT

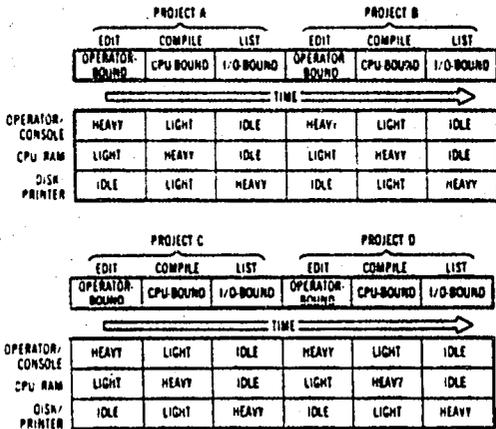
Concurrent CP/M-86 simultaneously maintains several independent virtual console environments. Each virtual console is continuously active, either prompting the user for commands to perform or running an application program.

The physical console can be logically mapped to any virtual console by a single function key, directing keyboard input to the task owning the virtual console and displaying its screen output. One virtual console is always mapped to the physical console and is the foreground console. The remaining virtual consoles do not have access to the physical console and are background consoles. By pressing a function key, the current foreground console is switched with the selected background console. In a typical installation, 4 to 10 function keys on the console keyboard represent separate virtual consoles. Consoles can be switched at any time, while the operating system or application program awaits operator input, or while an application program is executing. A task running on a virtual console does not suspend execution when it is in the background, but continues to operate in parallel with other tasks.

Background virtual consoles operate in two different modes, dynamic and buffered. In dynamic mode Concurrent CP/M-86 updates a buffer, a screen image in RAM, as each character is received. When reselected this screen image is displayed on the console. The effect of the function keys in dynamic mode is similar to turning one's chair from one physical console to another. When a task is operating in buffered mode, output is stored in a disk file. When the corresponding virtual console is selected, each character is consecutively transmitted to the console until the file is empty. The operator sees all output generated since that task was last viewed; nothing is lost.

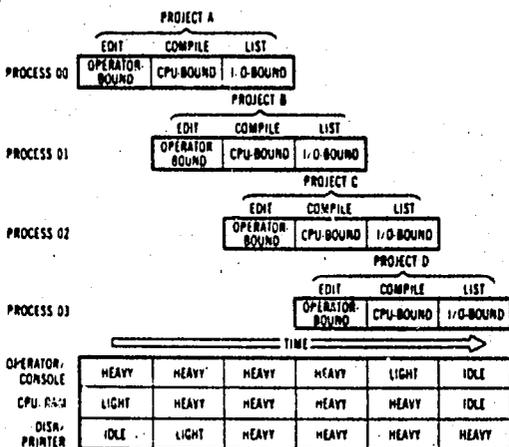
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DEVICE UTILIZATION OVER TIME (a)



SINGLE-USER SYSTEM

DEVICE UTILIZATION OVER TIME (b)

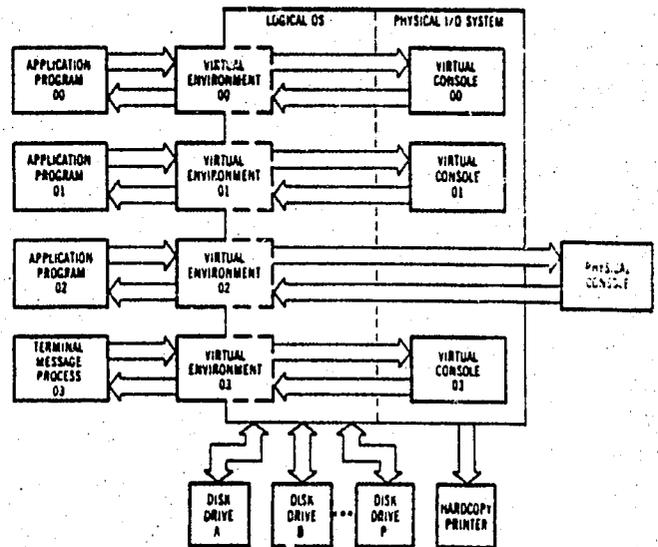


CONCURRENT SYSTEM

COMPATIBILITY

The Concurrent CP/M-86 file system is upward compatible with CP/M 1.4, CP/M 2.2, CP/M-86, and MP/M-86 files. All files generated by CP/M systems can be read under Concurrent CP/M-86; the wide base of application software available under CP/M-86 is compatible with Concurrent CP/M-86. Concurrent CP/M-86 commands are a superset of CP/M-86. Familiar CP/M commands such as DIR, STAT, TYPE, PIP, and ERA respond as they do in the CP/M-86 environment.

VIRTUAL CONSOLE ENVIRONMENT



MEMORY MANAGEMENT

Memory can be partitioned at the time of system generation into an arbitrary number of partitions, each ranging in size from 1 K bytes to one megabyte. Memory requests are satisfied on a best-fit basis.

SHARED CODE

Concurrent CP/M-86 allows processes to share reentrant code. Disk load time and memory requirements are reduced when running several copies of the same task. The user can start a word processing program on one virtual console, then switch to another virtual console and invoke the same program. The second invocation only loads the initialized data sections of the word processor. When both invocations of the word processor terminate, the code section remains in memory and subsequent invocations load only the data from disk.

DATE AND TIME STAMPING

Concurrent CP/M-86's extended directory entries provide date and time stamping for files. Each file can have two date and time stamps. This feature is controlled by an attribute in the directory label, which can be set by the system manager, and automatically adds the date and time of creation and either the date and time of last access or update. The SDIR utility displays date and time stamp information.

PASSWORD PROTECTION ON DIRECTORIES AND FILES

Protection for user files and directories is enhanced through the optional use of passwords. Concurrent CP/M-86 allows a user to assign passwords to files and directory labels. Application programs may employ a password checking procedure to determine access authorization before opening files. Passwords are encrypted to provide additional security.

REAL-TIME CAPABILITY

The Concurrent CP/M-86 Dispatcher, the portion of the Real-Time Monitor which changes the currently executing task, requires from 400-600 microseconds to switch tasks (5MHZ 8086). This low overhead leads to greater system throughput. For real-time applications, the interrupt mechanism is disabled for less than 150 microseconds during a dispatch. Thus, high priority interrupts can be serviced in a timely fashion.

COMPONENTS OF Concurrent CP/M-86

Described below are the modules in an example implementation of Concurrent CP/M-86 supporting four virtual consoles and requiring 68K of RAM. The operating system size for a specific implementation depends on the hardware supported by the XIOS, the data structures reserved by GENSYS (the system generation program) as well as the number of virtual consoles. Concurrent CP/M-86 can be located anywhere within the 8086/8088 address space.

- Supervisor (SUP) — manages the intermodule and user interfaces (4K)
- Real Time Monitor (TRM) — provides process control and dispatching as well as queue, flag and clock management (4K)
- Memory Manager (MEM) — supports the megabyte address space of the 8086/8088 processors (3K)
- Character I/O (CIO) — handles screen I/O and list output, assigns ownership of character-oriented I/O devices (2K)
- Basic Disk Operating System (BDOS) — manages files and directories with file and record locking, password protection, time and date stamps (9K)
- System Data — data areas required by the above modules (Approximately 11K0)
- eXtended Input/Output System (XIOS) — the part of Concurrent CP/M-86 modifiable to support diverse hardware environments (7K on up)
- Virtual Display XX — RAM areas needed to save CRT screen images (2K data, 2K attributes for each Virtual Console)

- PIN RSP (Physical Input Resident System Process) — handles characters input from keyboard, controls virtual screen switching, implements type ahead and live keyboard (3K)
- VOUTXX RSP (Virtual OUTput Resident System Process) — one per virtual console, spools data to files when in background and in buffered mode (2K shared code, 1K data area per virtual console)
- Terminal Message Process (TMP) — the human interface, reads the user's command line. Modifiable by the OEM (3K)
- Other RSPs — such as CLOCK.RSP, CCPMSTAT.RSP or others written by the OEM.

CUSTOMIZATION

Concurrent CP/M-86 is portable: the hardware dependent code is confined to the XIOS. CP/M-86 must be implemented before Concurrent CP/M-86 in a new hardware environment; most of the device handling code, including the Disk Definition tables, can be copied from the CP/M-86 BIOS. The virtual console handling of Concurrent CP/M-86 is adaptable to any display device. Keyboards with no function keys can implement an escape sequence to switch from one virtual console to another. Digital Research supplies assembly language source code for an example XIOS.

Concurrent CP/M-86 UTILITIES

Concurrent CP/M-86 includes all of the MP/M-86 utilities to list directories, transfer files, edit files, and create and debug 8086/8088 assembly language programs. The following utilities are also part of the Concurrent CP/M-86 package:

CPMSTAT

The CPMSTAT utility shows the state of the virtual consoles in the system, as well as different options for displaying the state of processes, queues and other system resources.

VCMODE

The VCMODE utility sets and shows parameters of a specific virtual console. The user can change the background mode to dynamic or buffered and can change the maximum file size for buffered mode.

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Concurrent CP/M-86 PACKAGE

Concurrent CP/M-86 is shipped on two 8-inch single-sided, single-density diskettes.

SOFTWARE PERFORMANCE REPORT

Concurrent CP/M-86 is supported by Digital Research's Software Performance Report (SPR) system. This service provides a prompt response to technical problems associated with Concurrent CP/M-86. Users are provided with SPR forms which serve as a communications device to inform the Digital Research Product Support staff of user-identified problems.

HARDWARE REQUIREMENTS

- An Intel 8086/8088 microprocessor.
- 1 to 16 disk drives of up to 512 megabytes each.
- A console device and a real-time clock.
256K bytes of RAM is recommended.

DIGITAL RESEARCH

Digital Research, Pacific Grove, CA is the leading producer of microcomputer operating systems, languages and utilities for 8- and 16-bit microcomputers. For eight years, Digital Research has been involved with the design, development and support of industry standard microcomputer software. Digital Research's languages and productivity tools are designed for the professional programmer writing commercial software packages. Together, they form a family of compatible software products. Digital Research users include over 350,000 systems, 500 OEMs and 600 independent software houses.

ORDERING INFORMATION

Product	Order Description
Concurrent CP/M-86 System	Two 8" single-density, single-sided diskettes and Concurrent CP/M-86 documentation.
Concurrent CP/M-86 Documentation	Three manuals: Concurrent CP/M-86 User's Guide, Programmer's Guide, and System Guide.

Note: The information set forth in this Product Brief is descriptive only. For detailed specifications consult the DRI technical manual for the product.

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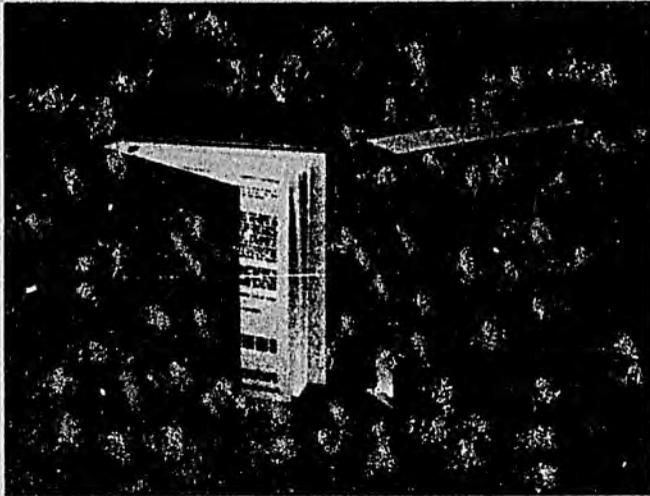
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CP/NOS™



CP/NOS™ OVERVIEW

CP/NOS is a CP/M® compatible operating system designed to perform file I/O across a network. CP/NOS operates with either the Intel 8080/8085 or Zilog Z-80® microprocessors. Local disk drives are not supported. This reduces the overall memory requirements and allows CP/NOS to be placed in 4K of ROM. This ROM-able capability allows CP/NOS to operate on low-cost diskless hardware. CP/NOS can also be downloaded from a network server. CP/NOS may be used with any physical and data link protocol, including tightly-coupled multiprocessing. The hardware-dependent modules from a CP/M and CP/NET® system can be easily modified to run under CP/NOS. Programs written under CP/M are fully compatible with CP/NOS.

The low hardware cost associated with CP/NOS is effective in multi-user environments that require a high degree of interactivity or compute-bound processing, with a fairly small amount of disk I/O. Typical applications include operating systems for intelligent terminals, word processing systems, electronic mail systems and data-base query systems.

Utilities are provided for handling electronic mail, reconfiguring the network environment, and determining network status.

CP/M COMPATIBLE

CP/NOS network message formats are identical to those of CP/NET, allowing both kinds of systems to coexist in the same network. The network server operates using a CP/M compatible subset of MP/M™ system calls, providing support for multiple network nodes while keeping system loads acceptably low.

CP/NOS provides full CP/M 2.2 compatibility. The wide base of application software designed for CP/M systems will run under CP/NOS.

CP/NOS FEATURES

- CP/M Compatible across a Network
- ROMable
- Supports a Local Console and Printer
- Support for a Networked Spooler
- One Server supports up to Sixteen Requesters
- Electronic Mail Utilities
- Hardware Independent

CP/NOS UTILITIES

NETWORK

Provides the user with the ability to change the network environment, limiting or extending access to remote disk drives, consoles, printers, spoolers, etc.

CPNETSTS

Displays the current network configuration.

LOGIN

Allows a CP/NOS requestor to access a server.

LOGOFF

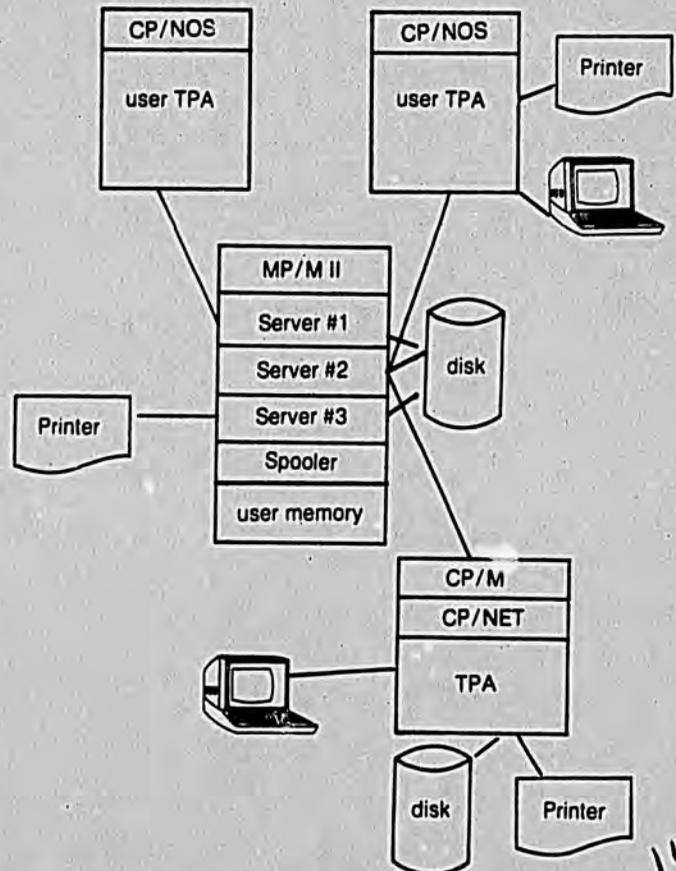
Removes a CP/NOS system from a network.

SNDMAIL

Allows the user to send electronic mail to a server or another user.

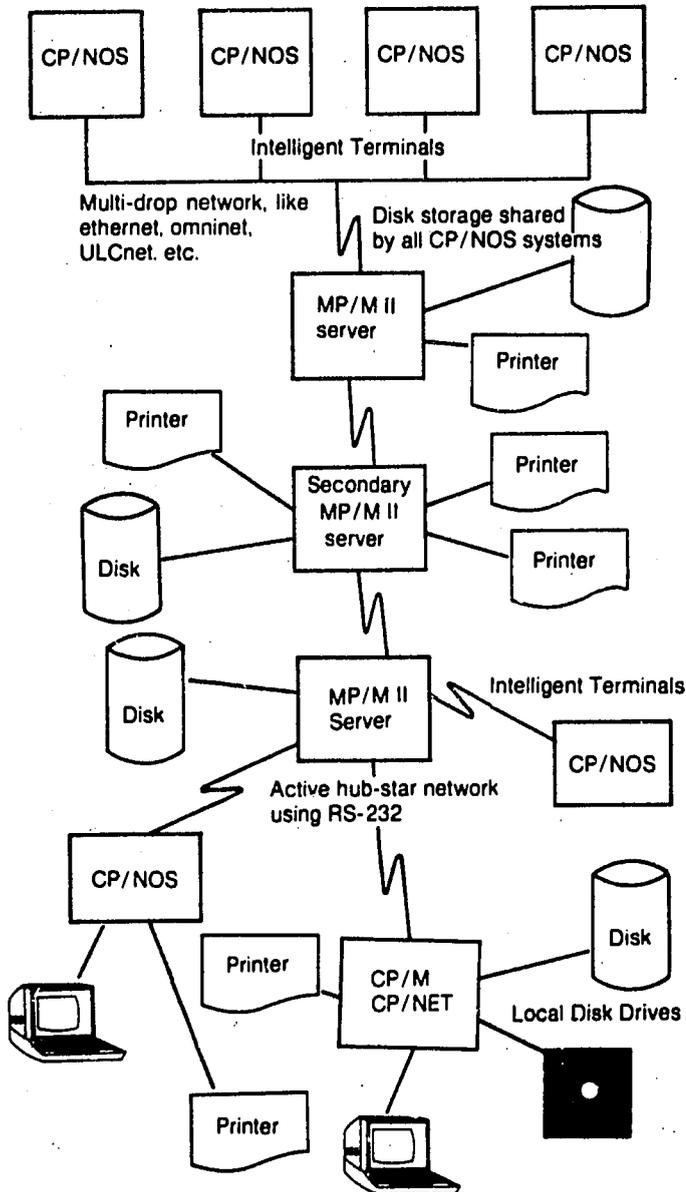
RCVMAIL

Collects and displays all electronic mail that has been posted to the user.



SOFTWARE PERFORMANCE REPORT

CP/NOS is supported by Digital Research's Software Performance Report (SPR) system. This service provides a prompt response to technical problems associated with CP/NOS. Users are provided with SPR forms which serve as a communications device to inform the Digital Research Product Support staff of user-identified problems.



HARDWARE REQUIREMENTS

- An Intel 8080/8085 or Zilog Z-80 microprocessor.
- 4K of ROM is suggested for CP/NOS in a standalone operation, although downloading from a network server is possible.
- At least 16K RAM, with 60K allowed when using a 4K ROM.
- An MP/M II system with 48K of RAM.

DIGITAL RESEARCH

Digital Research, Pacific Grove, CA., is the leading producer of microcomputer operating systems, languages, and utilities for 8- and 16-bit microcomputers. For eight years, Digital Research has been involved with the design, development and support of microcomputer software. Digital Research's operating systems are the industry standard. Digital Research's languages and productivity tools are designed for the professional programmer writing commercial software packages. Together, they form a family of compatible software products. Digital Research users include over 600,000 systems, 700 OEMs and 600 independent software houses.

ORDERING INFORMATION

Product	Order Description
CP/NOS System	Two 8" single-density single-sided diskettes and CP/NOS documentation.
CP/NOS Documentation	CP/NET User's Guide and CP/NOS addendum.

NOTE: The information set forth in this product brief is descriptive only. For detailed specifications, consult the DRI technical manual for the product.

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Z-80 is a registered trademark of Zilog Corp.

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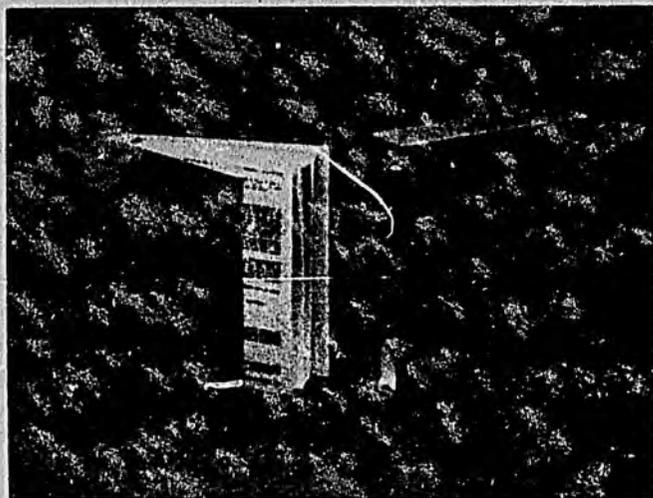
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CP/M Plus™



CP/M Plus OVERVIEW

CP/M Plus is a high performance single-user, single-tasking operating system designed for microcomputers that use the Intel 8080 or Zilog Z-80® family of microprocessors. CP/M Plus was designed with the business user in mind — it is easy to learn and use. CP/M Plus also features a flexible application program interface and powerful system utilities to facilitate software development.

CP/M Plus includes a fast, sophisticated file system. It has a time tested, modular design which allows it to be easily customized to run in a particular hardware environment. It can be configured for either banked or non-banked memory. System dependent input/output device handlers are located in a module called the Basic Input/Output System (BIOS). The BIOS interfaces to the logical, hardware independent portion of the operating system and is the only module that must be customized.

CP/M Plus is small, residing in about 10K bytes of memory. Its size is dependent on the size of the BIOS. The actual size of the customized BIOS is dependent on the number of peripheral devices in the system. Although it is compact, CP/M Plus can manage up to sixteen banks of RAM and up to sixteen disk drives, making it a good match for today's expanded 8-bit microcomputer systems.

CP/M Plus FEATURES

- High Performance File System
- CP/M 2.2 Compatible
- Time and Date Stamps on Files
- Automatic Disk Login of Removable Media
- Support for 1 to 16 Banks of RAM
- Support for 1 to 16 Drives of up to 512 Megabytes Each
- Console I/O Redirection
- Easy to Use System Utilities with HELP Facility
- Powerful Batch Facility
- Systems Primitives Designed for Applications Programmers
- Resident System Extensions
- Sophisticated Programmer Utilities

HIGH PERFORMANCE FILE SYSTEM

In CP/M Plus, hashed directory access, record buffering, and multi-sector disk I/O support a high performance file system. CP/M Plus uses a hashing technique to directly access directory information, eliminating the need for directory searching. Record buffers maintained in memory on a LRU scheme give the application program fast access to a working set of directory and data records. Multi-sector I/O allows application programs and the operating system to read or write up to 16K of program or data records in one operation. The operating system uses multi-sector reads to load programs at high speed.

CP/M Plus 2.2 COMPATIBLE

The CP/M Plus file system is upward compatible with CP/M 2.2 and MP/M II files. All files generated by CP/M systems can be read under CP/M Plus. Application software which runs under CP/M 2.2 will run under CP/M Plus without modification.

TIME AND DATE STAMPS ON FILES

Time and date stamping options allow the user to record in the disk directory two entries for time and date stamps for each file. The user can select the time and date of the last update to a file and either time and date of the file's creation or last access. The DIR command displays time and date stamp information.

AUTOMATIC DISK LOGIN OF REMOVABLE MEDIA

CP/M Plus automatically logs in a disk when it detects a media change. The user need not inform the operating system when a disk is changed. If files are open and CP/M Plus detects a media change, CP/M Plus performs no further file I/O for these files.

ADDRESSES UP TO SIXTEEN BANKS OF RAM

A banked CP/M Plus system requires a minimum of two banks of memory and can support up to sixteen banks of memory. The top region of each bank (4K to 16K) is always in context and contains the resident portion of the operating system. Because the resident portion of the operating system occupies only a small area in the common memory, a banked CP/M Plus system can give the transient program the advantage of more than 60K of execution space.

DISK DRIVE SUPPORT

CP/M Plus supports up to sixteen logical drives, each containing up to 512 Megabytes. Any one file can be up to 32 Megabytes in size, with space dynamically allocated and released. A single volume can be partitioned into sixteen different logical areas identified by a user number. All files on user area 0 can be made available under the other user areas.

NO I/O REDIRECTION

The CP/M Plus GET and PUT utilities allow application programs to redirect serial device input/output to or from a disk file. Programs do not need to be modified to use this facility.

SYSTEM UTILITIES

CP/M Plus utilities have a consistent syntax and accept optional English words to make commands easier to use and remember. A HELP command displays concise information on all system commands and available options. The HELP input file can be expanded to include information about application programs.

BATCH FACILITY

The batch facility, SUBMIT, Plus allows the user to perform repetitive tasks without re-keying the command sequence. SUBMIT input files can include both program and system input. SUBMIT input files can include commands to execute additional SUBMIT files. A sequence of CP/M Plus commands can also be entered with one console input line.

SYSTEM PRIMITIVES

CP/M Plus is upward compatible with CP/M 2 at the operating system functional level. Added system primitives allow the application program to determine the amount of free space available on a drive, truncate files, and chain to another program. An additional primitive allows application programs to intercept and process system errors.

RESIDENT SYSTEM EXTENSIONS

The CP/M Plus RSX facility allows customization of the operating system on a selective basis. RSX modules are attached to the base of the operating system where they intercept operating system functions and either perform the function or forward the function to the operating system. RSX modules can remain permanently in memory or be removed when a transient program terminates.

SOPHISTICATED PROGRAMMING UTILITIES

The CP/M Plus package includes Digital Research's symbolic instruction debugger, SID™, macro assembler, MAC™, relocating macro assembler, RMAC™, and linkage-editor with overlay capability, LINK-80™. These utilities simplify systems level programming.

CUSTOMIZATION

For ease in transporting CP/M Plus to a specific hardware environment, all hardware dependent code is located in one module, the Basic Input/Output System (BIOS). The BIOS manages the hardware peripheral devices.

CP/M Plus can be transported to a specific hardware environment by customizing the BIOS. This customized BIOS must support a standard set of Input/Output primitives upon which the operating system depends. Some of the standard primitives are:

- 1 Character Device Input
- 1 Character Device Output
- 1 Select Disk Drive
- 1 Read Sector
- 1 Write Sector
- 1 Select Memory Bank

These and other required primitives pass data to the operating system through standard subroutine calls and returns.

To simplify the preparation of a custom BIOS, Digital Research supplies the source of a working BIOS which is comprised of a kernel, a character input/output module, a disk input/output module, and several other related modules. This source can be modified and linked to form a complete, customized BIOS. A set of powerful system generation utilities are also included to reduce development time and cost.

Memory Organization of Non-banked CP/M Plus System

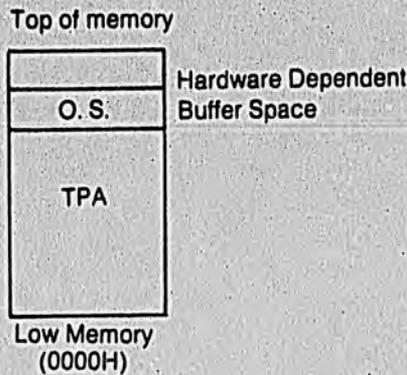
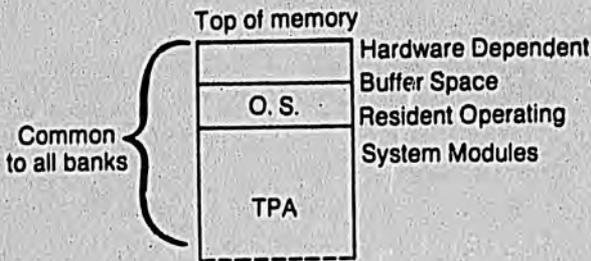


Figure 1

Memory Organization of Banked CP/M Plus System



Top of Banked Memory

Bank-Switched

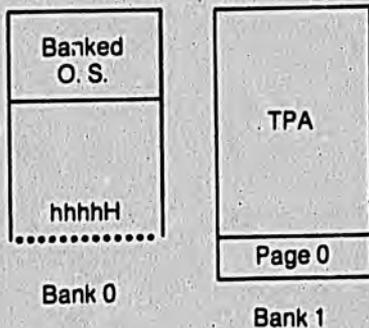


Figure 2

CP/M Plus UTILITIES

CP/M Plus includes utilities to list file directories, transfer files, edit files and create and debug 8080 assembly language programs. The following utilities are also part of the CP/M Plus package.

DEVICE

The DEVICE command sets communication protocols and baud rates for character I/O devices. It also allows the user to change device assignments and to assign program output to multiple devices.

GET

The GET command redirects console input to be read from a disk file. The input file can contain both standard CP/M Plus input and input to the application program.

PUT

The PUT command complements the GET command by allowing application programs and CP/M Plus system output to be directed to a disk file.

SET

The SET utility allows the user to set various file attributes and time and date recording mode. The file attributes include Read-Only and System.

SETDEF

The SETDEF command displays and defines the disk search order. With this command, the user can cause CP/M Plus to search more than one drive for a command file. The user can also direct CP/M Plus to search for files of type SUB as well as type COM.

SHOW

The SHOW utility displays information about the characteristics of a logical drive such as capacity, number of directory entries, and directory label information.

SUBMIT

The SUBMIT command lets the user execute a command sequence stored in a disk file. The file can contain both CP/M Plus system input and application program input.

CP/M Plus PACKAGE

CP/M Plus is shipped on two 8-inch single-sided, single-density diskettes.

SOFTWARE PERFORMANCE REPORT

CP/M Plus is supported by Digital Research's Software Performance Report (SPR) system. This service provides a prompt response to technical problems associated with CP/M Plus. Users are provided with SPR forms which serve as a communications device to inform the Digital Research Product Support staff of user-identified problems.

HARDWARE REQUIREMENTS

- An Intel 8080/8085 or Zilog Z-80® microprocessor.
- 1 to 16 disk drives of up to 512 Megabytes each.
- A console device.
- 64K of RAM.

DIGITAL RESEARCH

Digital Research, Pacific Grove, CA., is the leading producer of microcomputer operating systems, languages and utilities for 8- and 16-bit microcomputers. For eight years, Digital Research has been involved with the design, development and support of microcomputer software. Digital Research's operating systems are the industry standard. Digital Research's languages and programming tools are designed for the professional programmer writing commercial software packages. Digital Research's CP/M Graphics products are built on a standard interface for portability and are a first for the microcomputer graphics industry. Together they form a family of compatible software products. Digital Research users include over 800,000 systems, 700 OEMs and 600 independent software houses.

ORDERING INFORMATION

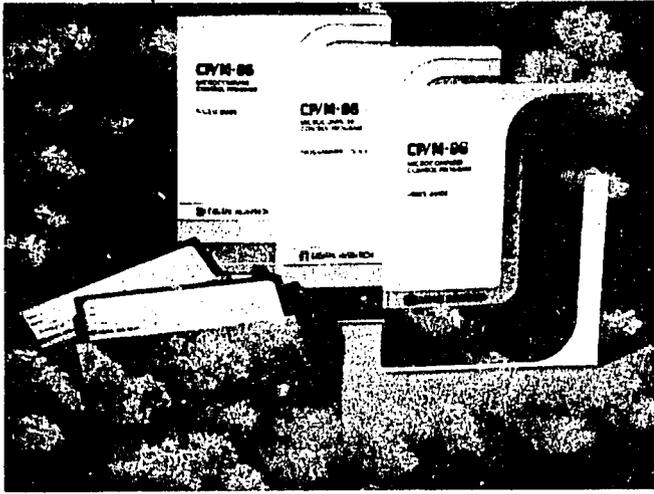
Product	Order Description
CP/M Plus System	Two 8" single-density, single-sided diskettes and CP/M Plus documentation.
CP/M Plus Documentation	CP/M Plus Programmer's and User's Guides.

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CP/M-86™**CP/M-86 FEATURES**

- Memory Space Efficient — Resides in 12K Bytes
- Manages up to 1MByte RAM
- Allows up to 128MByte of on-line magnetic storage
- Allows multiple programs in memory
- Cross Development Tools for customization on CP/M® based 8-bit systems
- Compatible with CP/M
- File Structure compatible with CP/M for 8-bit systems
- Allows non-contiguous physical memory areas
- Manages non-contiguous memory areas for application programs

CP/M-86 OVERVIEW

CP/M-86 is a proprietary, general purpose control program designed especially for microcomputers that use the Intel 8086 or 8088 microprocessor.

CP/M-86 is efficient and powerful. CP/M-86 systems can support application programs that range from small to complex. It has a time-tested, modular design. The system modules include:

- The Command Console Processor (CCP) — the human interface of the operating system that parses and executes user's commands.
- The Basic Disk Operating System (BDOS) — the logical, invariant portion of the operating system that performs system services such as managing disk directories and files.
- The Basic Input/Output System (BIOS) — the physical, variant portion of the operating system that contains the system-dependent input/output device handlers.

CP/M-86 is small, residing in about 12K bytes of memory. Its size is dependent on the BIOS. The actual size of a customized BIOS is determined by the number of peripheral devices in the system. Although it is compact, CP/M-86 can give application programs the full advantage of the 8086 address space, because it manages up to a full megabyte (1,048,576 bytes) of main memory.

CP/M COMPATIBILITY

CP/M-86 files are completely compatible with the versions of CP/M for the 8080, 8085 and Z-80® based microcomputer systems. This simplifies conversions of software developed to run under CP/M to the new 16-bit 8086-based systems.

The end-user will notice no significant difference between CP/M-86 and CP/M; commands such as DIR, TYPE, PIP, and STAT respond the same way in both systems. The program interface is also unchanged — CP/M calls for system services have the same function numbers in CP/M-86.

It is easy to upgrade existing CP/M application software to run under CP/M-86 because CP/M-86 is so similar to its predecessors. Although assembly language programs will require recoding, higher-level language programs will recompile with little modification.

To make software transport even easier, CP/M-86 uses the 8086 registers corresponding to 8080 registers for system call and return parameters, and allows the user to load application programs into a memory environment similar to the configuration of CP/M. In this execution environment, CP/M-86 loads programs starting at location 100H and stores the default buffers and file control blocks in the base page of memory. This execution environment allows code and data segments to overlap, making the mixture of code and data that often appears in 8-bit applications acceptable to the 8086.

FILE MANAGEMENT

CP/M-86 can support up to 16 logical drives, each containing up to eight megabytes, for a maximum of 128 megabytes of on-line storage. Any one file can reach the full drive size, with space dynamically allocated and released. Each device has a directory of file control blocks that map each file's physical locations on the disk. Disk definition tables in the BIOS translate this logical drive, directory and file structure to the physical characteristics of the disk. This file system is identical to the file system of CP/M 2.

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MEMORY MANAGEMENT

CP/M-86 is extremely flexible because it can reside anywhere in memory. Plus, it is very simple to relocate. Simple changes in the command file header and BIOS memory table place CP/M-86 at a new location for subsequent system loads.

Through a user-defined memory configuration table, CP/M-86 manages non-contiguous memory locations. CP/M-86 allows multiple programs to reside in memory simultaneously. This provides facilities for background tasks. Also, a transient program may load additional programs for execution under its own control. These multiple programs may use non-contiguous memory areas. CP/M-86 keeps track of the order in which programs are loaded and, if an abort command is entered, discontinues execution of the program most recently activated.

CP/M-86 is also sophisticated in its handling of user memory. Language processors may specify up to eight independent program units. When the GENCMD utility prepares a memory image file, it builds a file header that specifies the application's memory requirements for each independent unit, including segment information, and a minimum and maximum buffer size. CP/M-86 uses this header information to allocate memory for the program to be loaded. An executing program may request additional buffer space from CP/M-86 during execution. Memory space allocated to the operating system, to background tasks, or to buffer space for the executing program need not be contiguous with the memory occupied by the executing program.

Because 8086 programs are so easy to relocate, dependence on absolute addresses has been minimized. For example, CP/M-86 uses a reserved software interrupt for system entry. To make a call for system services, an application program need only place the required call parameters in the appropriate registers and execute the 8086 instruction, INT 224. Control passes to the operating system, which performs the requested service and then returns control to the calling program. Intel Corporation has reserved the instruction INT 224 specifically for CP/M-86 and its applications programs.

CROSS DEVELOPMENT TOOLS

To assist OEM's wishing to bring up CP/M-86 on a specific hardware device, Digital Research provides a set of development tools which reside on a CP/M based 8-bit Z-80, 8080 or 8085 system and may be used to develop a version of CP/M-86 to be loaded on a target system. Thus, users taking advantage of these development tools are spared the expense of obtaining a 16-bit microcomputer development vehicle.

The primary software cross development tools consist of an assembler, ASM-86 and a utility, GENCMD; both will run on an 8-bit CP/M system. Using these tools on an 8-bit system, the programmer can assemble the custom BIOS program and generate a loadable object file that will run on the target system. This process can save time and money.

CUSTOMIZATION

For ease in transporting CP/M-86 to a specific hardware environment, all hardware dependent code is located in one module, the BIOS (Basic Input/Output System). The BIOS module manages the hardware peripheral devices.

Digital Research ships CP/M-86 configured for the Intel 8612 Single Board Computer with SBC 204 Disk Controller. To bring up CP/M-86 on a different system, a custom BIOS module must be tailored to the specific hardware environment, which usually includes a console, disk drives, a RAM memory configuration and a hard-copy listing device. The custom BIOS must support a standard set of I/O primitives on which the BDOS depends. Some of the standard primitives are:

- Console Status
- Console In
- Console Out
- List Out
- Select Drive
- Set Track
- Set Sector
- Read Sector
- Write Sector
- Return Memory Descriptor Table Address

Custom code for these and other required primitives can handle most application hardware, but must accept and return the appropriate values to the BDOS through a standard subroutine call and return.

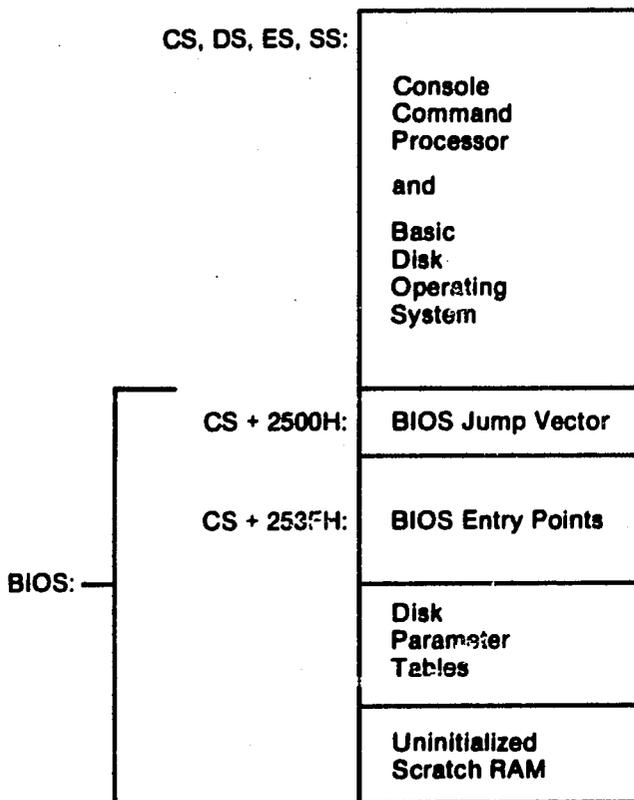
To simplify the preparation of a custom BIOS, Digital Research supplies a source listing of a working BIOS, a skeleton for a custom BIOS module, and powerful utility programs that allow users to develop a module on either an 8-bit or 16-bit machine. The CP/M-86 assembler, ASM-86™, and two other utility programs, GENCMD and GENDEF, are supplied in two forms on the distribution disk: one to operate under CP/M-86 and the other to operate under CP/M for use on Z-80® and 8080 systems. Users can develop CP/M-86 on an existing 8-bit CP/M system, reducing development time and cost.

Once a custom module has been prepared, it is easy to add to the invariant modules of CP/M-86. To do this, the user must concatenate the module with the invariant files, then build a memory image file with the GENCMD utility. The .CMD file that results may then be loaded and executed.

BASIC I/O SYSTEM (BIOS) ORGANIZATION

The distribution version of CP/M-86 is set up for operation with the Intel SBC 86/12 microprocessor and an Intel 204 diskette controller. All hardware dependencies are, however, concentrated in subroutines which are collectively referred to as the Basic I/O System, or BIOS. A CP/M-86 system implementor can modify these subroutines to tailor CP/M-86 to fit nearly any 8086 or 8088 operating environment.

The BIOS portion of CP/M-86 resides in the topmost portion of the operating system (highest addresses), and takes the following general form:



PROM LOADER

For users who have the SBC 8612 hardware configuration, Digital Research can optionally provide a PROM Loader. This firmware brings the CP/M-86 loader into the system and sets up the hardware to initialize CP/M-86.

UTILITIES

CP/M-86 is supplied with 8 powerful utilities:

PIP

The Peripheral Interchange Program provides file transfer between devices and disk files and performs various reformatting and concatenation functions. Formatting options include parity-bit removal, case conversion, Intel "hex" file validation, subfile extraction, tab expansion, line number generation and pagination.

ED

The CP/M-86 Text Editor allows creation and modification of ASCII files using extensive commands: string substitution, string search, insert, delete and block move. ED allows text to be located by context, line number or relative position with a macro command for making extensive text changes with a single command line.

ASM-86

The CP/M-86 Assembler is a fast 8086 assembler using standard Intel mnemonics. ASM-86 also allows users to define unique instructions with its code-macro facility. ASM-86 is supplied in two forms: an 8086 cross assembler designed to run under CP/M on an 8-bit system and an 8086 assembler designed to run under CP/M-86.

DDT-86

The CP/M-86 Dynamic Debugging Tool allows the user to test and debug programs interactively in a CP/M-86 environment. The command set allows users to trace program execution with full register and status display. DDT-86 contains an integral assembler/disassembler module that lets users patch and display memory in assembler mnemonic form.

SUBMIT

The Submit utility allows the user to batch together a parameterized group of prototype CP/M-86 commands in a file and then "submit" them to the operating system with a single command.

STAT

The STAT utility alters and displays I/O device and file status including free-space computations, status of on-line diskettes and physical-to-logical device assignment.

GENCMD and LMCMD

The GENCMD utility processes Intel "H86" format files, which may be produced either by Digital Research's ASM-86 or by Intel's OH86 utility. LMCMD processes Intel L-module files resulting from the standard Intel LOC86 Object Code Relocator Utility.

THE CP/M-86 PACKAGE

CP/M-86 is shipped on two single-sided, single-density, 8-inch floppy disks in IBM compatible format. These disks contain the following machine-readable files:

Distribution Disk 1

CPM.SYS
LOADER.COM
DDT86.COM
STAT.COM
SUBMIT.COM
PIP.COM
GENCMD.COM
LDCOPY.COM
ED.COM
GENDEF.COM
ASM86.COM
CPM.H86
LDBDOS.H86
LDBIOS.H86
LDCPM.H86
GENDEF.COM
GENCMD.COM
ASM86.COM

Distribution Disk 2

RCM.A86
BIOS.A86
CBIOS.A86
RANDOM.A86
LDCPM.A86
DEBLOCK.LIB
SINGLES.LIB
SINGLES.DEF

The CP/M-86 package includes full documentation for the product. Documentation is also available separately. A CP/M-86 PROM loader is available for the Intel 8612 Single Board Computer.

HARDWARE REQUIREMENTS

The version of CP/M-86 that Digital Research ships and supports requires an Intel 8612 Single Board Computer and an Intel 204 Disk Controller. CP/M-86 may be reconfigured for a custom hardware environment with a CP/M development system. Custom hardware environments must include:

- An Intel 8086 or 8088 CPU
- At least 56K of RAM
- One to sixteen disk drives of up to 8 megabytes each
- An ASCII console device such as a CRT

DIGITAL RESEARCH

Digital Research, Pacific Grove, CA is the leading producer of microcomputer operating system software and utilities. For 10 years, Digital Research has been involved with the design, development, and support of microcomputer software. The single user operating system, CP/M, multiuser MP/M™ and software network, CP/NET™, form the basis of a family of operating system software products spanning 8 to 16 bit microcomputers. Digital Research users include over 200,000 systems, 250 OEMs and 300 independent software houses.

ORDERING INFORMATION

Product	Order Description
CP/M-86 System	Two Single Density, single sided diskettes and CP/M-86 Documentation.
CP/M-86 Documentation	CP/M-86 System Guide, CP/M-86 Programmer's Guide and CP/M users Guide.
CP/M-86 Development PROM	PROM for use on an 8612 Single Board Computer.

CP/M is a registered trademark of Digital Research, Inc. MP/M, CP/NET, CP/M-86, ASM-86 and DDT-86 are trademarks of Digital Research, Inc. Z-80 is a registered trademark of Zilog. 5 81

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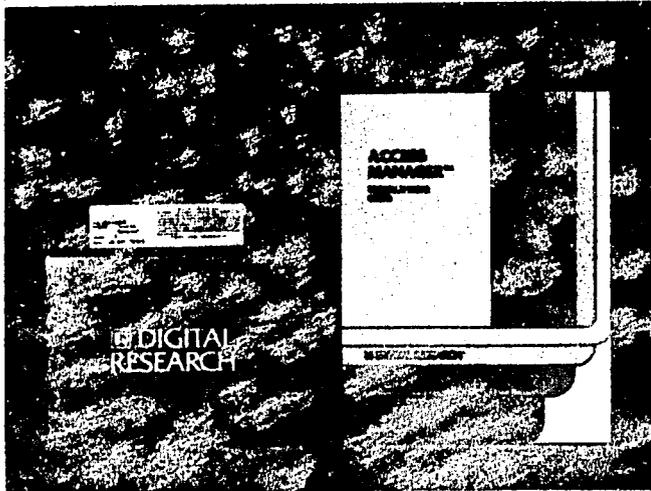
P.O. Box 579
Pacific Grove, CA 93950
408-649-3896
TWX 910 360 5001

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Comparison Of CP/M 2.2 and CP/M Plus™ Banked And Non-banked

	CP/M Plus banked system	CP/M Plus non- banked system	CP/M 2.2 non- banked system
Hardware supported			
8080, Z-80®, or equivalent	yes	yes	yes
Banked RAM	yes	no	no
Minimum RAM	96K	64K	20K
TPA size (assuming 2K BIOS)	62K	54K	58K
Maximum number of drives	16	16	16
Maximum capacity per drive (in Mb)	512	512	8
Maximum file size (in Mb)	32	32	8
Performance			
Hashed directory access	yes	yes	no
LRU record buffering	yes	no	no
Multi-sector disk reads and writes	yes	yes	no
OS reloaded on warm boot	no	no	yes
User interface			
Time and date stamps on files	yes	yes	no
Automatic diskette login	yes	yes	no
HELP facility	yes	yes	no
System utilities prompt for missing arguments	yes	yes	no
Console I/O redirection	yes	yes	no
User profile initiated at system boot	yes	yes	no
Multiple system commands on one line	yes	yes	no
Line editing of console buffer input	yes	no	no
Multiple drive file searches	yes	yes	no
System files on USER 0 available to all USER #'s	yes	yes	no
Application program interface			
Application program may trap system errors	yes	yes	no
Drive free space system function	yes	yes	no
Truncate file system function	yes	yes	no
Program chain system function	yes	yes	no
Time and date accessible through system function	yes	yes	no
Direct BIOS calls through system function	yes	yes	no
Program and overlay loading as system function	yes	yes	no
System Control Block	yes	yes	no
I/O Byte	no	no	yes
Multiple device input and output	yes	yes	no
Resident System Extensions	yes	yes	no
File system compatibility			
CP/M 2.2 files	yes	yes	yes
MP/M II file password protection	yes	no	no
System implementation			
Blocking and deblocking code in BIOS	no	no	yes
Linkable BIOS	yes	yes	no
System generation utility	yes	yes	no

Access Manager™



Access Manager™ OVERVIEW

Access Manager is a versatile file access method for CP/M® and MP/M II™ systems. A compatible file accessing method across all of Digital Research's compiled languages, Access Manager interfaces multiple languages to a common data file. Access Manager maintains separate index and data files to eliminate the need to sort the data records. The index is accessed in either ascending or descending order to rapidly search for and retrieve information from an unsorted data file.

The index file contains the key values and the data record number that indicates the location of the record in the data file. Data files may have up to ten keys; for each key a separate index file is maintained. Access Manager supports logical record lengths defined by the user. Duplicate keys can be distinguished from one another automatically.

Access Manager supports both single-user and multiple-user operating systems. File and record locking is provided to ensure data integrity in multi-user operating systems. A multi-user system provides up to 40 keys for data files.

Access Manager FEATURES

- Indexed Access to Data Records
- B-Tree Index Structure
- Multi-User Support
- Automatic Reclaiming of Disk Space
- Efficient Memory Utilization
- Portability Across Multiple Languages

INDEXED ACCESS TO DATA RECORDS

Multiple keys may be associated with the records in a data file. For each key, Access Manager maintains a separate ordered index file. As new data records are added to the data file, the associated keys are placed in the proper position in the index file. Keys need not be in any particular position in the data record. The user must supply the proper interpretation of the key values in the index files. If two or more data records have the same key, the duplicate keys can be handled automatically by Access Manager. Searches of the index will return each of the records with the same key.

B-TREE INDEX STRUCTURE

Index files are organized using a height-balanced multi-way tree structure. The index files never needs to be reorganized when data is inserted or deleted. The balanced structure ensures the minimum number of accesses to search an index file for a key.

The amount of buffer space reserved for index files is controlled by the programmer. Access Manager never reads information from an index file if it already exists in the index file buffer.

MULTI-USER SUPPORT

Access Manager works with the MP/M II operating system to provide data file and data record locking. Access Manager provides a system resident process to handle all index and data file accessing in multi-user applications.

Access to data files and records within a data file may be restricted by the user. Access can be controlled in four ways. First, the complete file may be locked so no other user can access the file. This is an exclusive file lock. An entire file may also have a shared file lock. This is used to block an exclusive file lock when a file is already in use. When multiple users are allowed to access a data file, there are two levels of locking that may be used with a given record in the data file. A record may be locked so that other users may read the record but not change it. This is a shared record lock. Finally, a record may be locked so that no other user but the one locking it may read or write the record. Record locks are on logical records, not on physical disk sectors.

Access Manager is initially configured for three users, but will accommodate up to eight users at one time. All necessary source code is provided to configure Access Manager for up to eight users. Programs designed for a multi-user environment will also work with a single-user system. Programs are not recompiled to shift between single and multiple-user operation; they need only be relinked.

AUTOMATIC RECLAIMING OF DISK SPACE

A data record and its associated key values may be deleted from the Access Manager files. The space in both the index and data files is reclaimed and made available for use when another record is added to the data file.

Access Manager allows data files to expand as required by the application at the same time ensuring that all disk space is being used efficiently. Access Manager will also identify any deleted records which have not yet been reused. If required Access Manager can rebuild an index file in cases where the index file has been lost.

EFFICIENT MEMORY UTILIZATION

Access Manager is designed to use the minimum amount of memory. The memory requirements are different for single-user and multi-user systems. The single-user library components are:

■ Language Interface	0.6k
■ Adding Key Values	1.5k
■ Deleting Key Values	1.8k
■ Opening, Closing and Searching	
Index Files	4.7k
■ Accessing Data Files	2.6k
■ Index File Buffer Area (minimum)	0.6k
TOTAL	11.8k

Multi-user operation requires 2k of user memory, as well as 16.4k in a separate shared resident system process and 4.5k of shared buffer area.

PORTABILITY ACROSS LANGUAGES

Access Manager data files can be accessed by any of the Digital Research native code languages. This permits a common data base to be used by programs written in different languages.

The handling of data files as well as index files is defined by Access Manager. Special interfaces are provided to interface each language with Access Manager.

Access Manager DESIGN SPECIFICATIONS

Access Manager has the following design specifications:

- Maximum key value length is 48 bytes
- Maximum index file size is 8 megabytes
- Data record numbers are limited to 4 bytes of binary
- Data file records are all a fixed length as defined by the user

When operating under CP/M version 2, Access Manager includes the following additional design specifications:

- The maximum data file size is 8 megabytes
- Twenty data files may be open at one time
- Ten index files may be open at one time
- Eighteen disk buffers may be requested

When operating under MP/M II Access Manager includes the following design specifications:

- The maximum data file size is 32 megabytes
- Forty data files may be open at one time
- Forty index files may be open at one time
- Sixty disk buffers may be requested
- Eight users can share index and data files

ERROR HANDLING

Access Manager allows two types of error handling. During initialization, the program sets an option to have all error messages display on the console and terminate the program. Optionally, Access Manager allows the program to make all error messages available to the program via an ERRCOD function. Any errors discovered by Access Manager will set an error code and return it to the executing program.

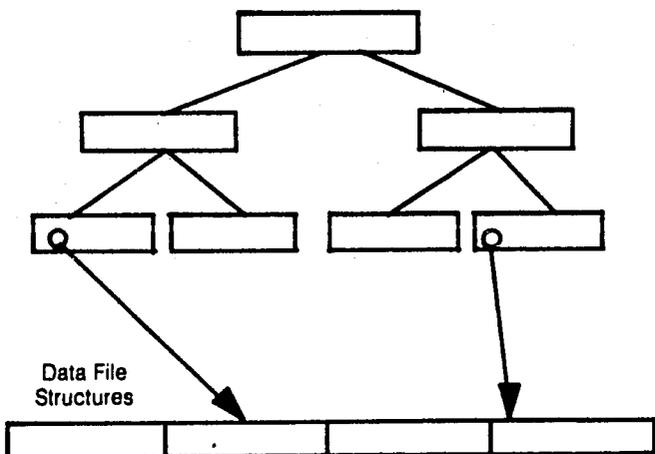
A lock code is returned whenever an attempt is made to lock a data file or data record. The action to be taken after an unsuccessful locking request is made at program level.

INDEX FILE HANDLING ROUTINES

Access Manager provides a comprehensive set of routines to access index file information. Calls made to the run-time system allows programs to traverse the index file in sequential order or reverse order. A program can scan the index for an exact match on a key, or a key value equal to or greater than the requested key, or the previous key value. Requesting information about the first, last or next available entry in the index file is available with a single subroutine call to the run-time system. In addition, routines are provided to add new key values, delete existing key values in the index file or update existing index pointers.

Routines are provided to determine the number of index key values which are available to the program. The ability to force an index file to update to disk after each update exists. Index file maintenance routines to open, close, save and delete index files are all available under program control.

INDEX FILE STRUCTURE

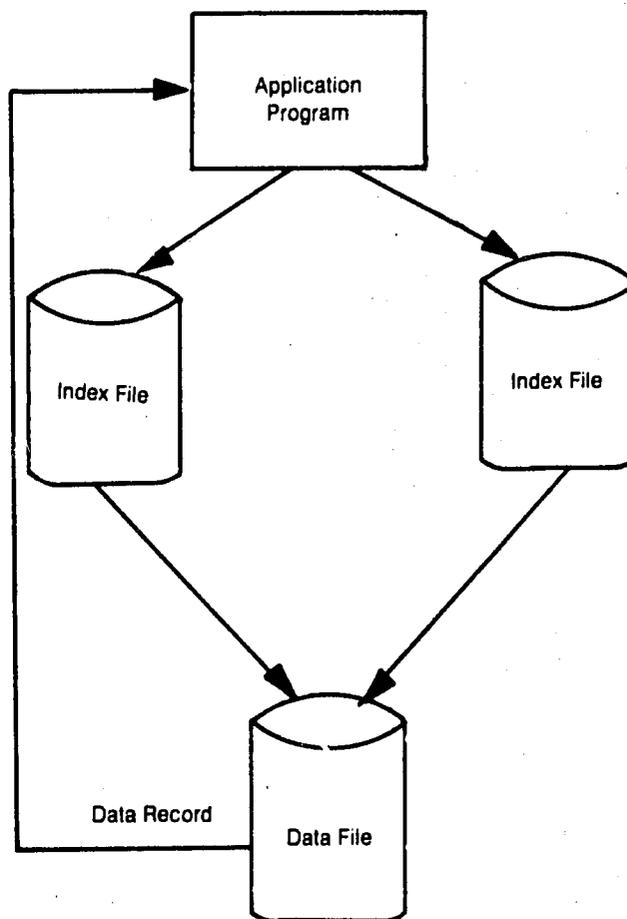


DATA FILE ACCESSING ROUTINES

Modifying, adding or deleting data records from data files are accomplished by calling routines in the Access Manager run-time library. These routines allow programs to open, close or erase data files. Forced updates to disk can also be accomplished whenever it is necessary to guarantee data file integrity. Routines are provided to determine the size of data files and the number of data records in a data file. Access Manager uses four byte pointers for each data record. The high order two bytes are accessible and can be modified to allow multiple volume data file support.

Data records are accessed by using the Data Record Number returned from the index handling routines. Data records can be read, written, reread for subsequent reuse. The next available Data Record Number in the data file is available when adding to the data file. Setting and releasing file and record locks are handled through the data file handling routines.

ACCESSING A RECORD BY KEY



Access Manager PACKAGE

Access Manager is shipped on two 8-inch single-sided, single-density diskettes.

SOFTWARE PERFORMANCE REPORT

Access Manager is supported by Digital Research's Software Performance Report (SPR) system. This service provides a prompt response to technical problems associated with Access Manager. Users are provided with SPR forms, which serve as a communications device to inform the Digital Research Product Support staff of user-identified problems.

LANGUAGE SOFTWARE DIRECTORY

The Language Software Directory is an up-to-date reference tool for accounting, word processing, utilities, and vertical market application packages. It serves as support for the Independent Software Vendor's (ISV) product by providing a complete listing of the application package the end-user is looking for. The directory contains a listing of companies actively marketing business application packages, followed by product name, description, and memory requirements.

HARDWARE REQUIREMENTS

- Operates with either the CP/M or MP/M II operating systems.
- An Intel 8080/8085 or Zilog Z-80® microprocessor.
- A minimum of 48k bytes of random access memory is required.
- One floppy or hard disk drive and a console.

DIGITAL RESEARCH

Digital Research, Pacific Grove, CA is the leading producer of microcomputer operating systems, languages and utilities, for 8- and 16-bit microcomputers. For 8 years, Digital Research has been involved with the design, development, and support of microcomputer software. Digital Research's operating systems are the industry standard. Digital Research's languages and productivity tools are designed for the professional programmer writing commercial software packages. Together, they form a family of compatible software products. Digital Research users include over 350,000 systems, 600 OEMs and 600 independent software houses.

ORDERING INFORMATION

Product	Order Description
Access Manager System	Two 8" single-density, single-sided diskettes and Access Manager documentation.
Access Manager Documentation	Access Manager Programmer's Guide.

CP/M is a registered trademark of Digital Research. The Digital Research logo, MP/M II, and Access Manager are trademarks of Digital Research.

Z-80 is a registered trademark of Zilog.

NOTE: The information set forth in this Product Brief is descriptive only. For detailed specifications, consult the DRI technical manual for the product.

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Printed in the United States

DIGITAL RESEARCH

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TWX 910 380 5001

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EtherShare™ Network Server

EtherShare™ is an Ethernet-based network server which offers IBM Personal Computer users shared access to a hard disk. It is packaged as a complete unit which includes Winchester disk storage, processor, memory, Ethernet connection, and software which manages concurrent use of the disk by many IBM PC users.

EtherShare offers shared access to data and program files in addition to the regular benefits of a hard disk, like faster loading of programs, quicker file access, greater capacity, and increased reliability. The results are lower costs, more efficient utilization of storage, and increased productivity from the sharing of information and analysis tools.

FEATURES

- 10 MB fast-access hard disk, expandable to 40 MB
- 1 MB 5¼ inch floppy disk for backup
- Powerful 16 bit processor with 512K bytes memory
- Transparent access to hard disk for up to 40 IBM PC's
- No software changes to DOS or applications programs
- Shared and private diskette-sized volumes
- Password control for secure access
- Incremental server capabilities via add-on software

Specifications

Hardware: The EtherShare network server is a desk top unit which consists of a system cabinet containing a high performance processor and memory, a 10 MB 5¼ inch Winchester disk, and a 1 MB 5¼ inch floppy disk drive. The Ethernet controller is integrated into the system unit and interconnects with the Ethernet coaxial cable through an external transceiver. A CRT display and keyboard are included for entering administrative commands and monitoring status.

Software: The EtherShare software divides the Winchester disk into diskette-sized volumes which can be read or written by any IBM Personal Computer on the network. You access an EtherShare volume by supplying its name in a command which creates a link between your PC and that particular volume on the shared disk. Making this link is equivalent to placing a floppy in the diskette drive and closing the door. After that, programs may be loaded and files may be read or written by DOS without any changes to your software. Operation of the hard disk and communications across Ethernet are totally transparent to DOS and to applications programs which execute on your IBM Personal Computer. The EtherShare volumes are either 160 or



320 Kbytes in size, corresponding to either a single- or double-sided diskette. Each PC may access up to four diskette volumes at one time, in any combination of EtherShare volumes and real diskettes.

Public or private EtherShare volumes may be created as they are needed. Public volumes are accessible by any EtherShare user; may be used by more than one person at a time, and are write protected to guard against accidental change or erasure. Private volumes may be accessed for reading and writing by only one user at a time.

Two types of password protection are provided. Each user may have a password which must be given to log into EtherShare. Each EtherShare volume may also be assigned a password to control access and prevent unauthorized use.

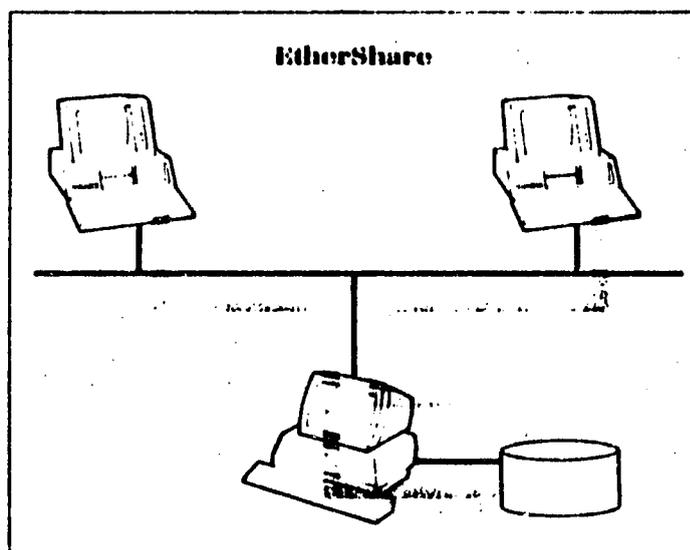
The EtherShare software provides HELP facilities to aid new users. If you request a summary of commands, a list, complete with descriptions, will be displayed on your screen. You may ask for more extensive information on an individual command, and it will be supplied with examples of its use. If a command you enter is incomplete, you are prompted to provide the missing infor-

mation, or are given a message describing the error.

Backup: The EtherShare network server incorporates a 1 MB floppy disk drive for backup of the hard disk. You may choose a full backup and copy the entire disk, or a time-saving incremental backup, where only those parts of the disk that have changed since the last full backup are copied. An optional cartridge tape drive is also available for backup.

Expansion: Your network can grow easily as your needs increase. New users are added to EtherShare with simple commands, and EtherShare add-on disks can increase storage capacity to 40 MB. Large networks may be configured with multiple EtherShares. Ethernet networks can support up to 100 computers without repeaters. This modular, incremental approach to network growth means that as your requirements change, your network will easily accommodate them.

EtherShare can be expanded to provide additional server functions. With the add-on EtherPrint™ software, EtherShare becomes a print server, able to be used transparently by any PC on the network. EtherMail™, another add-on software package, extends EtherShare to offer interper-



sonal messaging via electronic mail to all Personal Computer users on the network.

IBM PC EtherShare Commands: EtherShare commands provided with the IBM PC software are used to access the EtherShare volumes on the server.

LOGIN—Logs a user into the EtherShare and checks for the proper password.

CREATE—Creates a new EtherShare volume, giving it a name, defining its access (public or private), size (160 or 320 KB), and password, if desired.

LINK—Establishes a link between a standard DOS drive specifier ("A:", "B:", "C:", or "D:") and the EtherShare volume you want to access. From here on, any further references to files on this volume use standard DOS file names.

UNLINK—Breaks the link between a named EtherShare volume and its DOS drive specifier.

ERASE or DELETE—Deletes an EtherShare volume.

MODIFY—Allows the owner to change the name, password, or access parameters of a volume.

DIR—Lists the names of EtherShare volumes, and shows which are currently in use.

USER CREATE—Adds a new user to EtherShare.

USER ERASE—Deletes a user from EtherShare.

USER DIR—Lists the names of all users on the EtherShare, and shows which are currently logged in.

USER MODIFY—Allows a user to change a password.

EtherShare Network Server

HELP—Gives more information about commands and their structure. Detailed information about specific commands can be requested.

LOGOUT—Logs a user out of the EtherShare.

EtherShare Administrative Commands: Additional commands are provided for operating and maintaining the EtherShare network server. Administrative command entry takes place at the keyboard of the EtherShare CRT display. These commands provide for startup and shutdown of the server; backup and restore of the disk; status monitoring; and other similar activities. Menu-driven commands step you through the various functions and supply necessary information and prompts whenever needed.

Installation

EtherShare installation is done by the user, and does not require any special tools. Complete step-by-step instructions cover unpacking, set up, and loading of software. Connection to Ethernet requires plugging the coaxial cable into the Ethernet transceiver supplied with the unit.

All EtherShare software for the IBM Personal Computer is supplied on a DOS format diskette. Instruc-

tions on software installation are included in the EtherShare User's Guide. Each IBM PC must be connected to Ethernet by an EtherLink™ card. EtherShare is compatible with IBM DOS applications only.

Documentation

EtherShare User's Guide: The EtherShare User's Guide gives complete details on how to use EtherShare's shared disk, including a complete description of the commands, tutorial examples, and software installation instructions. Additional examples are provided which show you how to use popular programs like VisiCalc®, EasyWriter™, WordStar®, and PFS:® FILE with EtherShare. The EtherShare User's Guide consists of a 3-hole punched section which is to be inserted into the EtherLink User's Guide binder.

EtherShare Administrator's Guide: The EtherShare Administrator's Guide is a 3-ring binder which includes information on how to unpack and install EtherShare. A step-by-step guide is provided for using the EtherShare Administrative commands. Descriptions of the diagnostic software and problem isolation procedures are also included.

Technical Specifications

Processor:	Intel 8086 (10 MHz)
Memory:	512K Bytes, Parity Checked
Disk Capacity:	10 MB formatted, expandable to 40 MB
Disk Seek Time:	3 ms, track-to-track 205 ms, maximum
Average Access Time:	85 ms
Average Latency:	8.33 ms.
Real Time Clock/Calendar	
Temperature:	5 to 45 deg. C. 20 to 80% relative humidity non-condensing
Power Consumption:	250 w. 100-130V, 60 Hz.
System Unit Dimensions:	17 x 18 x 6.5 inches

Ordering Information

Model Number	Description
3C600	EtherShare Network Server. Includes server with 10 MB Winchester disk drive, 1 MB 5 1/4 inch floppy disk drive, Ethernet network interface, EtherShare shared-disk software, and EtherShare Administrator's Guide. One copy of the EtherShare IBM PC User's Guide and Software is also included.
3C601	EtherShare Network Server. Same as 3C600 but with 20 MB disk.
3C610	EtherShare 10 MB Expansion Disk. For use with 3C600 or 3C601. Maximum of one expansion disk per EtherShare.
3C611	EtherShare 20 MB Expansion Disk. For use with 3C600 or 3C601. Maximum of one expansion disk per EtherShare.
3C620	EtherShare Cartridge Tape Drive. Includes a 17 MB capacity cartridge tape drive in an expansion cabinet.
3C650	EtherShare/IBM PC User's Guide and Software. Includes the EtherShare User's Guide and a DOS format diskette containing the EtherShare user software for the IBM PC. One copy should be obtained for each IBM PC user.

Cables must be purchased separately. See 3C600 Ordering Guide for cable lengths and product numbers.

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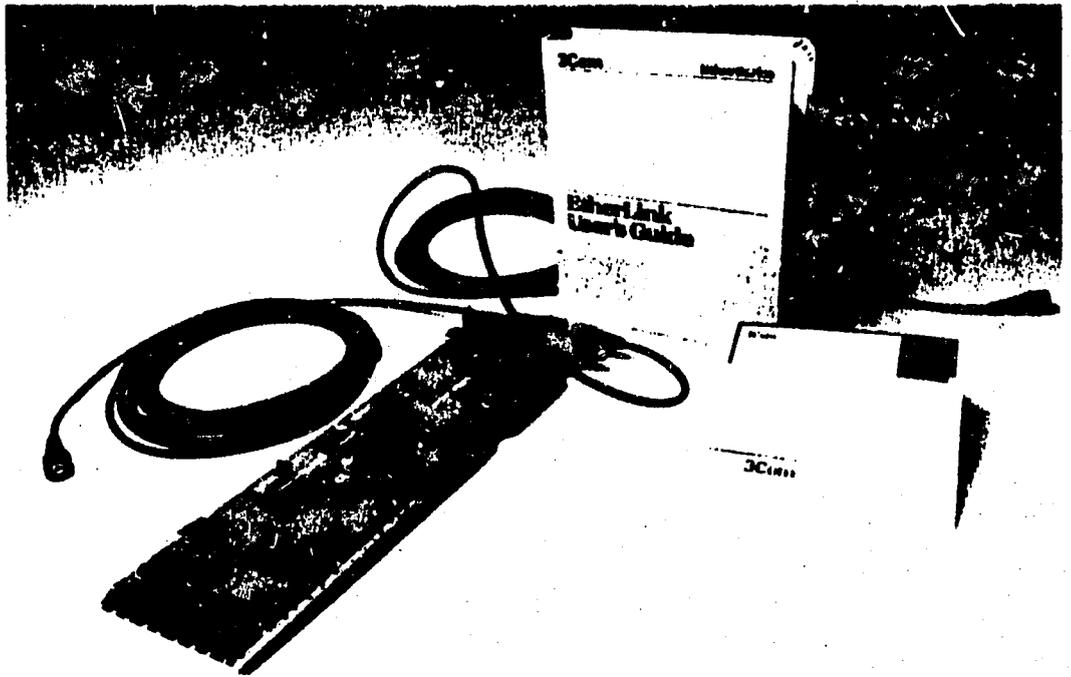
EtherLink™

EtherLink™ is a hardware and software package which connects IBM Personal Computers and enables them to cooperatively exchange data and programs via Ethernet. EtherLink includes the hardware interface and software which permits a PC running IBM DOS to access a remote diskette and to use a remote printer which is connected to another PC.

EtherLink allows you to put your network to work right away, beginning with a network as small as two IBM Personal Computers. If you want information that belongs to another IBM PC user, the EtherLink software lets you copy a single file or an entire diskette from one PC to another. With EtherLink, you may also use another IBM PC's printer via the network. The EtherLink hardware and software manage all communications transparently, so no changes are needed to DOS, your applications programs, or your methods of using your computer.

Features

- Transparent access to remote diskettes for DOS and your application software



- Files or entire diskettes may be copied across the network
- Transparent use of printers on remote IBM PCs
- Easy user installation of EtherLink card and network wiring
- Ethernet compatible—conforms to the DEC-INTEL-XEROX specification

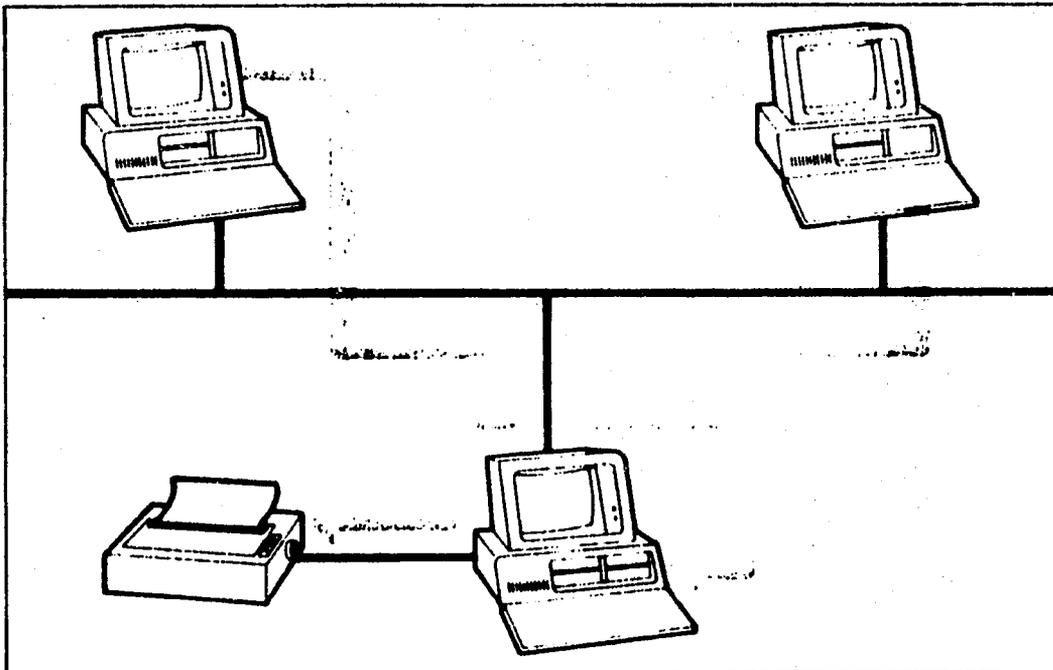
Specifications

Hardware: The EtherLink card is a single circuit board which plugs into one expansion slot in the IBM Personal Computer.

The circuitry manages the transmission and reception of data on the network and includes an on-board transceiver which connects directly to the Thin Ethernet coaxial cable. A standard Ethernet transceiver connector is also provided if you plan to use EtherLink with an existing Ethernet network.

Software: Upon command, the EtherLink software sets up a communications channel with another computer across the network. When this channel between PCs has been established, you can read or write any file on

that remote computer's diskette. Although it is physically located elsewhere, it is treated just like another diskette drive on your computer. You access it using the standard DOS commands or program I/O statements. You may copy files from the remote computer's diskette to your local diskette drive using the DOS "COPY" command, or you may copy an entire diskette using "DISKCOPY". If any errors occur during the remote diskette operations, an appropriate message is sent back, and DOS will display an explanation of the error for you.



Printing via EtherLink works in the same way. First, you use EtherLink commands to establish a channel between your computer and the printer on another IBM PC. Then you can print from your display using the "Print Screen" key, you can direct output from a program to the printer, or you can use DOS commands to copy a text file to the printer. You can do anything with an Etherlinked remote printer that you can do with a printer connected directly to your computer. It takes place without changes to your programs or changes to DOS.

The EtherLink software manages the communications over Ethernet for you. The computer whose diskette drive or printer you're using across the network must be running a server program which is supplied as part of the EtherLink software package. While this PC's diskette or printer is being used, it is dedicated to the task of "serving" other computers on the network and cannot be running other programs. The diskette and printer services are independent so they may be interacting with two different computers at the same time.

All EtherLink programs and commands have features which make using them easy. If you forget a parameter, you will be prompted to supply it. If you forget a command, you may ask for help and will be given a display screen menu which describes all the commands.

Ethernet Compatibility: The EtherLink card conforms to the Ethernet network specification. As such, it is compatible with other Ethernet equipment from 3Com as well as other vendors.

IBM PC Requirements: EtherLink requires you to have an IBM Personal

Computer with at least 64K bytes of memory, a diskette drive, DOS, and one available system expansion slot. EtherLink is compatible with IBM DOS applications only.

Installation

EtherLink is installed by the user and requires only a screwdriver. No tools are required to connect your IBM Personal Computer to the Thin Ethernet or a standard Ethernet coaxial cable. Cables are not included in the EtherLink package, and are available in standard lengths.

Documentation

EtherLink User's Guide: The EtherLink User's Guide is a 3-ring binder which provides information on how to install and use the EtherLink hardware and software. Step-by-step instructions detail the installation of the EtherLink card. A section on network configuration shows how to put the coaxial cables together to build an effective network. The guide explains the use of the EtherLink commands and programs, and includes a tutorial with examples. Additional examples are provided which show you how to use EtherLink with popular programs such as VisiCalc[®] and Easywriter[™].

EtherLink

Technical Specifications

EtherLink Card

Size	10.7 x 33.5 cm. 4.2 x 13.2 in. Requires one IBM PC expansion slot
Power Requirements	1.4 a. (a + 5 v. .1 a. (a + 12 v. (with internal transceiver) .5 a. (a + 12 v. (with external transceiver)
Temperature/ Humidity	0 to 55 degrees C., 10 to 90% humidity (non-condensing)
Network Connections	BNC connector for coaxial cable using on-board transceiver or Female 15-pin D-Series connector for Ethernet trans- ceiver cable

Ethernet Network

Data Rate	10 M bits/second
Packet Size	512-12144 bits
Maximum Length of Network	300 Meters (Thin Ethernet Cable), 500 Meters (Ethernet Cable), 1000 Meters (Ethernet Cable with 3Com transceivers), 2.5 KM between any two computers (using repeaters)
Maximum Number of Computers	100 per cable segment, and 1000 per network (using repeaters)
Access Method	Carrier Sense Multiple Access with Collision Detection (CSMA/CD)
Error Detection	32 bit cyclic redundancy check on each data packet

Ordering Information

Model Number Description

3C500 EtherLink/IBM PC.

Includes an Ethernet network interface card, the EtherLink software on DOS format diskette for accessing remote diskettes and printers, and the EtherLink User's Guide.

Cables of various lengths and network terminators must be purchased separately. See 3Com Ordering Guide for cable lengths and product numbers.

What is Thin Ethernet?

Thin Ethernet is a cabling method promoted by 3Com specifically to interconnect personal computers. The Thin Ethernet cables and connectors maintain the critical Ethernet specifications, but offer two major improvements: lower cost and easier installation. The Thin Ethernet cable is 2/10th of an inch in diameter, compared to 4/10 of an inch for the standard Ethernet cable. This makes it lighter and more pliable. The lighter weight, greater flexibility, and smaller size greatly simplify cable routing and installation. The push-on/twist-to-lock connectors attach directly to the EtherLink card and make couplings simple and secure. The only difference is the maximum allowable length of a cable segment. Each Thin Ethernet cable segment may be up to 300 meters in length, while a thick Ethernet cable segment may go as far as 500 meters.

EtherLink cards may be used with the thicker Ethernet cables or an existing Ethernet network with 3Com transceivers, transceiver cables, coaxial cables, and adapters.

EtherLink and 3Com are trademarks of 3Com Corporation.
VisiCalc is a registered trademark of VisiCorp.
EasyWriter is a trademark of Information Unlimited Software, Inc.

3Com Corporation
computer communication compatibility

1400 Shorebird Way
Mountain View, California 94043 USA
415/961-9602 Telex 315546

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Printed in USA



IBM PERSONAL COMPUTER FACT SHEET

System Unit

Size: Width - 20", Depth - 16", Height - 5.5"

Weight: Without diskette drive - 21 lbs.
With one drive - 25 lbs.
With two drives - 28 lbs.

Electrical: 120 V. AC

Cycle Time: Main storage - 410 nanoseconds
Access - 250 nanoseconds

Memory: 40K built-in read only memory (ROM)
16K to 256K user memory

Standard:

Keyboard for data and text entry
Cassette player jack for cassette attachment
Five expansion slots for additional memory and display, printer, communications and game adaptors
Built-in speaker for musical programming
Power-on automatic self-test of system components
BASIC language interpreter, 16K memory

Keyboard

Size: Width - 20", Depth - 8", Height - 2"

Weight: 6 lbs.

Keys: 83 full-function for data and text entry: includes
10 for numeric entry and cursor control and
10 special function for scrolling, editing, etc.
Easy access to 256 characters (ASCII and Special)

Keyboard: Adjustable typing angle
Detached from system unit and connected by six-foot cable for flexibility
All keys automatically repeat

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Matrix Printer

Size: Width - 16", Depth - 15", Height - 4"

Weight: 12.5 lbs.

Features:

- 80 characters-per-second printing
- Continuous feed, multi-part paper
- Self-diagnostic checks to assure proper operation
- 12 type styles to suit various printing needs
- Page spacing and column skip for word processing
- Bi-directional printing for increased speed
- 40, 66, 80 or 132 characters-per-line formats
- Out-of-paper alarm
- Replaceable ribbon cartridge and print head

Monochrome Display

Size: Width - 15", Depth - 14", Height - 11"

Weight: 17 lbs.

Display Functions:

- 25 lines of 80 characters on 11½" screen
- Underlining, high intensity blinking characters and reverse image for highlighting information
- Non-display for security data
- Upper and lower case display for word processing
- Brightness and contrast controls for reading comfort

Diskette Drive

Number of diskettes: Up to two 5¼" diskette drives

Storage capacity: 160 kilobytes per diskette

Other Options

Communications: Asynchronous communication line with data bases, other computers, laboratory instruments or other products using a standard RS-232C asynchronous adaptor

Games: Permits user-supplied joy sticks and paddles to be connected to the system

Note: All weights and measurements are approximate

SOFTWARE

System Software

BASIC Interpreter - Based on the popular Microsoft Basic and offered in three versions -- cassette, diskette and advanced.

The cassette level is included in the read-only memory of every system and provides input/output instructions needed to enter and retrieve data. It also supports use of the keyboard, display, light pen and printer and provides a full complement of editing and mathematical functions.

The diskette and advanced levels are optional. The diskette extension supports the use of diskettes, while adding date, time of day and communications capabilities to the system. The advanced extension enhances the display graphics to include features such as point, circle and get/put display, while increasing light pen and joy stick support for design work and home entertainment.

Disk Operating System (DOS) - DOS supports one or more diskette drives, allowing the user to write or read from the system's removable diskettes, display a directory and rename, erase, display or copy files.

Pascal Compiler - This language compiler allows separate compilations of program elements for maximum system performance. In addition, it supports several programming features for advanced programming work.

CP/M-86* and UCSD p-System* - IBM has contracted with Digital Research, Inc. and SofTech Microsystems, Inc. to make CP/M-86 and the UCSD p-System available for the IBM Personal Computer. We expect their availability will provide the opportunity for many current applications to be transferred to the IBM Personal Computer with minimal modifications.

Application Software

VisiCalc* is a problem-solving program package for financial or mathematical forecasting and computations. All data is arranged into a grid of up to 63 columns and 254 rows and interrelated so that users may create "what if" situations that will show the effect of one changed element on the remainder of the data. VisiCalc has vertical or horizontal scrolling, easy cursor movement and the ability to vary formats.

General Ledger keeps detailed records of financial transactions and generates a balance sheet and income statement, providing timely information on a company's financial status. It has "menu" instructions for its programs, password security, departmental income statements, and the ability to compare prior-year budgets.

Accounts Receivable is a complete invoicing and monthly statement generating package that tracks current and old accounts. A complete record is maintained for each customer and the current status of each customer account is instantly available. A complete set of "prompts" allows inexperienced operators to make full use of the system with minimal instruction.

Accounts Payable keeps track of current and old accounts, incorporating programs to maintain a complete record for each vendor and determines vouchers to pay by due date. It also will automatically print payment checks and maintain a check register.

EasyWriter* is a versatile, easy-to-use application that lets users process words and text quickly. EasyWriter functions are highlighted and prompted from menus listing all needed commands. Texts are maintained on diskette files which can be saved, retrieved, deleted, printed, revised, linked and appended. The simple text entry and text editor are combined with the flexibility of formatting to allow users with varied skill levels, from hobbyist to typist, to be productive quickly.

Microsoft Adventure provides the IBM Personal Computer with a role-playing fantasy game. The game setting is a vast network of caves beneath the earth and the land outside. The fantasy world contains 130 rooms or nodes, 15 treasures, 40 useful objects and 12 problems to solve. The program allows players to store the status of two games on a diskette. It will provide useful hints, instructions and feedback on a player's progress.

Communications software allows users to access external data like Dow Jones News/Retrieval* and THE SOURCE* for information and to communicate with other computers. To enhance this communication capability with larger systems, IBM also said it intends to provide a full subset of 3270 emulation capabilities.

#

* Trademarks:

VisiCalc - Personal Software, Inc.

EasyWriter - Information Unlimited Software, Inc.

Dow Jones News/Retrieval Service - Dow Jones and Company, Inc.

THE SOURCE - Source Telecomputing Corp.

CP/M-86 - Digital Research, Inc.

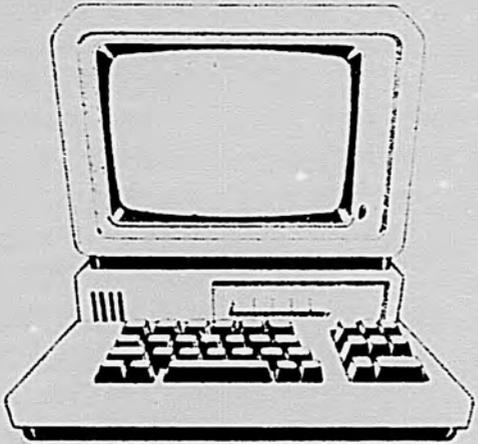
UCSD p-System - Regents of the University of California

Address Book 2
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IBM PERSONAL COMPUTER (AUGUST, 1981)

<u>Part No.</u>	<u>Description</u>	<u>Price</u>
IBM-A210D	System w/16K, no drive	\$1265.00
IBM-A211D	System w/48K, one drive	2235.00 ✓
IBM-B126U	16K Add-on memory	90.00 ✓
IBM-B129U	32K Add-on memory	325.00
IBM-B130U	64K Add-on memory	540.00 ✓
IBM-C155U	IBM Monitor/ Parallel Printer Adapter Interface	335.00
IBM-C156U	Color Monitor Adapter Interface	300.00
IBM-C157U	Parallel Printer Adapter Interface	150.00
IBM-C158U	Disk Drive Adapter Board	220.00
IBM-C159U	Serial Asynchronous Adapter Interface	150.00
IBM-C160U	Game Control Adapter Interface	55.00
IBM-E200D	Monochrome Display Green	345.00
IBM-E201D	Matrix Printer, 80 cps	755.00
IBM-F142U	Disk Drive w/o Adapter	570.00 ✓
IBM-H344U	Matrix Printer Stand	55.00
IBM-K1592	DOS and Basic Extension	40.00 ✓
IBM-K1593	Pascal Compiler	300.00 ✓
IBM-K1594	Asynchronous Communications Support	40.00
IBM-K1595	Visicalc	200.00 ✓
IBM-K1596	Easywriter	175.00
IBM-K1597	Adventure	30.00
IBM-K1598	General Ledger Peachtree	595.00
IBM-K1599	Accounts Receivable Peachtree	595.00
IBM-K1600	Accounts Payable Peachtree	595.00
IBM-R0097	Parallel Printer Cable	55.00
	RF Modulator	29.95

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There's a new type of computer system that's better suited to your needs and your budget.

This computer system is designed to take the processing power of personal computers and the access to shared resources that independent local networks systems can offer, and combine them in a single package.

Nestar's new type of personal computer systems is this package. We call it the Nestar Community Computer.

Community Computer systems are made up of a group of PCs sharing a central workstation. This workstation, in turn, is connected to an independent personal computer, disk storage, printers, etc., on a LAN mainframe.

This sharing gives you the advantages of distributed data processing with the advantages of personal computers. It's the best of both at the cost of higher processing power. It's the most efficient and flexible solution for your information transfer needs.

Community Computer is a distributed information handling system of the future. It's available today. From Nestar.

NESTAR

Local Systems, Incorporated
100 East Highway Road
Channahon, IL 61413
(312) 244-3333

Turn simple
personal
computers
into a
community
of shared
resources.

Introducing
Community
Microcomputing.
It unites
personal
computers to
form a
sophisticated
business system.

Nestar's PLAN for complete information handling.

To make the concept of Community Microcomputing work, Nestar has developed PLAN 4000™ our third-generation Personal Local Area Network. PLAN 4000 unites Apple II, Apple III, and IBM Personal Computers with other system elements to form a complete, flexible information system.

The system's baseband, token-passing protocol approach makes PLAN 4000 low cost and contention-free. The system follows the structure of the ISO seven-layer model and implements layers one and two of the ARCnet™ standards and layers three and four of the Ethernet™ standards. The result is ease of interconnections and adaptation of existing systems and software. Transmission rates of 2.5 megabits/second make PLAN 4000 fast enough for the 16 and 32 bit workstations of the future. And Nestar's extensive field-proven software makes it powerful and reliable. As many as 255 personal computers can be linked together in an arbitrary topology with distances over 4 miles between any two stations.

Complete communications.

Nestar's File Transfer Server, combined with the MESSENGER™ electronic mail program, allows community members to exchange files and messages between their workstations and other Nestar PLAN 4000 systems or remote workstations. A 3270 Emulator Server gives each workstation the best features of an IBM 3270. A 3780 Emulator Server gives you batch-mode access to the full power of an IBM mainframe. A Gateway Server permits real-time access to other Nestar networks. A Telex Server allowing access to Telex lines from each workstation is also available.

Many more communications servers are now being developed.

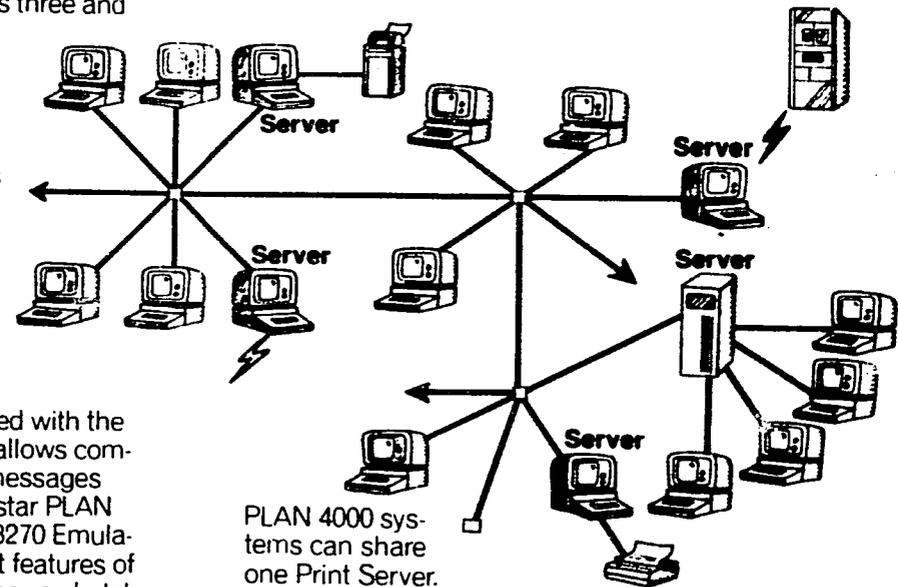
Complete file handling.

The File Server handles all access to shared mass storage and system backup. Each File Server can support up to 548 megabytes of formatted storage on 60 and 137 megabyte hard disks. By using multiple File Servers, storage capacity can be expanded virtually indefinitely. System backup is provided through 20 or

45 megabyte streaming tape drives. The File Server supports a wide variety of popular operating systems in the workstations, extensive file management utilities, and some of the most comprehensive security options in the business.

Complete printing facilities.

Spooled system printing can be distributed using multiple Print Servers. Each Print Server can support as many as six printers of almost any type. Several



PLAN 4000 systems can share one Print Server.

Files to be printed can be queued, and you can specify printing priority, document appearance, the number of copies to be printed, and much more.

How to plan for our PLAN.

Call or write us today. We'll send you complete specifications on our PLAN 4000 System.

NESTAR

The First Source for
Community Microcomputing.

SPECIFICATIONS SUMMARY

Basic System

Hardware
Winchester hard disk
5 or 10 Megabyte 5 1/4 inch
Nestar Apple Network Interface Card
4 Cables
Nestar Clock Calendar Card
1 A 64K Apple II is required as the master processor. A 5 1/4 floppy disk drive is recommended for system backup.

Software

File Server Program - Supports Apple II & Apple Basic
Including:
Passwords - 15 Characters (age appropriate)
Volume files and records, even on-line
Stored command sequences
Hierarchical file directories

Optional Features

Apple II @P.M.® Support
Apple II SOS Support
Print Server - Shared Printing
Messenger - Electronic Mail Program
File Transfer Server - Network Transfer
Gateway - Multiple Versions

System Configuration & Specification

Data Rate: 240K bits per second
Network length per segment: 1,000 ft (300m)
Total number of segments per Network: 4 (4,000 ft)
Maximum Distance between Stations without repeaters: 1,000 ft (300m)
Network medium: 16 wire pair of shielded twisted pairs
Number of Stations: Up to 65 per network segment
Network Topology: Unconstrained
Reliability Features: Redundancy checks on addresses and data. Packet retransmissions as necessary. Timeout to avoid lockups.

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2585 East Bayshore Road
Palo Alto, California 94303
Tel: (415) 493-2223
TELEX: 171420 NESTAR PL

1000

The
Personal

Local

Area

Network

With

Advantages

12/1

The PLAN 1000™ Personal Local Area Network has been developed especially for you, the small system user. It is easy-to-use

and offers you advantages over your stand-alone Apples® that you never thought possible. By means of simple plug-in cards and cables plus a hard disk and Nestar's field-proven system software, you now have a "system". You can share information, send electronic mail, print reports, transmit files over long distances, or communicate with an IBM mainframe. These options are available to you as you discover the potential of networking.

Local floppy disks create storage and security problems as well as having volume limitations and a higher cost-per-byte than hard disks.

PLAN 1000 Advantage:
You can share the use and cost of high-capacity hard disks and be assured that information is safely stored.

Personal computers are wonderful devices. But alone, they are just not complete enough to be an efficient use of resources.

PLAN 1000 Advantage:
Link your Apples together for full communications and resource sharing.

To be fully functional, each personal computer must be equipped with a storage unit, printer and software.

PLAN 1000 allows you to centralize these important functions, thereby lowering overall equipment costs.

Personal Computers have thousands of ready-to-use software packages that can adapt to many applications.

PLAN 1000 Advantage:
Users can share programs and the information generated by them rather than buying one program for each computer.

Stand-alone personal computers cannot communicate.

By linking your Apples together, an instant communications network is created allowing exchange of information and electronic messaging among users, locally or remote.

Good quality printers are expensive and impractical to connect to each personal computer.

PLAN 1000 Advantage:
By connecting all Apples onto one system, expensive printers can be cost justified since they are shared by all users.

The BIGGEST PLAN 1000 Advantage:
The PLAN 1000 is an inexpensive starter system which will familiarize you with networking. When you become comfortable with the concept, Nestar provides migration paths to higher performance, larger capacity systems. Your initial investment in hardware and software is not lost.



SYSTEM OVERVIEW



Nestar's PLAN 4000™ (Personal Local Area Network) system is a networking product that integrates both state-of-the-art hardware and field-proven software. It is the first system to answer the Community Microcomputing™ needs of the working environment by putting full functionality into the hands of users. The PLAN 4000 system is based on the concept of using personal computers to provide economical, accessible, dedicated computing power to a community of users. Each user has the power of his or her workstation, plus the availability of network mass storage, communication facilities and printers. By sharing resources, users share equally in the cost and use of the higher priced elements of a system.

Nestar's PLAN 4000 system emphasizes productivity — from top level management to the department level. It is a concept whose time has come.



NESTAR

PLAN 4000™



NETWORK TECHNOLOGY

The PLAN 4000™ system incorporates Nestar's field proven network software with a blend of popular, local area network technologies permitting a high speed transmission rate of 2.5 megabits per second. This token passing protocol conforms to the International Standards Organization's seven layers of network architecture.

Stations Supported

The PLAN 4000 system currently supports three of the most popular business oriented personal computers — the IBM PC, the Apple II and the Apple III. All three workstations can communicate with each other by various means including electronic mail. Each network segment will support up to 255 stations. These stations can be any mixture of server and user workstations. Even larger networks may be constructed by connecting network segments together using bridges or gateways.

Topology

The Nestar PLAN 4000 system supports an arbitrary topology without loops. Since the stations are assigned unique addresses, they may be connected in an arbitrary manner regardless of their physical location. There can be only one unique path between two stations. With this topology, a network can accommodate a great variety of situations including different floors in the same building or different buildings clustered together.

A LID™ is the device through which a group of workstations connect to the network. This connection is made via coaxial cable which runs between each workstation and its associated LID. The functions of the LID are to electrically isolate the workstation from the network and to minimize the amount of cable running between groups of workstations. In the simplest configuration, there is one LID and all stations connect directly to it.

The maximum cable distance permitted between any two stations is over 4 miles (22,000 feet). This connection would require 10 intervening LIDs. The maximum distance between a LID and a workstation or between any two LIDs is 2,000 feet.

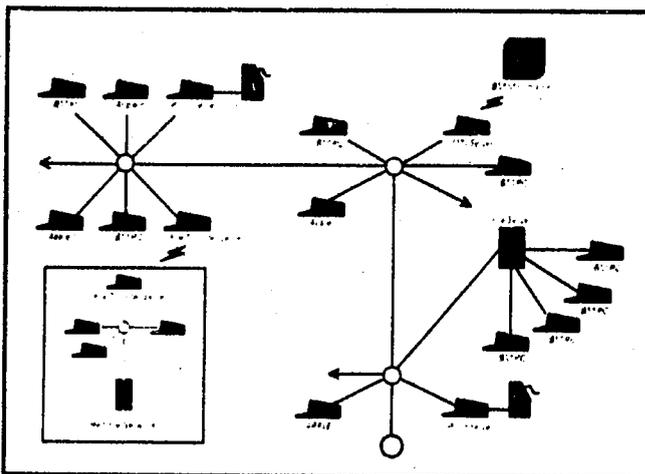
Workstation Connection to Network

Coaxial cable is used as the connection medium. Each station is connected to the network via a Network Interface Card that plugs into a slot in the workstation. The cabling, LIDs and the Network Interface Card comprise the logical and electrical interface between user workstations and the File Server. The Network Interface Cards transmit a baseband signal.

Access Scheme

Access to the network is controlled by a token passing protocol. Only a station in possession of the token can transmit. The token is passed from one station to the next higher address in a "logical" ring, regardless of its physical location. This results in a contention free network. A station must be in possession of the token before it can transmit.

Typical PLAN 4000 Network Configuration



SERVERS

Nestar believes in a "systems" approach to networking. Not only should the hardware be supplied, but so must the software that provides functionality to the system. In addition to the File Server, the PLAN 4000 system offers a Print Server, a File Transfer Server, a 3270 Emulator Server, a 3780 Emulator Server, a Gateway Server and a Telex Server.

File Server

This is a key component of the PLAN 4000 system. Its combination of software and hardware manages user access to shared mass storage and system back-up. Disk storage is available in 60 and 137 megabyte formatted capacity drives to a maximum of 548 megabytes (4 drives) per File Server. A high speed tape back-up unit with 20 or 45 megabyte streaming cartridge tape capacities is built into the File Server cabinet. The File Server software incorporates security features for protection of shared data and programs.

Print Server

The Print Server gives users the capability of "queueing" a request to print a file on a shared printer. By means of a simple menu, users can control format, number of copies, priority, specific printer or specific print server.

The File Transfer Server

FTS is an advanced communication sub-system which enables users of the network to exchange files, programs and messages with other Nestar networks or remote standalone stations having appropriate hardware and software.

3270 Emulator Server

By allowing each workstation to function as display stations, users can directly interface to IBM mainframes that support 3270 bisync protocols. Features emulated by the Nestar software include function keys, protected/unprotected fields, cursor select function and others. Screens may be written to a UCSD p-System text file or printed on a shared printer.

3780 Emulator Server

This Emulator Server gives PLAN 4000 users the capability of exchanging programs and/or data with mainframes and minicomputers that support the 3780 bisync protocols.

Gateway Server

The Gateway Server permits real-time access to other networks. Multiple networks, locally interconnected, can directly access each others' facilities.

TELEX Server

Used in conjunction with the MESSENGER™ Nestar's electronic mail program, this server allows users to conveniently communicate

messages to TELEX/TWX stations throughout the world from their personal workstations.

ELECTRONIC MAIL

The MESSENGER is an application program that allows a user to "send" messages electronically to other users on the network.

Electronic mail functions include answer, forward, file, display, print and send. Nestar server software has been integrated with the MESSENGER to produce a highly functional electronic mail system with remote communication capabilities.

OPERATING SYSTEM SUPPORT

The personal computers compatible with the PLAN 4000 system support popular operating systems. The IBM PC user has available PC DOS or UCSD P-system; the Apple II user may choose DOS, Apple Pascal System or CP/M; the Apple III user may run SOS. Users may change environments at will while working at a given station.

SERVICE

Like all Nestar products, the PLAN 4000 is backed by full field service. Support includes Nestar headquarters and regional support centers and third party organizations (dealers, OEMs and RCA Service Company). In addition, product support in Europe is handled by Zynar Ltd.

SYSTEMS SPECIFICATION SUMMARY

PERFORMANCE SPECIFICATIONS

Maximum number of stations: 255 per network segment

Transmission Rate: 2.5 Megabits per second transfer rate

Disk Capacity: up to 4 drives of 60 or 137 megabytes formatted capacity (548 megabytes maximum per file server)

Tape Capacity: 20 and 45 megabyte streaming cartridge tapes

Addressing: 8 bit Arcnet™ Station local address; 8 bit Arcnet Nestar System identifier; 48 bit Ethernet™ internet address

Access Protocol: Contention free token passing bus (Baseband)

Network Changes: Stations may be connected to or removed from an operating network at any time

Message Protocol: Multiple packets per message using Xerox Network Systems (NS) Internet Transport protocols

Packet Size: 2 - 512 bytes

Packet Protocol: Acknowledged error-free packets with flow control

Error Checking: 16 bit Cyclic Redundancy Check (CRC) on data and addresses

Error Recovery: Automatic retransmission on packet or message basis

Transmission Mode: Baseband serial transmission using transformer coupled RG-62 coaxial cable with BNC connectors

Cable is available in indoor or outdoor vinyl, polyethylene or teflon

Cable Topology: Arbitrary (without loops) using Line Isolation Devices (LID)

Cable Length: Maximum of 2,000 feet to nearest LID; 22,000 feet maximum between any two stations without gateways

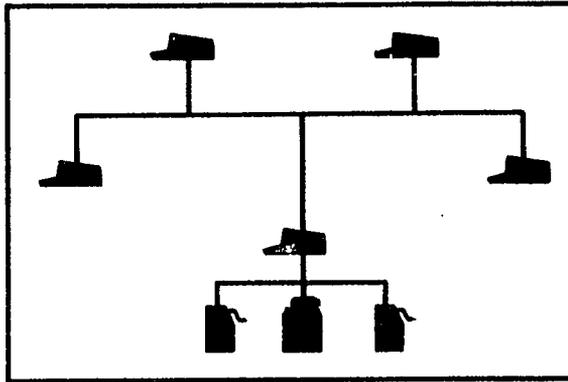
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PRINT SERVER



The Print Server is a sophisticated spooled printing subsystem which allows users of the Nestar PLAN 4000™ system to share printers. Up to 6 printers of varying types can be attached to one Print Server. In addition, the Print Server can connect to several networks, giving all users access to the same printers. Multiple Print Servers may be connected to a single network.

Individual workstations no longer need their own printers. Users can "queue" the request for a file to be printed by means of a simple menu. The menu also allows users to specify the number of copies, priority, the printer to be used, special paper and so on. The menu contains default values for these parameters, making the Print Server easy to use. Application programs can spool print files.

The Print Server processes and manages the print queue according to job priority and destination printer. From their stations, users can query the state of the print queue to find out when their printing is ready for collection.

The Print Server integrates with the MESSENGER™, Nestar's electronic mail program, to print messages. Because the Print Server creates a shared system resource, substantial cost efficiencies are introduced.

As with all Nestar software, the Print Server is integrated into a PLAN 4000 system, to create a total workstation environment for the community of users.

Features

- Each server can support up to 6 printers
- Serves one or several networks
- Network can support multiple print servers
- User specific priorities, number of copies, printer and printer setup parameters (paper, etc.)
- Requires password before it will print protected file
- Menu or application driven
- Integrates with MESSENGER Electronic Mail for hardcopy
- Integrates with FILE TRANSFER SERVER for internetwork communication

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PLAN 4000™

SPECIFICATIONS SUMMARY

Hardware Requirements

Server Station

- Apple II (64K memory) and Network Interface Card OR
- IBM PC (128K memory) and Network Interface Card

User Station

- Apple II (64K) with CPIM* or Apple Pascal System
- Apple II (32K) with DOS
- Apple III (128K)
- IBM PC (64K) with UCSD p-System*
- IBM PC (128K) with PC DOS

File Types Supported

- Apple II: DOS text, BASIC programs, Apple Pascal System text and CPIM text
- Apple III: SOS text
- IBM PC: UCSD p-System text and PC DOS text

Print Request Specifications

- Installation and user defined defaults for Print Request menu
- 4 priorities — high, standard, low and overnight
- Multiple copies may be requested (up to 999)
- Up to 8 files on the same volume may be requested at one time
- Jobs may optionally have a title printed on each page of output
- Number of lines per page or form feeds within the text itself may be specified
- Print server, printer, forms, typeface and ribbon may be specified in print request

Software Compatibility

- Integrates with MESSENGER™ for electronic mail hardcopy

Ordering Information

- Apple II host — order C-4820
- IBM Personal Computer host — order C-4821
- Optional features to print:
 - Apple II DOS files (#1201)
 - Apple II Pascal files (#1203)
 - Apple II CPIM files (#1204)
 - Apple III SOS files (#1301)
 - IBM PC DOS files (#2101)
 - IBM PC p-System files (#2103)



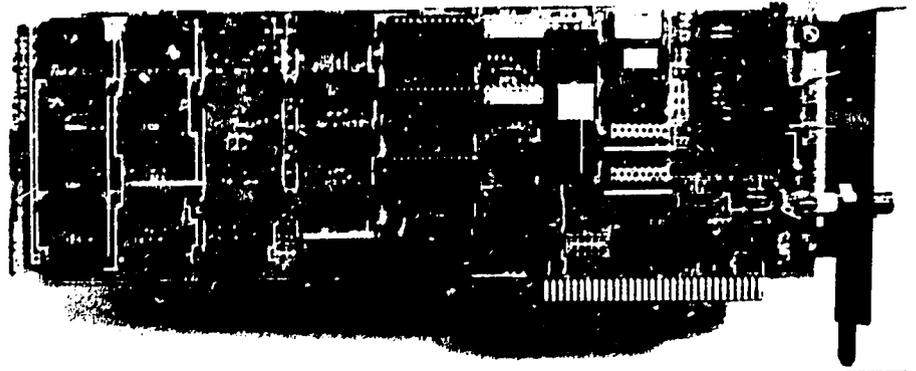
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IBM PERSONAL COMPUTER NETWORK INTERFACE CARD



A Nestar Network Interface Card connects the IBM PC to the PLAN 4000™ system. The card plugs into any peripheral slot of the workstation. Coaxial cable, the transmission medium of the network, is then plugged into the back of the IBM PC. The card contains devices that control the transmission of data on the network. It also contains memory for buffering of data. Because the network protocols are handled independently by the interface, data transfer is both fast and cost efficient.

Features

- ☐ Plug into any IBM PC slot
- ☐ Compatible with IBM expansion bus
- ☐ 2.5 Megabits network transmission speed using low cost coaxial cable
- ☐ Network protocol guarantees equitable access by all stations
- ☐ Internet compatible network protocols
- ☐ Packet level flow control prevents unnecessary network traffic
- ☐ Broadcast message facility
- ☐ Transformer coupled for ground isolation
- ☐ Does not affect network operation when powered off
- ☐ With multiple network interface cards, station can run on multiple networks
- ☐ 2 LED's indicate when board is operating and assists in service diagnostics
- ☐ Contains 2 Kbyte of RAM for buffers, 2 Kbytes of RAM for programming and 4 Kbytes of PROM
- ☐ Interrupt capability on packet transmission or reception
- ☐ Unique Ethernet address assigned to each card
- ☐ Data is moved from IBM PC to network buffer at 381K bytes/sec
- ☐ Asynchronous network data transfer allows overlapped processing and network access

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PLAN 4000™

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SPECIFICATIONS SUMMARY

PERFORMANCE SPECIFICATIONS

Maximum number of stations: 255
per network segment

Transmission Rate: 2.5 Megabits
per second transfer rate

Addressing: 8 bit station local
address; 48 bit Ethernet internet
address

Access Protocol: Contention free
token passing bus (Baseband
modulation)

Network Changes: Stations may
be connected to or removed from
an operating network at any time

Message Protocol: Multiple pack-
ets per message using transport
level Sequenced Packet Protocol
(ISO levels 1 to 4)

Packet Size: 2-512 bytes

Packet Protocol: Acknowledged
error-free packets with flow control

Error Checking: 16 bit Cyclic Redundancy Check (CRC) on data and addresses

Error Recovery: Automatic retransmission on packet or message basis

Transmission Mode: Baseband serial transmission using transformer coupled RG-62 coaxial cable with BNC connectors. Cable is available in indoor or outdoor vinyl, polyethylene or teflon*

Cable Topology: Arbitrary (without loops) using Line Isolation Devices (LID*)

Cable Length: Maximum of 2,000 feet to nearest LID; 22,000 feet maximum between any two stations without gateways

POWER

- +5.V DC, -5.V DC from IBM bus
- Typical power dissipation 700 milliamps at 5 volts, 8 milliamps at -5 volts
- Maximum power dissipation 1350 milliamps at 5 volts, 15 milliamps at -5 volts

MECHANICAL

- Size: 11.35"L X 4.9"W X .5"D
- Weight: 9.25 oz.
- Double-sided solder mask printed circuit board
- Standard 62-pin IBM bus connection with gold-plated fingers
- Network connection consists of one female BNC coax connector (RG-62)

ENVIRONMENTAL

- Operating Temperature: 50°F to 104°F (10°C to 40°C)
- Storage Temperature: -40°F to 140°F (-40°C to 60°C)

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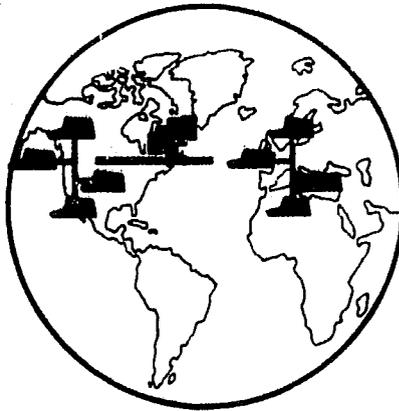
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FILE TRANSFER SERVER



The File Transfer Server (FTS) is a Communications Server which enables users of the Nestar PLAN 4000™ system to exchange files between installations. Remote stations can communicate with a network or with each other via a modem and the FTS software. When integrated with the MESSENGER™ electronic mail program, it gives users the capability of sending messages worldwide.

FTS runs unattended on an Apple II or Apple III which can be alternately used as a workstation. By means of a control file, the system manager can control times when connections will be made to other sites. FTS then automatically dials at the designated times or intervals, redialing as needed. FTS can also automatically answer incoming calls from remote locations. After the connection is made, FTS

may transfer and/or receive files. For adjacent networks FTS acts as a gateway (batch mode) for exchanging files between them.

As with all Nestar software, FTS is integrated into the PLAN 4000 system to create a total workstation environment for a community of users.

Features

- User stations can be mixture of Apple II, Apple III and IBM®PC computers
- Transfers files between local and remote networks and/or stand-alone stations
- Automatic connection between sites
- Supports variety of commercially available modems
- Automatic redial for busy or noisy telephone lines
- Server station is an Apple II or Apple III
- Operates transparently to the user
- Transfers files internationally
- Automatically resends corrupted blocks of data
- May be used with the MESSENGER to keep distribution lists and send internetwork mail
- May be used to create back-up of key files
- Logs all connections and transactions
- Transfers files at 300 or 1200 baud rate

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SPECIFICATIONS SUMMARY

Hardware Requirements

Server Station (network version C-4870)

- Apple II (64K) and Network Interface Card OR
- Apple III (128K) and Network Interface Card

Stand-Alone Station (C-4871)

- Apple II (64K) and 2 disk drives
- Apple III (128K) and 2 disk drives

Data may be transferred in the following forms:

Disk Volumes

- Apple II - DOS, Apple Pascal System or CP/M format
- Apple III - SOS format
- IBM PC - PC DOS or UCSD p-System format

Individual PASCAL files within virtual volume

Electronic mail

Spooled print server requests

Apple II Modems

D.C. Hayes Micromodem II™

300 baud (Bell 103 compatible)

Owl Ltd. Owlmodem™

1200 baud (Bell 202 compatible)

Novation Apple-CAT II™ modem

300 baud (Bell 103 compatible)
1200 baud (Bell 202 compatible)

CCS 7710 Asynchronous Serial Interface Card

Baud rate and protocols are dependent on external modem

Apple III Modems

D.C. Hayes Smartmodem™

300 baud (Bell 103 compatible)
1200 baud (Bell 212 compatible)

Regardless of their baud rate, modems can only communicate with each other if their Bell equivalence is the same.

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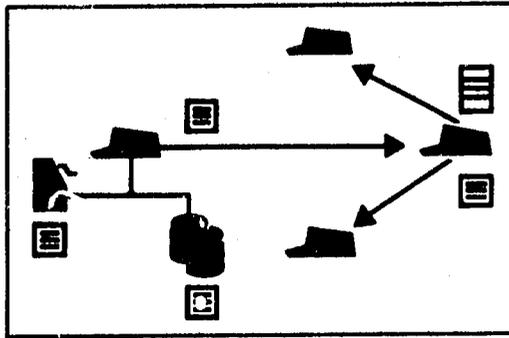
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THE MESSENGER



The MESSENGER™ is an electronic mail program which runs on Nestar's PLAN 4000™ system. It provides a cost-effective management aid for increasing office productivity. The MESSENGER replaces conventional memoranda, project documentation, management reports and telephone communication. It provides a quick, efficient alternative that can be more secure, more ordered, more reliable and cheaper to administer than the conventional channels.

The MESSENGER operates in conjunction with word processing, financial planning, decision support, data management and data processing packages to disseminate information effectively and promptly throughout the organization. The MESSENGER offers an easy-to-use, reliable method of communicating.

Users are provided with "in" and "out" menus for processing memos. Incoming mail arrives in a 'mailbox' and may be read at any time. Once read, messages can be answered, forwarded, printed (using the Print Server), filed, etc. Users can create and maintain their own file classifications, enabling electronic archiving of important memos. Upon sending a message, similar printing and filing options are available.

Used with the File Transfer Server (FTS), the MESSENGER can be used to communicate between Nestar networks thousands of miles apart. Distribution lists can be defined which correspond to departments or interest groups.

As with all Nestar software, the MESSENGER is integrated into the PLAN 4000 system to create a total workstation environment for the community of users.

Features

- IBM PC, Apple II and Apple III workstations can transmit messages to each other
- Mail may be forwarded, answered, filed and printed
- Upon sending mail, a user may request a return receipt from the destination station
- Groups of users may be defined as symbolic distribution lists
- Files created by Apple Pascal based word processing, financial planning, etc. may be incorporated within messages for distribution
- Mailbox may be password protected
- Mail may be written to Pascal text files

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PLAN 4000™

SPECIFICATIONS SUMMARY

Hardware Requirements

User Stations

- Apple II (64K) with Network Interface Card
- Apple III (128K) with Network Interface Card
- IBM PC (64K) with Network Interface Card

Software Requirements

System manager requires UCSD p-System to maintain associated files

Optional Software

The Print Server allows printing of messages

The File Transfer Server permits internetwork communication

Features Available

- Distribution lists (FTS is co-requisite)
- Password access controls
- User changeable password
- Date and time stamp on messages
- Registered delivery
- Scan of messages in mailbox
- Forwarding
- Filing by category
- On line help facility
- Pascal text files may be embedded in messages
- Messages may be written out to Pascal text files

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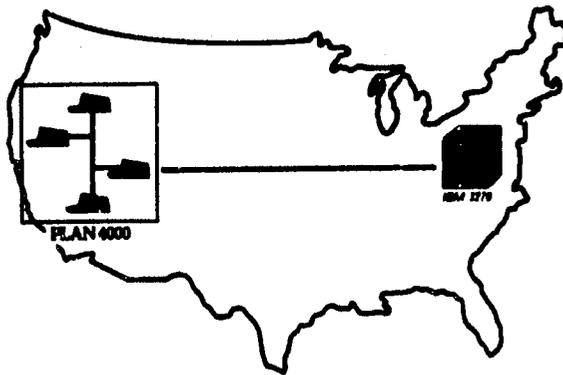
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IBM 3270 EMULATOR SERVER



The IBM 3270 Emulator Server allows personal computers on the Nestar PLAN 4000™ to act as IBM 3278 display stations (equivalent to standard IBM 3277). The server station interfaces with IBM mainframes that support the IBM 3270 bisync protocols. In addition, the server station communicates with the other workstations on the network. Workstations request connection to the mainframe and then operate as if they were IBM 3278 display stations. In the same manner, the mainframe communicates with the IBM 3278 display stations which are really IBM PC, Apple II or Apple III workstations.

Features emulated by the IBM 3270 Server software include a 24 row by 80 column screen, program function keys, program access keys and other special purpose keys. Screens may be written to a

UCSD p-System™ text file or printed on a shared printer. The personal computer workstation, in fact, performs just as an interactive IBM 3278 display station.

As with all Nestar software, the IBM 3270 Emulator Server is integrated into the PLAN 4000 system to create a total environment a community of users.

Features

- The Nestar 3270 Emulator allows one dedicated station on the network to emulate a remote IBM 3274 and up to 16 stations to simultaneously emulate IBM 3278's
- User stations can be a mixture of Apple II, Apple III and IBM PC computers
- Features emulated by the software include:
 - Upper/lower case display
 - 24 row by 80 column screen
 - Protected/unprotected fields
 - Program function keys 1-24
 - Program access keys 1-3
 - Clear key
 - Insert/delete keys
 - Cursor select function
 - Audible alarm
 - Numeric lock
- Screen may be written to a UCSD p-System text file or printed on a shared printer
- Bisync line discipline up to 9600 baud is supported via leased lines.

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PLAN 4000™

SPECIFICATIONS SUMMARY

Hardware Requirements

Server Station (C-4831)

- Apple II (64K)
- CCS 7712 High Speed Serial Interface Card
- Network Interface Card
- High speed modem connected to a remote line

User Station (C-4832)

- Apple II (64K) with Network Interface Card
- Apple III (128K) with Network Interface Card
- IBM PC (64K) with Network Interface Card

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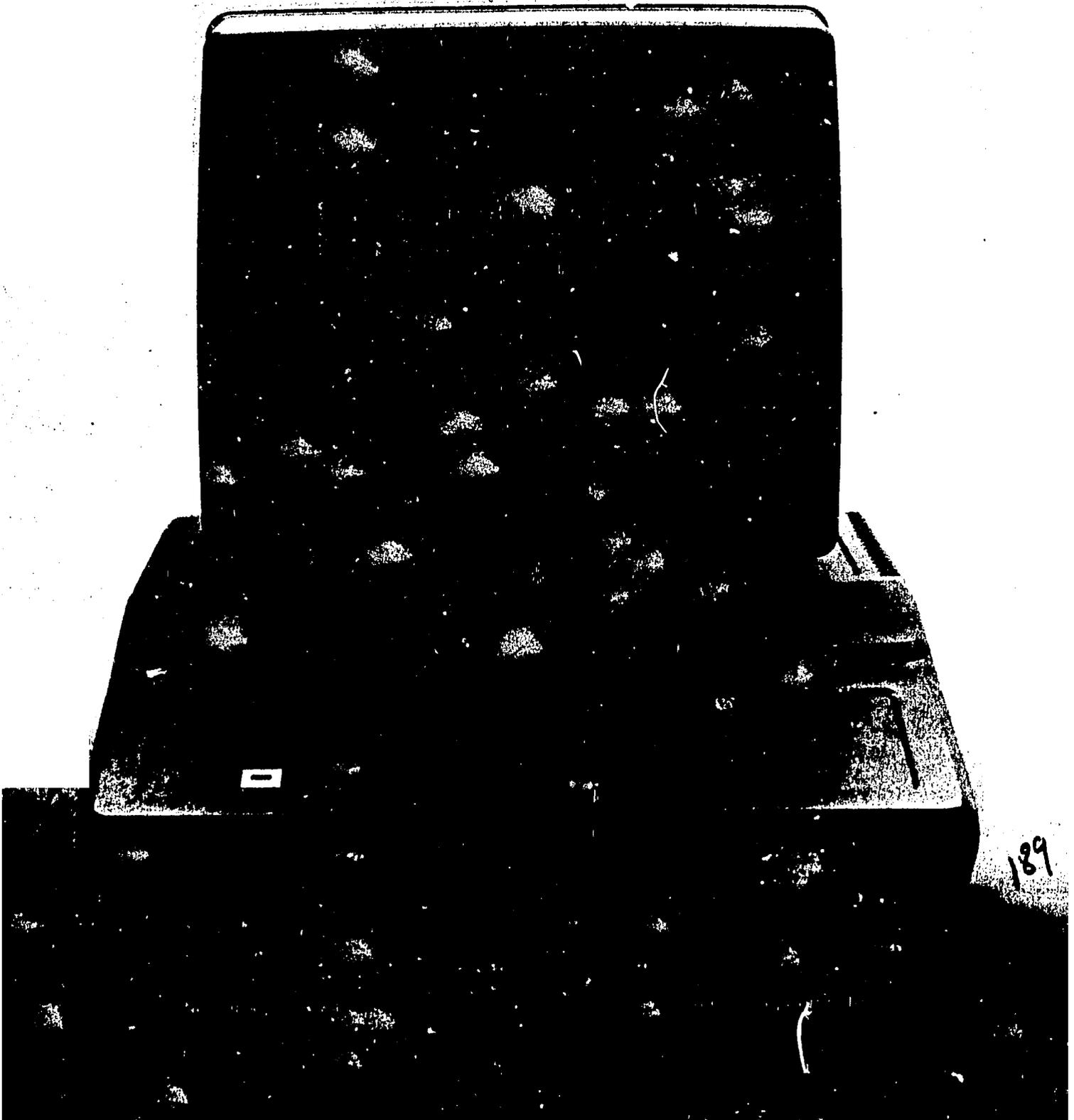
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USE THE NESTAR CLUSTER/ONE WITH VISICALC®



VISICALC EXPANSION FOR APPLE II

VC/80

Now you can get 80-column display for your VisiCalc Models! Just install an 80-column board, and boot the VC/80 diskette. Then boot VisiCalc. That's all there is to it! VC/80 even supports upper/lower case letter entry.

VC/80 works with most popular 80-column boards, including the M & R Sup'R'Terminal, ALS Smarterm, Videx Videoterm, and Vista Vision-80.

VC-EXPAND

This program expands the memory available to Visi-Corp's 16 sector VisiCalc on an Apple II, II Plus, or IIE with one or more Saturn boards. A standard 16K board may be used as well.

Your workspace memory under VC-Expand will depend on the boards present in your system as follows:

BOARDS PRESENT	APPROX. MEMORY
1 Saturn 32K	48K
1 Saturn 32K + one 16K	64K
1 Saturn 64K (or 2 Saturn 32K)	80K
1 Saturn 64K + 1 16K	96K
1 Saturn 64K + 1 Saturn 32K	112K
1 Saturn 128K	144K
1 Saturn 128K + one 16K	160K
1 Saturn 128K + Saturn 32K	176K

The VC-EXPAND software modifies VisiCalc in memory, without altering your VisiCalc diskette. VC-EXPAND will not noticeably slow down your VisiCalc calculations, although of course your Apple will need more time to recalculate the much larger spreadsheets you will be able to create with this system.

FAST SAVE/LOAD

Since the very large files possible with VC-EXPAND may take a long time to save and load in the usual format, VC-EXPAND now offers a fast save option. This feature saves files in binary format. Saving and loading takes less than a minute with this option. VC-EXPAND also includes the normal (text) save format so that you can still use other Visi programs on your models. If you use only VisiCalc, however, you can do all your file saving in the fast binary format.

MATRIX SIZE

VC-EXPAND modifies VisiCalc to let you use the entire displayed matrix, from A1 to BK254. (VisiCalc alone allows only about 9,000 cells.) This feature enables you to create far more extensive and powerful financial planning models.

MULTI-DISK FILES

Since the Apple diskette holds about 128K, you may need more than one diskette for your large models. VC-EXPAND takes care of this very simply for you: just switch diskettes when the screen prompts you.

VC-EXPAND/80

VC-EXPAND/80 combines all the features of VC-EXPAND and VC/80. It can be used in the 40 column mode without an 80 column board.

This program, with appropriate hardware, vastly expands your VisiCalc modeling capabilities. The display window becomes twice the normal size, and the

workspace can be almost 10 times its original size. See table under VC-EXPAND. Note that you may have 1K less than the table indicates, since VC-EXPAND/80 is larger than VC-EXPAND.

VC-EXPAND/80 is recommended for all VisiCalc users who have or are considering an 80 column board.

VC-EXPAND/80 FOR NESTAR CLUSTER/ONE

Hard disk support for the expanded VisiCalc is provided by this software. The program is installed on the hard disk and can be accessed by each station. The pathnames for VC-EXPAND/80 and for the virtual diskettes to be mounted are chosen when the program is installed. Files may be saved either on mounted volumes of the hard disk or on floppy diskette.

Only one copy of VC-EXPAND/80 FOR NESTAR is required for each network. Individual Apples connected to the network may have any combination of Saturn boards and/or 80 column boards; the program will use whatever hardware is available at each station.

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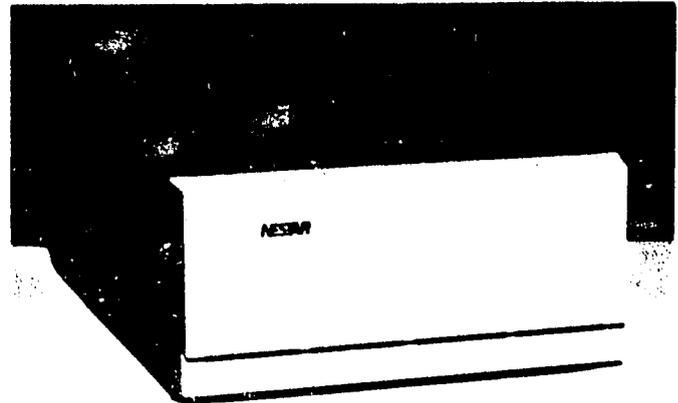
Saturn's VisiCalc expansion programs are well-supported software packages with constant attention being given to expanding business needs. As new features are added, upgrades are made available to current users at nominal cost.

The VisiCalc expansion software is written for Saturn by Micro Solutions, Inc.

Hard Disk Drive

Model A-2002 and A-2003

Cluster/One

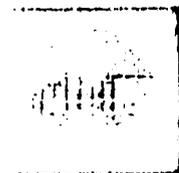


Description

Nestar offers two fixed media rigid disk drive units which allow users of the CLUSTER/ONE system to share low-cost, high-performance mass storage devices. These 14-inch Winchester technology drives provide a choice of 20 and 40 Megabytes of unformatted storage, with a significant cost-performance capacity ratio for rigid disk drives. Data integrity comparable to that found in large disk systems is assured by the use of Winchester-style heads and media. System reliability is maximized by the sealed contamination-free disk compartment and the reduction in parts count achieved by the use of a microprocessor. Hard disks are complete with cable and Apple interface card which plugs directly into the Network File Server. The Network File Server controls network access to disk storage.

Nestar Disk Features:

- 16.5 and 33 Megabytes formatted capacity storage
- Data integrity and system reliability rarely found in low-cost systems
- Data transfer rate improvement of 15:1 over double-density floppy disks
- Winchester technology heads and media provide state-of-the-art performance
- High-speed start/stop and landing zones maximize head/media life
- Single board microprocessor-based electronics provide flexibility and simplify maintenance
- Multiple hard disks can be connected together to run from one Network File Server



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Specifications Summary

Performance Specifications

Data Reliability

Mean Time Between Failures (MTBF)—8,000 hours for the basic drive.

Mean Time Between Failures (MTBF)—25,000 hours for sealed mechanism.

Recoverable Read Error Rate—less than one error in 10^{10} bits read.

Non-recoverable Error Rate—less than one error in 10^{10} bits read.

Positioning Error Rate—less than one error in 10^9 seek executions.

Data Handling

	A-2002	A-2003
Bytes per track:	24K	24K
Tracks per cylinder:	4	8
Cylinders per drive:	210	210
Bytes per drive:	20.16M	40.32M
Single track positioning time:	20 milliseconds	
Average positioning time:	60 milliseconds	
Maximum positioning time:	130 milliseconds	
Rotational Speed (Nominal):	2400 RPM	
Average latency:	12.5 milliseconds	
Recording density:	7545 BPI	
Track density:	182 tracks per inch	
I/O Transfer rate:	960 Kilobytes per second	
Recording code:	MFM, NRZ Serial	
Start time (Nominal):	3 minutes	

Physical Specifications

Power

100-115VAC, 60 Hz, 425W maximum with circuit breaker protection.

Other voltages available.

Environmental

Operating temperature: 50°F to 104°F (10°C to 40°C) with a maximum gradient of 18°F (10°C) per hour.

Storage temperature: -40°F to 140°F (-40°C to 60°C).

Humidity: Operational at 10% to 90% relative humidity, non-condensing.

Altitude: -1000 to 10,000 feet (-300 to 3000 meters)

Vibration: Peak displacement of $\pm 0.006"$ (.015cm) for frequency range of 20 to 40 Hz and $\pm 1g$ for 40 to 200 Hz range.

When packed for shipment, will withstand $\pm 1.5g$ from 5 to 500 Hz for one hr. along each of three mutually perpendicular axes, with a 20 minute sweep time.

Shock: Performs all read/write operations (no seek) while subjected to shocks of 3g ($\pm 10\%$) consisting of three shocks along each direction of three mutually perpendicular axes.

Mechanical

Color: Light gray

Dimensions: 19"W x 9"H x 29"D (48.3cm x 23cm x 74cm)

Weight: 110 lbs. (50kg) All steel cabinet.

Approvals

UL listed and CSA approved

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Network Interface Card

Model A-2701, A-2702, A-2703, A-2704, A-2701

CLUSTERONE



Description

The CLUSTERONE Network Interface Card connects an Apple II or Apple III computer to the Nistar network. There are two types of interface cards used for connection to the network—an interface card for use with the Network File Server and an interface card for all other server and user stations on the network. The cards plug into Apple peripheral slots one to seven and are totally compatible with local minidisks and peripherals which obey standard Apple conventions. The cards contain 1 kilobyte of RAM and 2 kilobytes of ROM for network interface routines. The Apple III interface card includes drivers for use with the Apple III Sophisticated Operating System (SOS).

Key Features:

- Apple II and Apple III compatible
- Obeys standard conventions for sharing the C800 address space
- Does not affect network operations when powered off
- Contains 1 Kbyte of RAM and 2 Kbytes of ROM
- Plugs into any Apple III peripheral slot or Apple II slot 1-7
- Hardware comparator recognizes network message addresses
- Network address is set by a switch on the card
- Simulates an Apple disk controller
- Compatible with local Apple peripherals obeying standard Apple conventions
- One card required for each Apple II or III station on the network
- Contains two network connectors for convenience in daisy-chaining

NESTAR 193

Specifications Summary

Performance Specifications

- Addressing: 8-bit station address, unique per network segment*
- Access Protocol: Carrier sense, multiple access (CSMA/CD)*
- Collision Detection: At beginning of each transmission*
- Message Protocol: Multiple packets per message*
- Packet Size: 258 bytes*
- Packet Protocol: Acknowledged error-free packets*
- Error-Checking: 16-bit checksum on data and addresses*
- Error Recovery: Automatic retransmission*
- Interrupts: Software activated 10 Hz. clock; interrupt on network address recognition*
- Transmission Mode: 8-bit parallel transmission*
- Transmission Rate: 250,000 bits per second equivalent transfer rate*

Physical Specifications

Power

- +5.V DC from Apple bus*
- Standby power dissipation 250 milliamps at 5 volts*
- Maximum power dissipation 390 milliamps at 5 volts*
- Power switching logic to reduce power consumption*

Environmental

- Operating Temperature: 50°F to 104°F (10°C to 40°C)*
- Storage Temperature: -40°F to 140°F (-40°C to 60°C)*

Mechanical

- Size: 7.3"L x 3"W x .5"D (18.5cm x 7.9cm x 1.25cm)*
- Weight: 4.5 oz. (126g)*
- Double-sided solder mask printed circuit board*
- Standard 50-pin Apple bus connection with gold-plated fingers*
- Network connection consisting of two 16-pin headers with two rows of 8 pins each on .1" centers*

Systems Specifications Summary

- Data Rate: 250K bits per second*
- Network Length per Segment: 1,000 ft. (300m)*
- Total Number of Segments per Network: 4 (4,000 ft.)*
- Maximum Distance between Stations (without repeaters): 1,000 ft. (300m)*
- Network Medium: 16-Wire Flat or Shielded Twisted Pairs*
- Number of Stations: Up to 65 per network segment*
- Network Topology: Unconstrained*
- Reliability Features: Redundancy checks on all addresses and data; packet retransmissions as necessary; timeouts to avoid lockups.*

Due to our continuing program of product development, specifications are subject to change without notice.

Headquarters: NESTAR SYSTEMS, INC.
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CABLING AND CONNECTORS

Cluster/One



Description

Cable is used to connect each station on network to a common bus. Nestar makes available a variety of fully-assembled standard and custom cables for users of the CLUSTER/ONE system. In addition to a selection of cable types, Nestar also provides various connectors which can be used to tailor a network to meet the special requirements of an individual user's environment. The cabling and connectors, in combination with the Network Interface Card, comprise the electrical and logical

interface between the Apple II and Apple III stations and the interstation network communication bus. In the CLUSTER/ONE system, all stations connect in parallel to a common bus. However, the network architecture provides for arbitrary topological configurations (star, bus, tree, ring). Nestar has tested the system extensively in a large variety of configurations, using at least 1,000 feet of cabling per network segment.

Types of Cabling - Standard and Custom

Description

Recommended Usage

16-wire flat cable

For standard applications

Jacketed 16-wire flat cable

For pulling through trays, or to prevent damage from being stepped on, bent, etc.

16-wire flat cable with ground plane

For better signal propagation in high-noise environments

15-wire twisted pairs with drain and shield

For environments requiring round cable or low radiation



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NESAR

Specifications Summary

Cabling

Technical Specifications

	16-Wire Flat	Jacketed 16-Wire Flat	16-Wire Flat with Ground Plane	15-Wire Round Twisted Pair
UL Style Number	2651	2912	2682	2464
Color	Grey	Black	Grey	Grey or Black
Temperature Range	-4°F to 221°F (-200°C to 105°C)			-4°F to 176°F (-20°C to 80°C)
Cable Size	0.8in. (2cm)	0.8in. (2cm)	0.8in. (2cm)	.33in. (9cm) diam.
Conductor Size	AWG #28	AWG #28	AWG #28	AWG #24
Conductor Spacing	.05in. (1.27mm)	.05in. (1.27mm)	.05in. (1.27mm)	N/A
Resistance in Ohms/1000 ft. (Ohms/KM)	65(213)	65(213)	65(213)	23.3(76.4)
Capacitance in p/ft. (p/m.)	12.6(41.3)	13.5(44.3)	25(82.0)	30(97)

(Metric measurements are indicated in parentheses)

Connectors

Technical Specifications

	*DA-15 Male	*DA-15 Female	IDC with 16 pins Male	IDC with 16 pins Female
Temperature Range	-67°F to 221°F (-55°C to 105°C)			
Size	1.6"L x .5"W x .4"D (4cm x 1.3cm x 1cm)		1.2"L x .6"W x .4"D (3cm x 1.5cm x 1cm)	1"L x .4"W x .2"D (2.5cm x 1cm x .5cm)
Insertion Force	11.2 lbs. max. (5.1Kg)		12.3 lbs. max. (5.6Kg)	
Withdrawal Force	.7 lbs. min. (.32Kg)		1.3 lbs. min. (.6Kg)	

*DA-15 connectors for round cables delivered with black casing—1.1"L x 1.8"W x .6"D (2.75cm x 4.5cm x 1.5cm)

Due to our continuing program of product development, specifications are subject to change without notice.

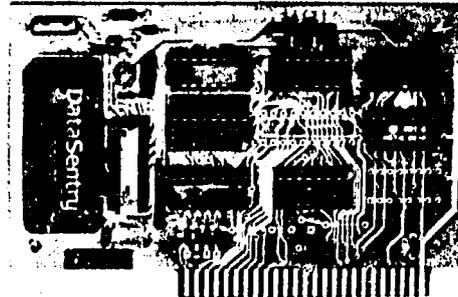
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Clock/Calendar Card

Model A-2101

Cluster/One



Description

Nestar's real-time clock/calendar card is an optional yet integrated feature of the CLUSTER/ONE system. This option gives the Network File Server the ability to maintain the current date and time for all system users, and will supply that information to all stations operating on the network. In addition, files maintained by the Network File Server are timestamped at the time of creation, when read, and when modified. An off-line utility program which runs in the Network File Server is used to set the current date and time in the clock/calendar card for the network.

The clock/calendar card hardware is an Apple peripheral card designed and manufactured by Nestar. It maintains year, month, day, and time of day to the second even when power is removed.

Key Features:

- Supplies year, month, day-of-month, day-of-week, hour, minute, and second in 24-hour clock notation
- Resolution to one second
- Accuracy is crystal-controlled to better than $\pm 0.005\%$
- On-card rechargeable Ni-Cad battery which maintains time and date for at least four weeks without external power
- Write-enable and battery-enable jumpers
- Code within the Network File Server time-and date-stamps new files, newly-modified files and files as they are accessed each day

1987
NESTAR

Specifications Summary

Technical Specifications

Power

+5V. DC from Apple bus

Active power dissipation less than 250 milliwatts

Standby power dissipation less than 0.18 milliwatts

Environmental

Operating Temperature: 50°F to 104°F (10°C to 40°C)

Storage Temperature: -4°F to 122°F (-20°C to 50°C)

Mechanical

Size: 4.6"H x 2.75"W x .75"D (11.7cm x 7.0cm x 1.9cm)

Weight: 3 oz. (85 g)

Double-sided solder mask printed circuit board with gold-plated fingers.

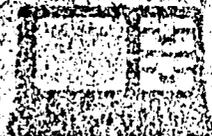
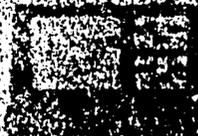
Due to our continuing program of product development, specifications are subject to change without notice.

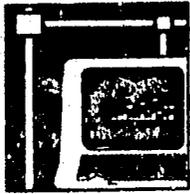
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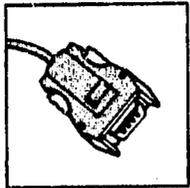
NorthStar™

NorthNet™
Planning Guide

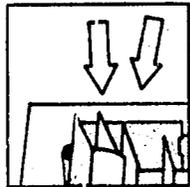




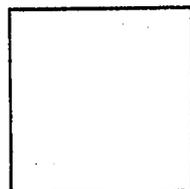
NorthNet: North Star's Local Area Network 2



How NorthNet Works 4



What Advantages Does NorthNet Offer? 8



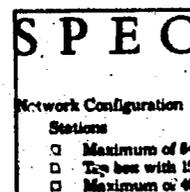
Planning Guidelines 14



Example 1: Lincoln & Dawson 16



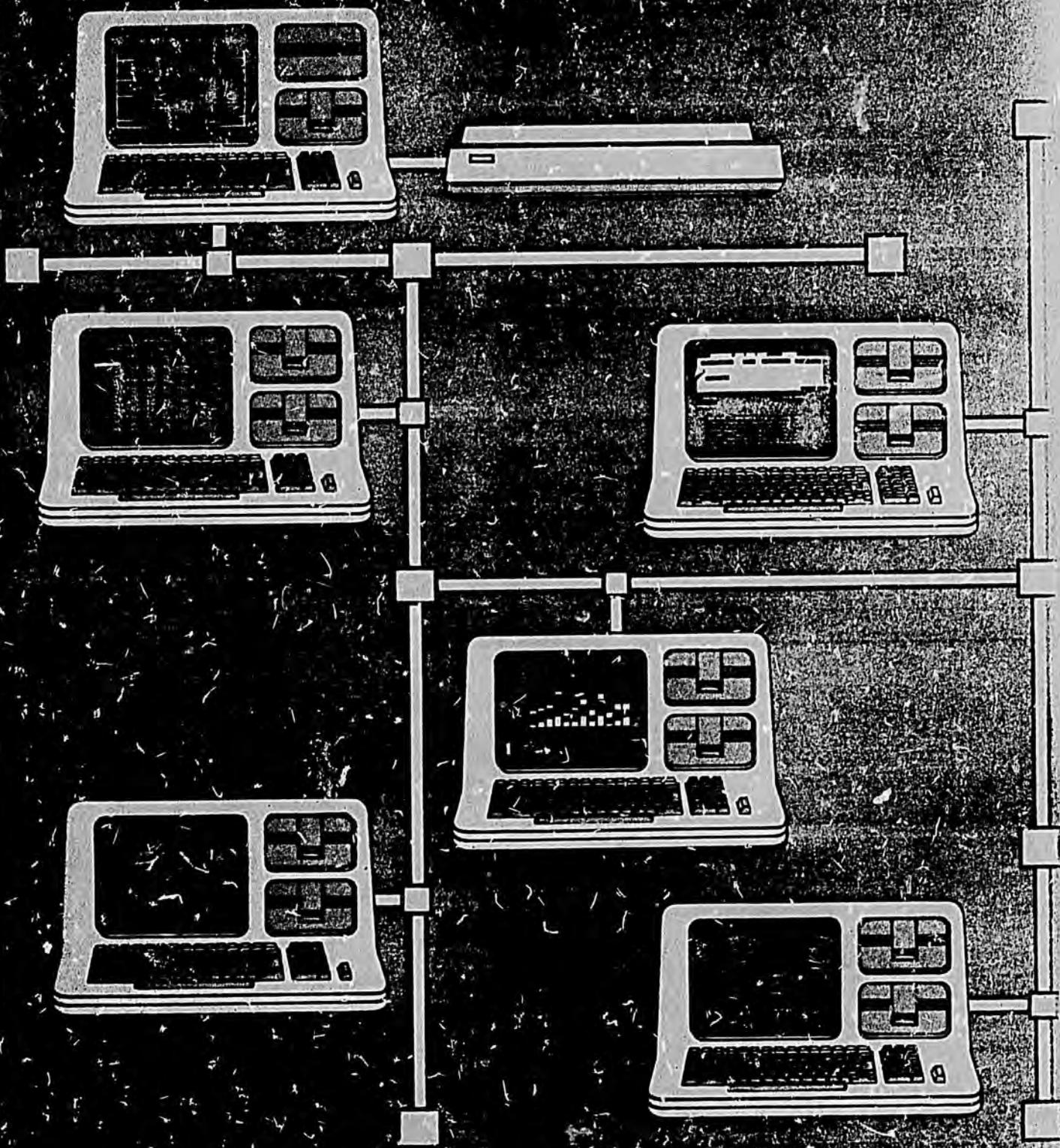
Example 2: Urban Design Associates 20



NorthNet Specifications 22

- Network Configuration
Sections
- Maximum of 64
 - Top bus with 12
 - Maximum of 4

NorthN



North Star's Local Area Network

Computer networks are not new. But until recently, they were reserved for businesses that used large mainframe computers.

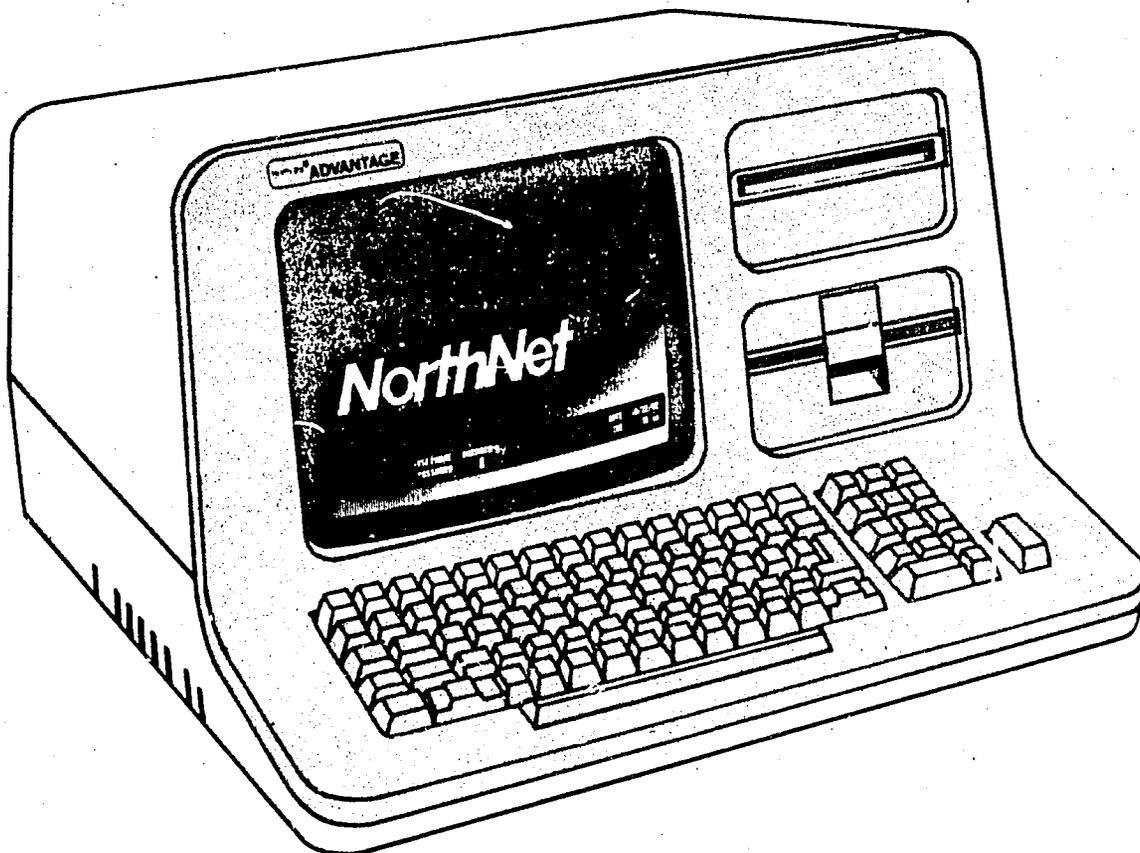
Now, North Star has responded to the small business computer owner who needs a reliable, low cost system for electronic communications, and information and resource sharing.

The solution is NorthNet—a Local Area Network that consists of a simple cable linking North Star ADVANTAGEs, printers, and hard disk drives.

This easily installed network allows everyone on the system to use any Graphics CP/M® program, including WordStar™, MicroPlan™, dBase II™, and the powerful North Star Graphics package. Network members working on North Star ADVANTAGE 8/16's with the Graphics MS-DOS™ operating system can use languages such as BASIC-16, COBOL-16, Pascal-16, and FORTRAN-16. Soon, NorthNet will also support North Star Application Software Programs, including the complete ACCPAC™ and PROPAC™ lines as well as NorthWord II™ and InfoManager II™.



How NorthNet Works



Work Stations

Most of the North Star ADVANTAGES on the network become work stations. A work station is comparable to a stand-alone North Star ADVANTAGE, except it has access to shared network resources, like printers and hard disks. Each work station can communicate with all the other stations on the network.

Server Stations

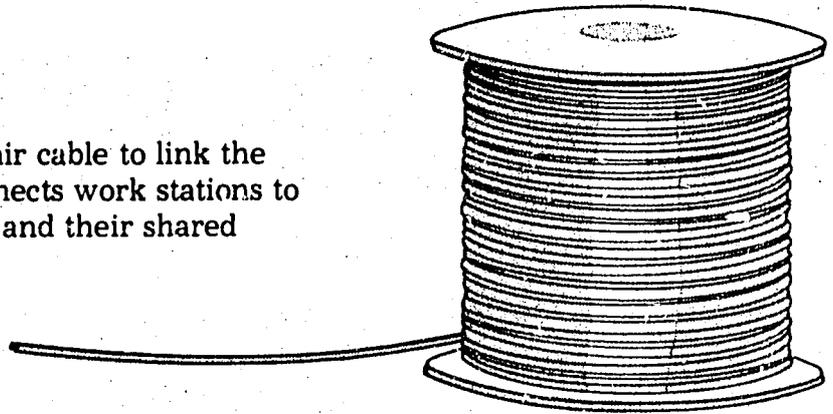
At least one hard disk North Star ADVANTAGE on a network becomes a server station. The server station manages the network's shared resources while continuing to function as a work station.

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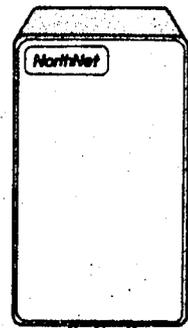
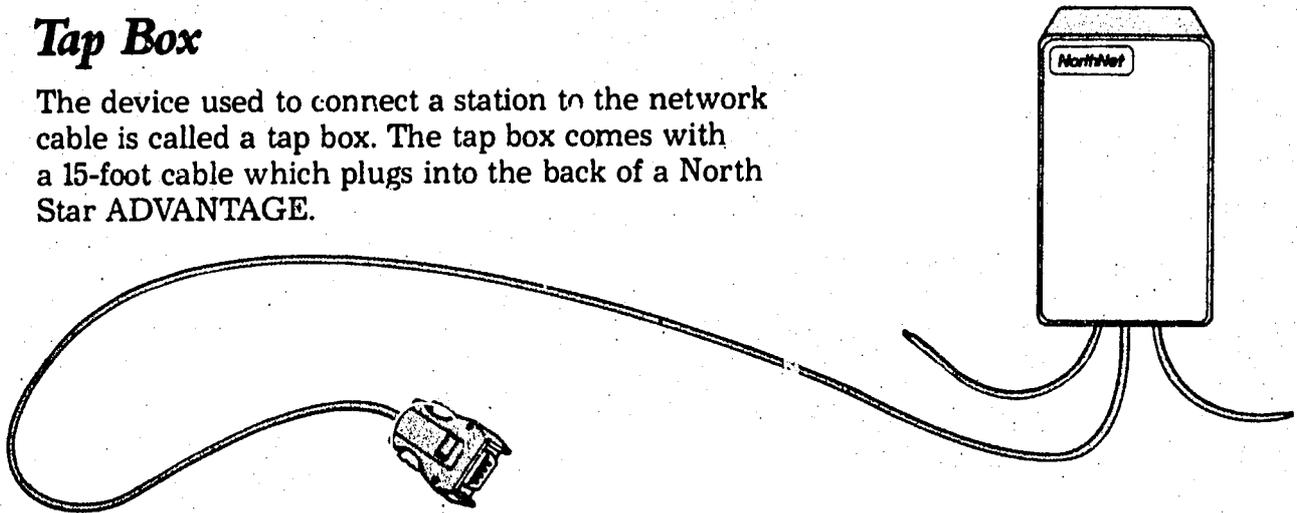
Twisted Pair Cable

NorthNet uses a single twisted pair cable to link the network together. This cable connects work stations to each other and to server stations and their shared resources.



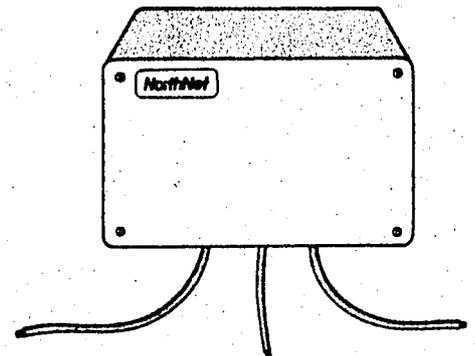
Tap Box

The device used to connect a station to the network cable is called a tap box. The tap box comes with a 15-foot cable which plugs into the back of a North Star ADVANTAGE.



Repeater

Larger NorthNet installations also use an electrical device called a repeater which refreshes the signals that are being sent along the cable. Repeaters give you maximum flexibility in network layout by allowing branches of connected cable to link stations.





Sharing Resources

NorthNet resources such as printers and hard disks are either shared or local. A shared resource is connected to a server station and can be used by anyone on the network. A local resource is connected to a work station and can be used only at that work station.

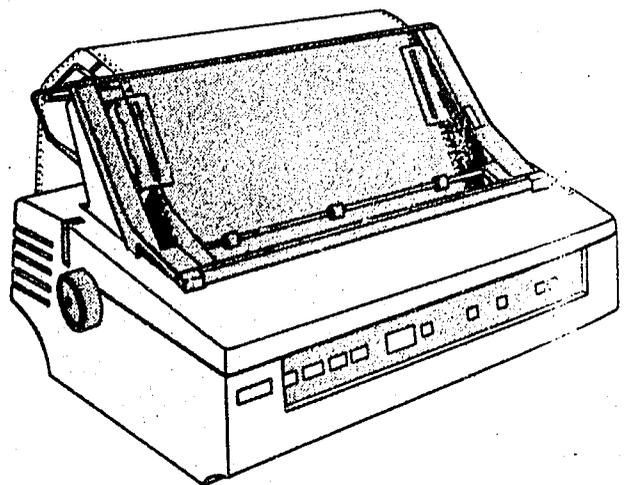
Hard Disks

Every server station has a shared hard disk. Programs or data files that are used by more than one member of the network are stored on these shared hard disks.

To access a shared file, you request the file from the server station where it's stored. Names and passwords limit access to any confidential files.

When requesting a file, you indicate whether you intend to read from the file or write to it. If you just want to read a file, you can request it as read only. This allows several people to read the same file simultaneously. If you also intend to write to a file, you can select the read/write option. This option protects the file so that no one else can use it until you're through.

NorthNet also allows you to choose the record locking option for writing to a file if the program you're using takes advantage of this feature. Record locking protects only that portion of the file you're working on, so several people can write to the same file simultaneously.



Printers

To make a printer a shared resource, you connect it to a server station. Then to use that printer, give the print command from any work station. An image of what you want printed is sent to the hard disk in the appropriate server. Each server maintains a list of all requests for the printers it manages. As a printer completes one job, the server automatically starts sending it the next one.

Electronic Mail

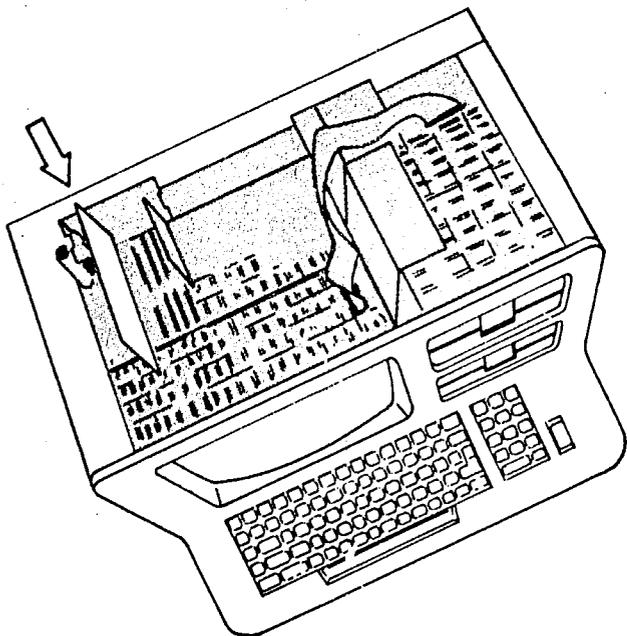
The built-in electronic mail program lets you send messages or files to anyone else on NorthNet. You just select the mail option, type the message or a file name, and send it. The next time the receiver signs on to the network or returns to the Network Executive program, a MAIL WAITING message appears at the bottom of the screen.

If mail is waiting for you, you can request a listing on your screen showing who sent each item. Then you can display any message you want to see. You can send messages you select to the printer for a copy. You can delete messages you no longer need and keep others for future reference.



What Advantages Does NorthNet

Low Cost



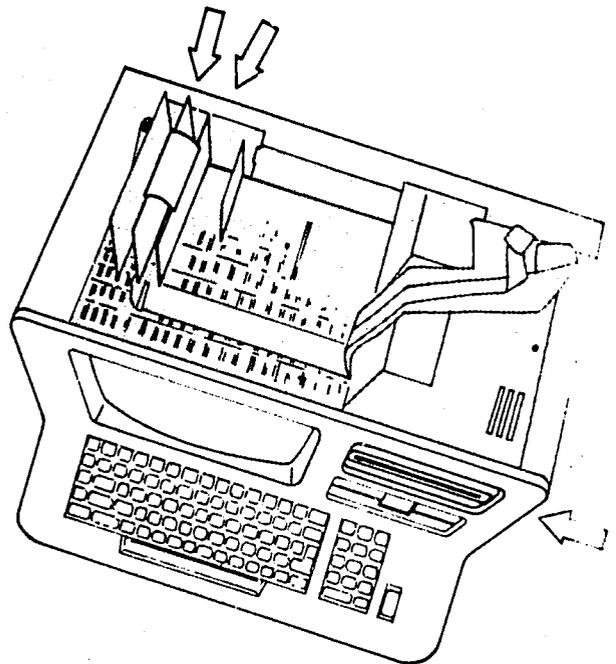
North Star ADVANTAGE work stations are available without any disk drives. So a work station can cost even less than a stand-alone North Star ADVANTAGE.

Since NorthNet supports CP/M programs, the only new software expense for CP/M applications is for the network software. This package includes the NorthNet operating system and Electronic Mail.

All that's required to convert a stand-alone North Star ADVANTAGE to a work station is the addition of a single circuit board.*

A second circuit board converts a work station with a hard disk to a server station.†

Since server stations continue to function as work stations, the cost per user for a server station is much lower than on most other networks which require dedicated servers.



- * Hard disk units built before December, 1982 require additional modification.
- † North Star ADVANTAGE 8/16's can only be used as work stations.

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Offer?

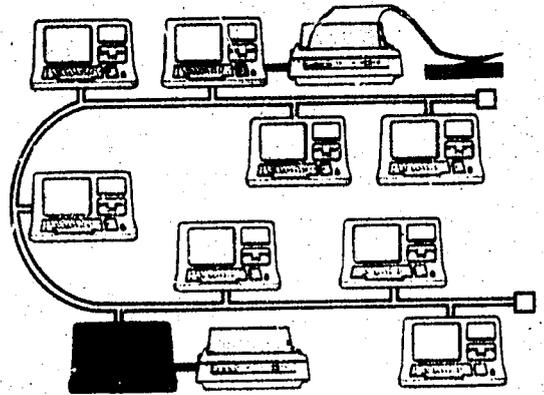
Reliability

NorthNet is based on the North Star ADVANTAGE... a microcomputer with a proven performance record.

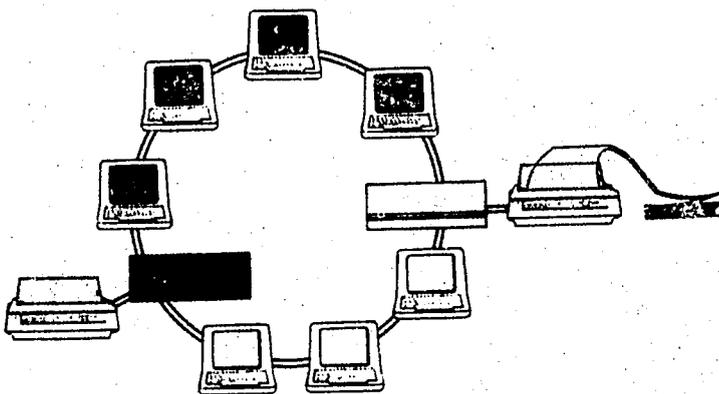
NorthNet is not a ring network, where a single station failure interrupts the entire message flow. NorthNet's multidirectional flow and independent station connections prevent a single work station failure from disrupting the entire network.

And unlike a star network, NorthNet doesn't depend on a single computer at its center to control the system. So you can't have a central computer failure disabling your entire network.

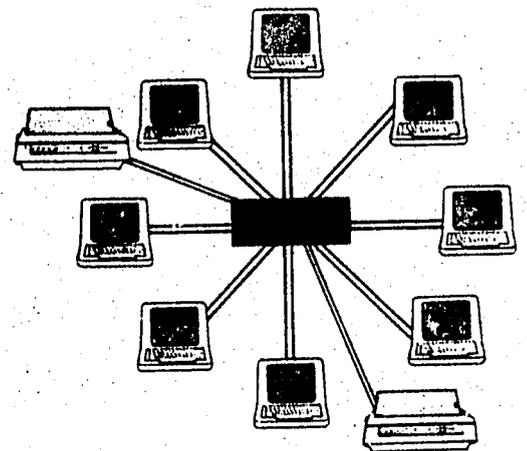
You can verify complete network and individual station integrity by using the NorthNet diagnostic programs. These specially designed tests help to quickly locate, diagnose, and correct a problem in any component of the system.



NorthNet with a server station failure.



A ring network with a server station failure.



A star network with a central computer failure.

The reliable North Star ADVANTAGE combined with the superior architecture and diagnostics of NorthNet give you a network that's easily maintained and highly productive.

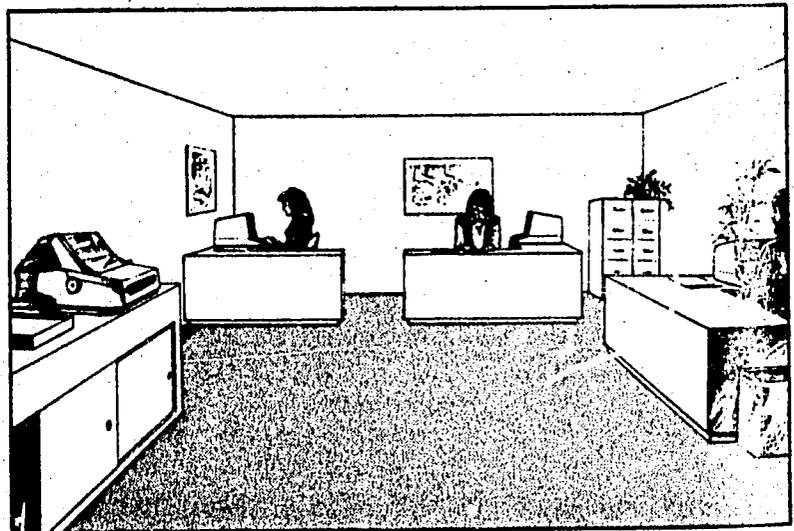
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Convenience

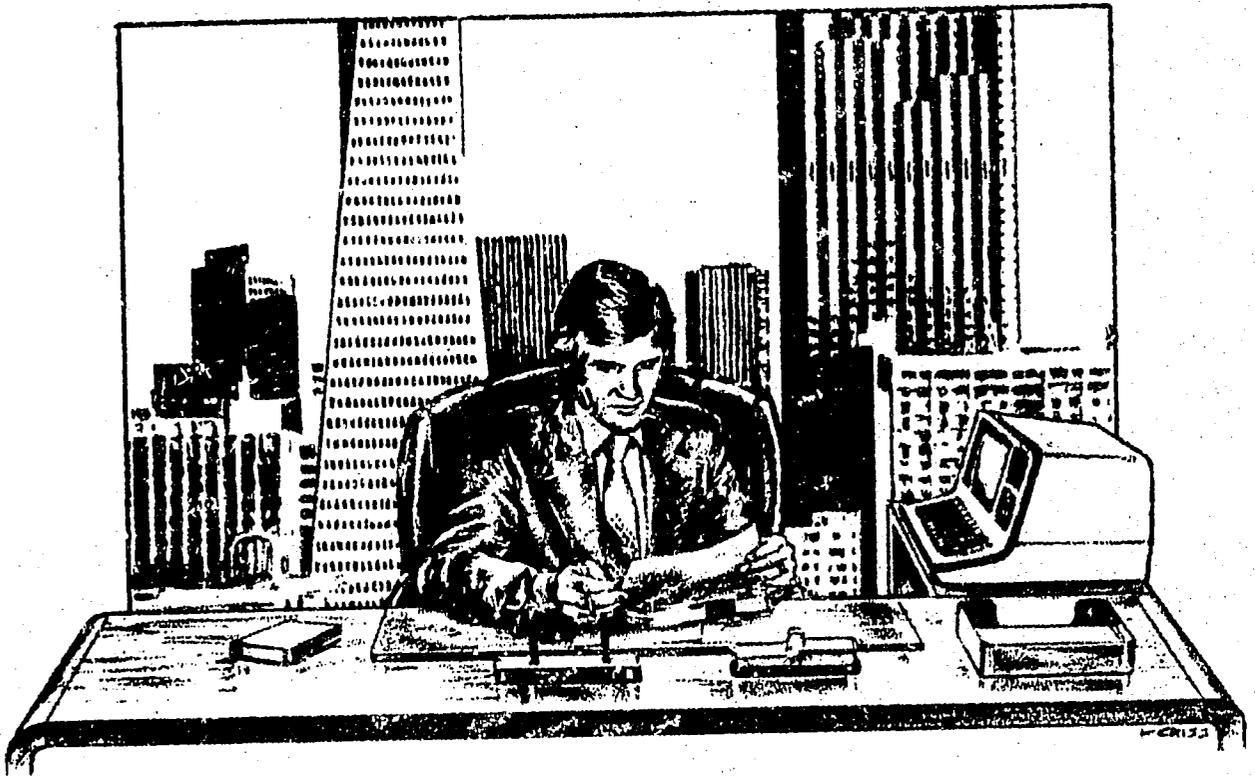
Using a North Star ADVANTAGE as a NorthNet station is much like using a stand-alone North Star ADVANTAGE. There's very little new to learn before using any of the application programs you already know.

NorthNet eliminates the need to interrupt your work, walk to a printer, and wait in line until it's available. All you do is initiate the print command from your work station and NorthNet does the waiting for you.

Programs and data files that are used by several people can be stored on a server station's hard disk, eliminating the need for creating and storing multiple floppy disk copies.



Independence



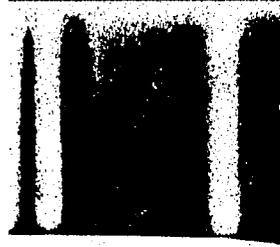
You can have your own floppy disk or hard disk drives to store personal files. So confidential files, like budgets, can remain private.

Even shared files are protected. Names and passwords ensure access only by authorized network members.

You can have your own floppy disk or hard disk drives to store information. So confidential files, like budgets, can remain private.

Any work station with a disk drive can be used as an independent North Star ADVANTAGE without disrupting the rest of the system. Simply sign off from the network and operate the machine as you would any stand-alone North Star ADVANTAGE.

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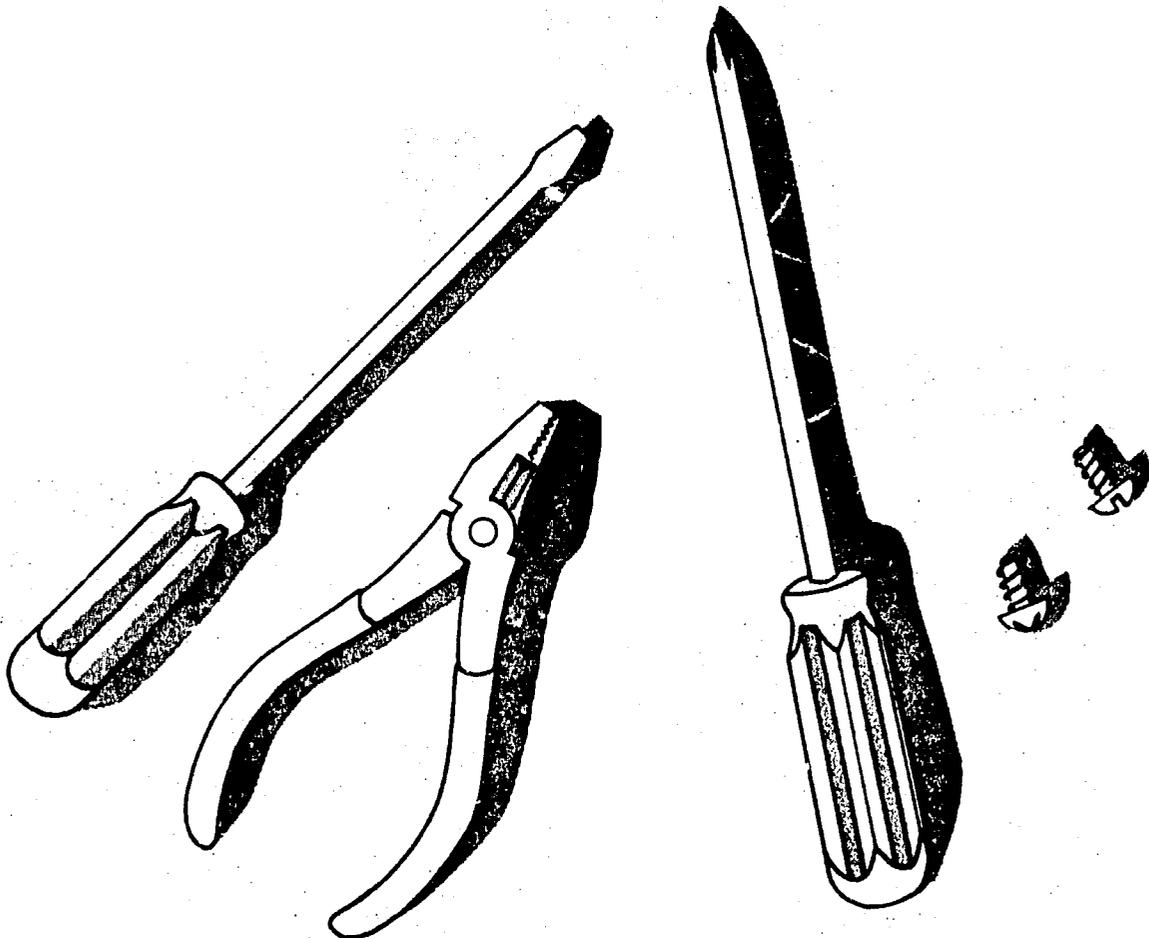


Easy Set Up

Attaching a North Star ADVANTAGE to the network cable is much like connecting speakers to a stereo system. The 15-foot cable that comes with the work station package plugs into the back of the North Star ADVANTAGE. The other end of the cable is attached to a tap box which can be quickly connected to the network cable.

You can easily plug th work stations and server stations into existing North Star ADVANTAGES. Only one screw is required to hold each board in place.

You can set up a complete NorthNet system using only two screwdrivers and a wire cutter.

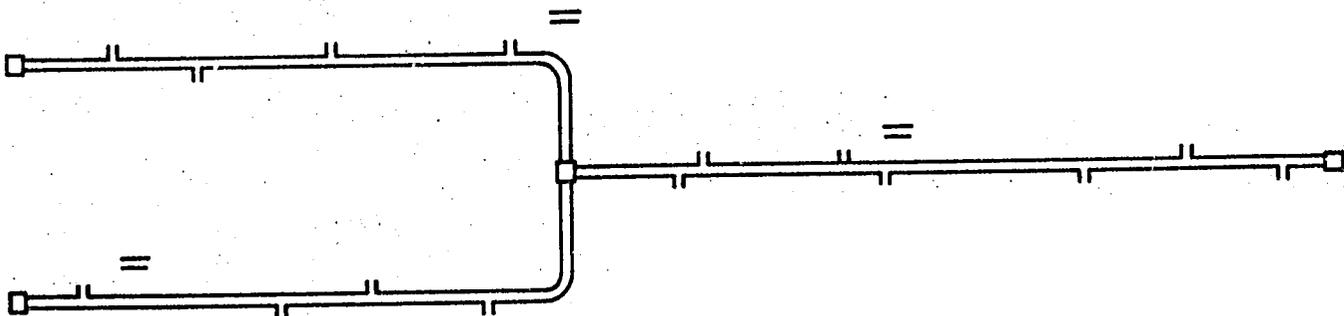
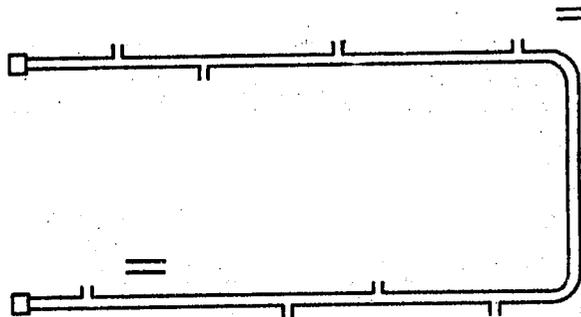
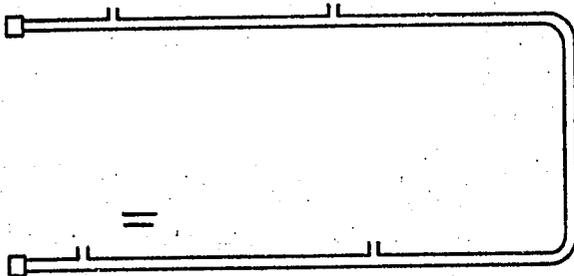


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Easy Expansion

Set up a NorthNet configuration to meet your current needs, with the assurance that you can expand it easily. NorthNet can support up to 64 stations, so you can add work stations, server stations, and shared resources as your business grows.

Gateways will soon be available to connect your NorthNet to other networks, stand-alone computers, and communications services.



2/2

P L A N N I N G

Everyone who needs to share resources, share information, or communicate with others on the network should have a work station. A work station is a North Star ADVANTAGE with one additional circuit board. The work station can have three possible disk drive configurations:

- no disk drives
 - two floppy disk drives
 - one floppy disk drive and one hard disk drive
-

Every network needs at least one server station to manage shared resources like printers and hard disk drives. A server station is a North Star ADVANTAGE hard disk (HD) with a work station circuit board and a server station circuit board. A server station continues to operate as a work station while performing the management functions of a server station.

Twisted pair cable, tap boxes, and repeaters are used to connect the work stations and server stations. The requirements for cable layout are:

- maximum total cable length of 10,000 feet
 - maximum transmission distance of 4,000 feet between any two stations
 - maximum distance of 500 feet between repeaters
 - maximum of seven repeaters in series between any two stations
-

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G U I D E L I N E S

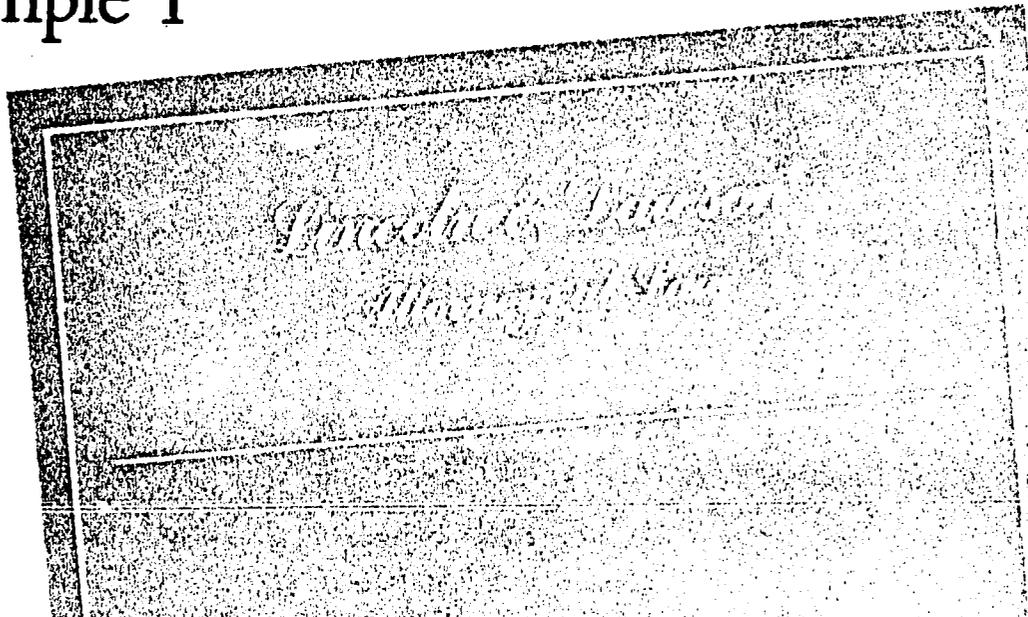
One member of the network community serves as the "manager." The manager has security privileges beyond those of other users. This individual is responsible for:

- configuring the network
 - maintaining network security
 - overseeing network operations
 - expanding the network
-

Any work station with a disk drive can have local storage and local resources that are not available to other users on the network. These work stations can be operated as stand-alone North Star ADVANTAGEs any time their users sign off from the network.

You can add new work stations, server stations, and shared devices to an existing network as your needs require. NorthNet supports up to 64 stations including the standard North Star ADVANTAGE and the North Star ADVANTAGE 8/16, which provides both 8-bit and 16-bit processing capabilities.

Example 1



Lincoln and Dawson is a small law firm with two attorneys who specialize in estate planning. Each attorney has a North Star ADVANTAGE with two floppy disk drives (2Q) to perform financial analyses for their clients.

Their secretary also has a North Star ADVANTAGE 2Q used to produce contracts, wills and correspondence. An NS-3510 letter-quality printer is attached to the secretary's computer.

The attorneys have recently hired a paralegal/secretary to conduct initial client interviews. The paralegal will enter client information directly into a computer and also help with overflow correspondence.

With the addition of a new employee, the attorneys have decided to install a NorthNet system. This will allow the attorneys direct access to client information entered by the paralegal and stored on the shared hard disk. It will also give the attorneys secretary, and paralegal immediate access to the most current versions of contracts and wills. And it will allow all four of them to share the printer without interrupting their work.

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To establish the optimal NorthNet configuration, Lincoln and Dawson needed to answer several questions.

Who will be on the network?

Considerations: Who needs to share information and/or resources?

Answer: Four people.



What resources will be shared?

Considerations: Every network must have a shared hard disk. What other resources do several people need to use?

Answer: One printer.

How many work stations will function as servers?

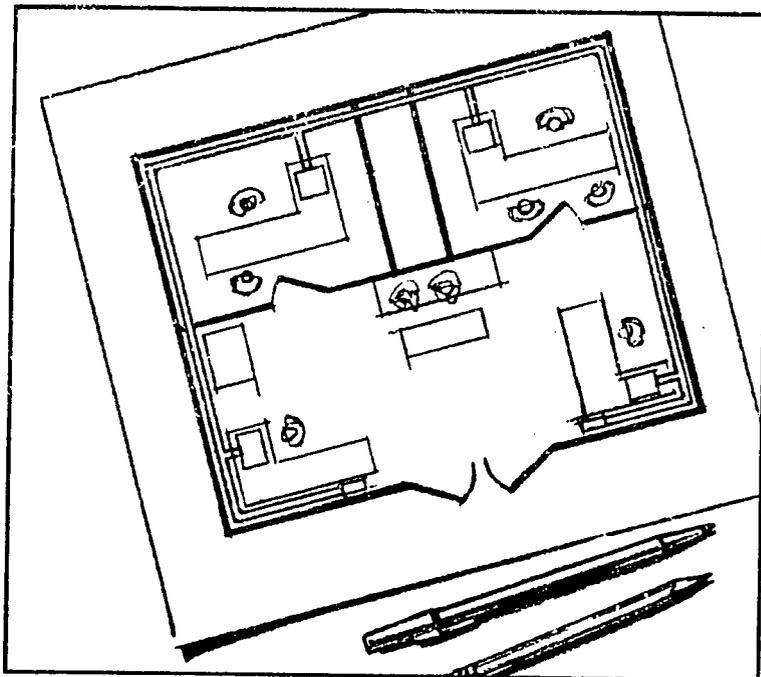
Considerations: How many resources will be shared and where should they be located?

The printer should be near the people who use it most often and close to the person who is responsible for changing the ribbons and paper.

Answer: One server station to be located at the secretary's desk.



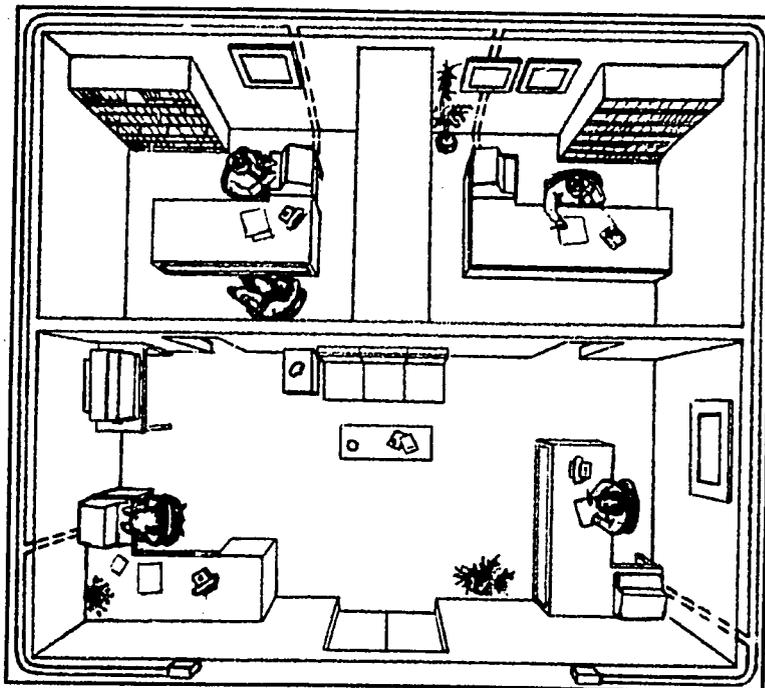
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How should the network be laid out?

Considerations: The network cable should be out of the way of traffic, and work stations should be within 15 feet of the network cable. How long will the network cable need to be?

Answer: Draw a layout of the office. Include potential locations of work stations, server stations, and shared resources. Total network cable length for this network is 90 feet.



What is needed?

Considerations: What do we already have?

- 3 North Star ADVANTAGE 2Qs
- 1 NS-3510 Printer
- Application Software

Answer: Additional Requirements

- 1 North Star ADVANTAGE with a 15 Megabyte capacity hard disk (HD-15)
- 4 Work Station Packs
- 1 Server Pack
- NorthNet Cable
- NorthNet Software Set

INSTALLATION PROCEDURE

The attorneys set up the network in less than a day using the procedure detailed in the NorthNet Installation Manual.

1. First, lay the network cable along the walls.
2. Disconnect the existing North Star ADVANTAGEs and the printer.
3. Determine a station address for each station. A station can have any unique address from 1 to 64.
4. Convert the three North Star ADVANTAGE 2Qs to work stations. First, remove the top of a machine and plug the work station board into the appropriate slot, inserting one screw to hold it in place. Then substitute one plug-in component on the main circuit board according to directions.

Put the top back on the machine and set the station address at the back of the computer. Finally, connect the North Star ADVANTAGE to the tap box cable. This entire procedure takes about 15 minutes for each machine.

5. Convert the North Star ADVANTAGE HD-15 to a server station. Follow the conversion procedure for a work station and plug in a server board in addition to the work station board.
6. Connect the tap box-cables to the network cable.
7. Connect the printer to the server station.
8. Finally, the attorney who has agreed to act as the network manager loads the network software from the server station. He must answer a few questions asked by the configuration program to identify who is located at each station.

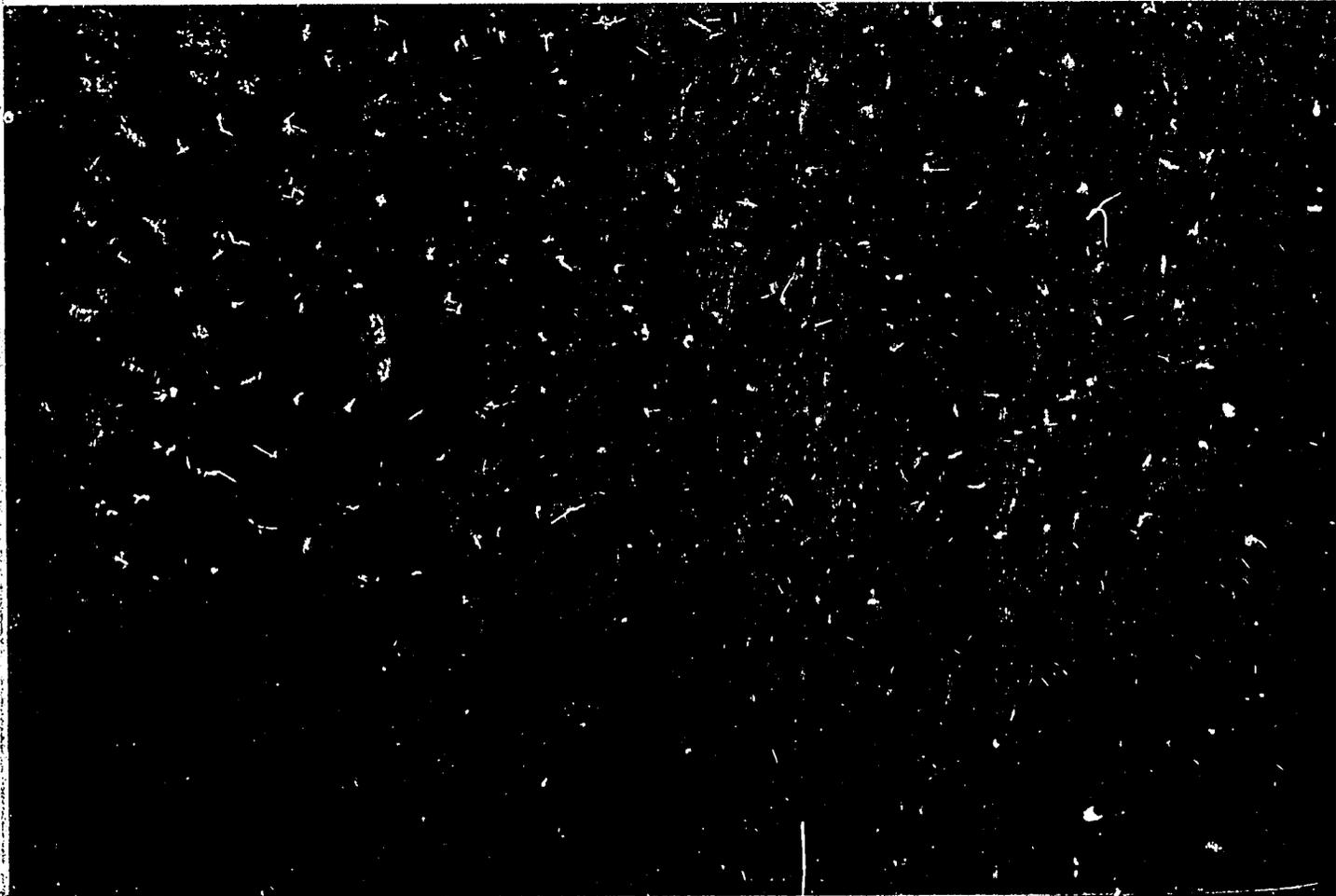
Example 2

URBAN DESIGN ASSOCIATES, INC.

Urban Design Associates, Inc. is an economic and land use consulting firm with six regional offices across the United States. They provide extensive land use and development reports for a clientele of land development corporations with revenues ranging from \$50 million to \$900 million.

The 14 member Client Services Department within the Southwest Division has recently decided to install NorthNet. The network will give all staff members immediate access to the shared programs, data, and reports generated using WordStar, MicroPlan, and dBase II.

NorthNet will also allow them to share their four printers and disk files more efficiently. They will maintain a common database using dBase II which will be regularly updated by accessing government public data base information over their modem.



NorthNet

Work Stations and Server Stations

- Work station is North Star ADVANTAGE or North Star ADVANTAGE 8/i6 plus work station board
- Server station is hard disk North Star ADVANTAGE plus work station board and server station board

Work Station Board

- Circuit board for North Star ADVANTAGE which contains Z-80A® microprocessor and hardware to provide network communications
- Plugs into North Star ADVANTAGE main board

Server Station Board

- Circuit board for North Star ADVANTAGE which contains 64K bytes dynamic RAM and clock/calendar
- Plugs into North Star ADVANTAGE main board and connects to work station board

Network Software

- NorthNet Software Set
 - Network Operating System
 - Electronic Mail
 - Network Graphics CP/M
- Other Operating Systems
 - Graphics MS-DOS
 - North Star Application Software Programs
- Applications
 - Most application programs that run under Graphics CP/M and Graphics MS-DOS, or hard disk North Star Application Software Programs will run without modification on any station

NorthNet Documentation

- NorthNet Work Station Installation Guide
- NorthNet Installation Manual
- NorthNet Operation Manual
- NorthNet Manager's Guide
- NorthNet CP/M Manual
- NorthNet Software Reference Manual
- NorthNet Service Manual

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S P E C I F I C A T I O N S

Network Configuration

Stations

- Maximum of 64 stations per network
- Tap box with 15-foot cable connects each station to NorthNet cable
- Maximum of 4000 feet of cable between stations

NorthNet Cable

- 20 gauge, shielded, twisted pair

NorthNet Cable Segment

- NorthNet cable consists of one or more cable segments
- A cable segment has:
 - o resistive termination at both ends
 - o no branches other than 15-foot tap cables
 - o maximum length of 500 feet, or 1000 feet if special cable is used
 - o maximum of 20 equivalent loads
 - 1 station = 1 equivalent load
 - 1 repeater = 2 equivalent loads

Repeater

- Electrical device which refreshes signals being sent along NorthNet cable
- Allows joining of 2 cable segments, and enables branching

Network Communications Protocol

Physical Layer

- Electrical interface emulates balanced RS-422
- 12 volt peak-to-peak common mode noise rejection
- Data transmission by bit stream encoding, with clock pulses for timing

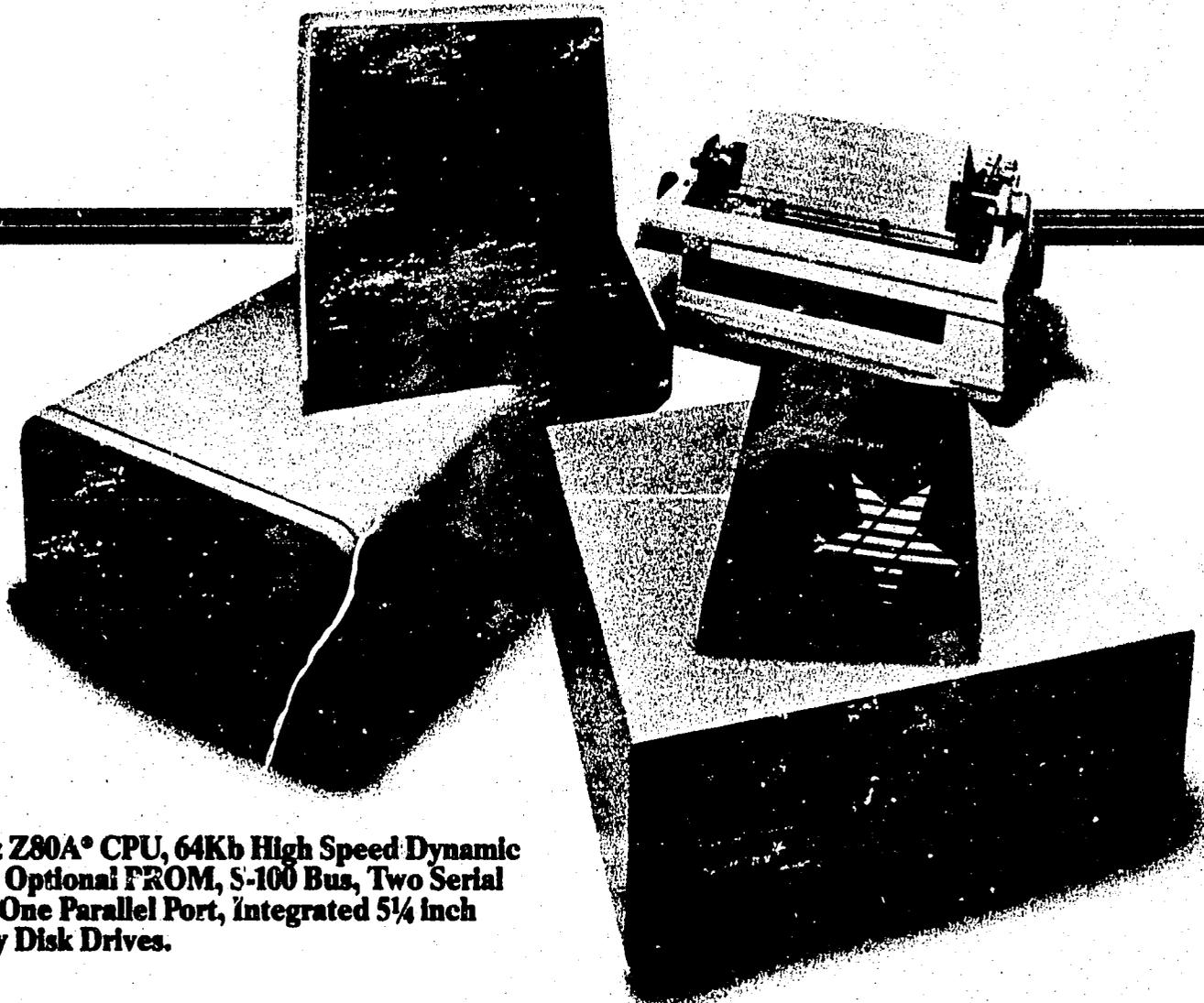
Data Link Layer

- Data communication structured by high level data link
- Message integrity verified by cyclic redundancy check (CRC)
- Network access and collision avoidance regulated by carrier sense multiple access/positive acknowledgment (CSMA/PA)

Data Transfer Rate

- 888,000 bits/second (888 kilobaud)

HORIZON



4 MHz Z80A[®] CPU, 64Kb High Speed Dynamic RAM, Optional PROM, S-100 Bus, Two Serial Ports, One Parallel Port, Integrated 5¼ inch Floppy Disk Drives.

HARDWARE

The HORIZON[®] computer incorporates a high speed 4 MHz Z80A microprocessor with 64Kb of Dynamic RAM including parity and two 5¼ inch floppy disk drives in an attractive desk top chassis. The chassis also provides a 12-slot S-100 mother board which contains a Real-Time Interrupt, two RS-232C serial ports, one 8-bit parallel port and power regulation circuitry for the integrated floppy disk drives. Either a 115 or 230 volt power supply with sufficient power for all 12 slots and the disk drives is also included. The use of high speed (200 nsec) Dynamic RAM and "fast stepping" floppy disk drives, along with the 4 MHz CPU, delivers the highest average performance of all comparable microcomputers as measured by independent benchmark studies!

SOFTWARE

The power and versatility of the HORIZON computer is further enhanced by a wide range of system and application software. For business use, the comprehensive North Star Application Software Packages offer Word Processing, Accounting and Financial Reporting in either single user or multi-user versions. For the scientific, engineering, or education oriented user, North Star's powerful DOS operating system with its efficient BASIC language or Pascal[®] I/O are available. The industry standard CP/M[®] operating system is also compatible with applications packages in MicroSoft BASIC, FORTRAN, and COBOL.

¹Reference to *Benchmark Report, Association of Computer Users*
Vol. 3.1, No. 3, March 1980

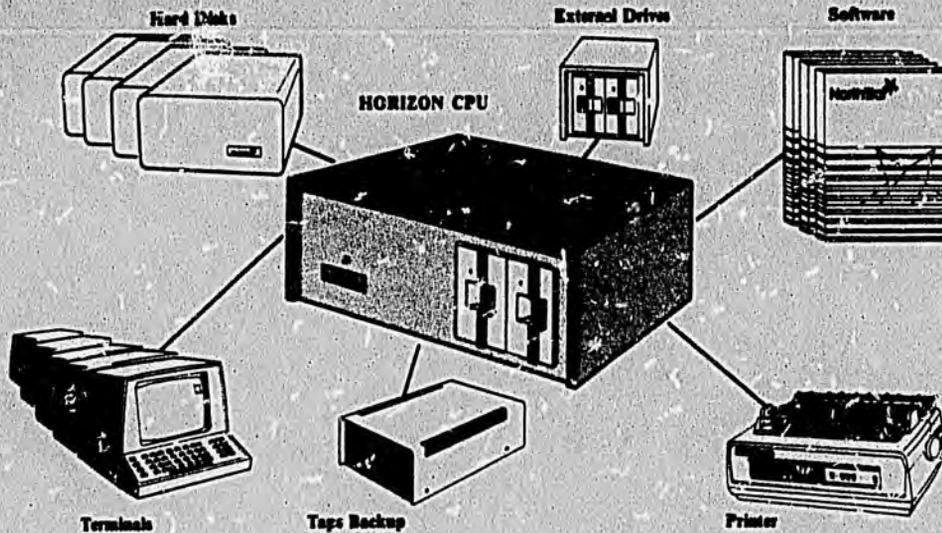
FOLLOW THE STAR

NorthStar



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SYSTEM COMPONENTS



SPECIFICATIONS

CPU
Zilog Z80A operating at 4 MHz.

Word Size
8 bits.

Cycle Time
250 nsec cycle time.

Memory Capacity
Eraseable PROM: 1Kb (optional).
RAM: One 64Kb memory board, with parity and bank select (HRAM).

Serial I/O
Two RS-232C or Current Loop Serial I/O Ports standard (Asynchronous or Synchronous).
Asynchronous: 8-bit characters with the following jumper selectable Baud rates: 75, 110, 150, 300, 600, 1200, 2400, 4800, 9600.
Synchronous: jumper selectable identical Baud rates.

Parallel I/O
8-bit parallel. (one)

I/O Bus
Standard S-100 bus.

Real-Time Interrupt
12 Real-Time Interrupt intervals (one selected by jumper connection) from 3.328 msec through 27.263 seconds. Each interval is an exact power of two times 3.328 msec.

Power Requirements
250W power supply—either 115V, 60 Hz or 230V, 50 Hz. Standard three prong plug into 20 amp single phase dedicated circuit.

Heat Dissipation
250W

Physical Specifications
Dimensions: 50.8 cm x 18.4 cm x 44.4 cm (20 in. x 7.25 in. x 17.5 in.).
Weight: approx. 22.7 kgs (50 lbs.) shipping weight including documentation.

Environmental Limits:
Ambient temperature while operating: 10° C to 40° C (50° F to 104° F).
Ambient humidity while operating: non-condensing.

EXPANSION OPTIONS

HRAM-64 High Speed 64Kb Dynamic RAM memory board with parity (up to a total of six)

HSIO-4 Four Serial Port Expansion Board (RS-232C or Current Loop).

FPB Floating Point Arithmetic Board.

ADC-2D Two additional 5¼ inch Double capacity floppy disk drives incorporated within a cabinet (360Kb total capacity).

ADC-2Q Two additional 5¼ inch Quad capacity floppy disk drives incorporated within a cabinet (720Kb total capacity).

HDS-5 5¼ inch Winchester Hard Disk — 5Mb formatted capacity.

HDS-18 14 inch Winchester Hard Disk — 18Mb formatted capacity.

Tape Backup 13.4Mb Tape Backup system for HDS-18 or HDS-5.

CRT Hazeltine 1420/Soroc 120. (Other software drivers available.)

Printer 35 or 55 cps letter quality printer.

Pascal II.0 is an implementation of the UCSD Pascal System. Z.80 is a registered trademark of Zilog Corporation. CPM is a registered trademark of Digital Research, Inc.

FOLLOW THE STAR
NorthStar™

North Star Computers, Inc. 1440 Cassien Street
San Leandro, CA 94771-1184

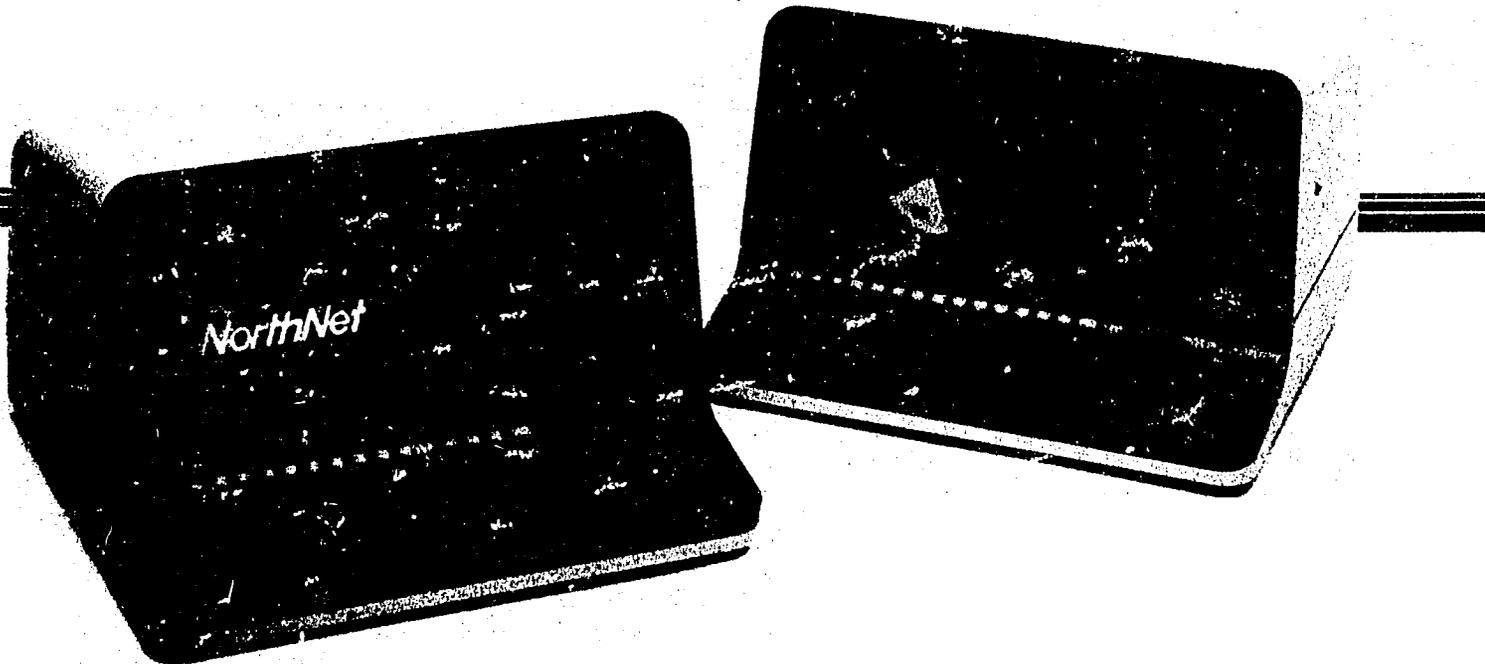
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NORTH STAR ADVANTAGE

Featuring 8/16 option and NorthNet



The Dual Purpose Computer for the Business That's Planning to Grow.

The North Star ADVANTAGE the easy-to-use desk top computer, doubles as a Word Processor and/or Data Processor in your office:

Word Processor Advantages

- Selectric® style keyboard with quality feel has 87 sculpted keys including 15 Function Keys for fast entry.
- Choose from three North Star software options:
 - Enhanced Wordstar™ for CP/M® users
 - NorthWord™ for simplified editing that's easy to learn
 - NorthWord™ II, the most efficient word processor for microcomputers
- Large disk capacity stores hundreds of documents.
- Can be connected to other computers by NorthNet™ North Star's local area network.

Data Processor Advantages

- Standard 8-bit plus fast 16-bit processors allow migration path as data bases or applications grow.
- 12-inch bit-mapped display offers high resolution graphics (640 x 240 pixels).
- Fully integrated, interactive financial software packages fulfill complete small business data requirements.
- State-of-the-art hardware offers optional 8MHz 16-bit 8088-2 processor with Z80A® co-processor, up to 256Kb

- of memory, and up to 15Mb of hard disk storage.
- Choice of Operating Systems includes Graphics CP/M, and Graphics MS™-DOS.
- Several North Star ADVANTAGEs on NorthNet can share large data bases with protected file access.

Growth Advantages

Your first North Star ADVANTAGE with two floppy disks—plus a dot matrix or letter quality printer and software—gives you all you need for high quality word processing and financial planning.

As your requirements grow, add hardware, software and more North Star ADVANTAGEs, and connect them with NorthNet into a fully integrated office of the future. You can increase computing power four ways:

- Plug in additional boards:
 - 16-bit 8088-2 processor
 - up to 256Kb of additional memory
 - NorthNet Workstation and Server Boards
 - serial or parallel I/O boards
- Upgrade mass storage to 5Mb or 15Mb Hard Disk.
- Add applications programs, languages, even more operating systems.
- Interconnect up to 64 North Star ADVANTAGEs on NorthNet.

FOLLOW THE STAR
NorthStar™

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SOFTWARE

North Star Graphics CP/M

Graphics CP/M is a powerful superset of CP/M that supports the extensive graphics capabilities of the North Star ADVANTAGE. It lets you make full use of the large body of CP/M-compatible software.

Languages on CP/M include North Star BASIC, COBOL, FORTRAN and Pascal.

North Star has enhanced several CP/M programs for use on the North Star ADVANTAGE, including:

Enhanced WordStar™ 3.0—the most popular word processing program in use today.
SpellStar™—the one-step “proofreader” for WordStar that catches misspellings and typos—and MailMerge™—the form-letter generator that lets you produce personalized letters.

Enhanced MicroPlan™—the sophisticated spreadsheet with advanced math and statistical functions for the serious financial planner.

dBASE™ II—the powerful and flexible relational data base manager that contains its own interactive command languages.

North Star Total Business Solutions Family

The Total Business Solutions Family is a high performance operating system for North Star proprietary word processing, financial and general business applications. The software is totally integrated so that every application can interact with every other one.

ACCPAC™ is a completely automated accounting system for small business with a comprehensive audit trail and detailed user menus. It includes:

- Accounts Payable
- Accounts Receivable
- General Ledger
- Order Entry
- Inventory Control
- Payroll

PROPAC™ is a time management and billing system for professional offices (medical, legal, financial) that includes:

- a client profile module (data base)
- a client time and billing module
- a client receivables module for balance forward billing and general ledger posting.

InfoManager™ II is a menu-driven data base management system that can store and manipulate lists of information. It includes both numeric and mailing list capability.

NorthWord is easy to learn and easy to use for report writing and editing. NorthWord II is a page-oriented, efficient word processor for professional users. NorthSpell II is a spelling verifier for NorthWord II-generated documents.

NorthPlan™ is a financial spread sheet that is fully integrated with InfoManager II and NorthWord II. It can be used in either an interactive or a preprogrammed mode.

Graphics MS-DOS

MS-DOS is the most popular 16-bit operating system in the microcomputer field, and Graphics MS-DOS is a superset that supports all North Star ADVANTAGE graphics features. Graphics MS-DOS also allows North Star ADVANTAGE to read IBM PC disks.

Together with the 80386-2 16-bit processor, Graphics MS-DOS represents a significant increase in computer speed and power. Available on it are:

- dBASE II—the 16-bit version of the relational data base manager is faster and can handle much more data bases than the CP/M version.
- WordStar—plus SpellStar and MailMerge
- BASIC 16
- BASIC 16 COMPILER
- FORTRAN-16
- COBOL-16
- Pascal-16

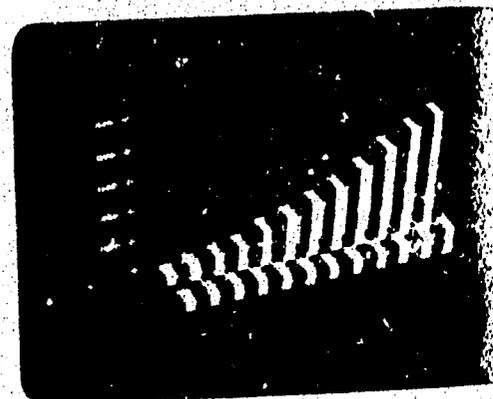
North Star Graphics DOS

Graphics DOS is North Star's proprietary operating system that supports the bit-mapped graphics features of the North Star ADVANTAGE.

TYPICAL SYSTEMS GRAPHICS:



LINE CHART



3-DIMENSIONAL CHART

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NORTHNET

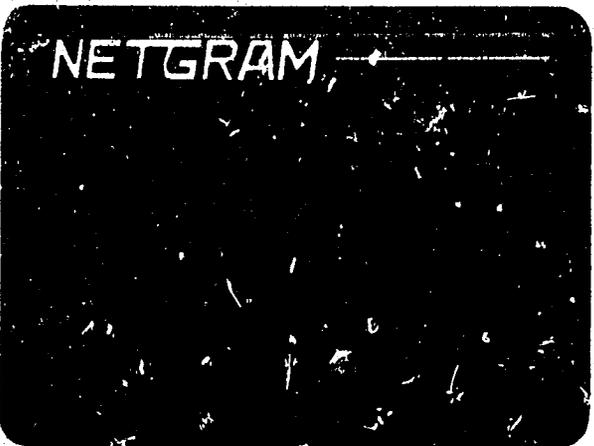
TYPICAL NORTHNET SCREENS:



UTILITIES MENU



NETWORK CONFIGURATION



ELECTRONIC MAIL

NorthNet - The Proprietary Local Area Network for the North Star ADVANTAGE and ADVANTAGE 8/16 NorthNet is a high speed, low cost local area network that is easy to install and simple to use. It interconnects a group of computers so they can share printers and large files, and can communicate with each other.

Unlike time shared multi-user computers, each user on NorthNet has a fully operational computer which can be used either on NorthNet or as a stand-alone, independent word processor or data processor.

NorthNet's versatile structure fits into any type and size of office. It can be configured to serve a number of separate departments — each with its own software, security and peripherals — and link all of them together with Electronic Mail. Or it can be used company-wide to provide a single integrated data base.

Whether you have two computers or 64, NorthNet lets you use them more effectively:

- Share expensive resources such as printers, hard disks and communications.
- Share and update a common data base with controlled access and record lockout.
- Communicate between North Star ADVANTAGEs with Electronic Mail.
- Access public data bases and other computer systems.
- Keep full processing speed and power plus local storage at each computer.

The NorthNet bus interconnects North Star ADVANTAGE computers with low cost, easy-to-install shielded twisted pair cabling. Each North Star ADVANTAGE is connected to NorthNet simply by plugging an inexpensive Workstation Board into the computer and running a 15-foot cable to the NorthNet bus. This allows the North Star ADVANTAGE to access shared files and resources, and to send and receive Electronic Mail.

The shared resources are provided by one or more North Star ADVANTAGE Workstations designated as Servers. These contain a Workstation Board, a Server Board and a Hard Disk. They may have other resources such as printers or communications facilities connected to them.

Software for NorthNet consists of a Network Executive Operating System to control access, configuration and communications; the Electronic Mail facility; and the CP/M operating system. To this basic software, add your selection of word processing and data processing applications.

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North Star ADVANTAGE Specifications

Cabinet
Dimensions:
 48 cm x 51 cm x 31.5 cm
 (18 3/4 inch x 20 inch x 12 1/2 inch)
Shipping Weight: Approximately 22.5 kg
 (50 lb.)
Net Weight: 19.5 kg (43 lb.)
Composition: High impact structural foam

Power Requirements
Domestic: 115v (95 to 135v), 50/60 Hz
International: 230v (190 to 265v), 50/60 Hz
Power Consumption: 2 amps @ 115v,
 1 amp @ 230v

Temperatures
Operating: 10°C to 40°C
 (50°F to 104°F)
Non-operating: -40°C to 60°C
 (-40°F to 140°F)
Shipping: -40°C to 52°C
 (-40°F to 125°F)

Humidity:
Operating: 20% to 80% non-condensing
Non-operating and shipping: 5% to 95%
 non-condensing

Processor/Memory

	North Star ADVANTAGE	North Star ADVANTAGE 8/16
CPU	Z80A Micro-processor	Z80A & 8008-2 Co-processors
Operating Speed:	4MHZ	8MHZ
Auxiliary processor:	Intel 8035	Intel 8055
Memory:	64Kb Main RAM 20Kb Display RAM 2Kb Boot PROM	64Kb-256Kb Main RAM for 8008-2 + 64Kb for Z80A 20Kb Display RAM 2Kb Boot PROM

Video

Screen: 28 cm (12 inch) diagonal P31 phosphor (green)
 Non-glass face plate

Standard Character Format: 1920-character display, 24 lines by 80 characters. 5 x 7 character in 8 x 10 dot matrix with descenders

Graphics Resolution: 640 pixels wide x 240 pixels high

Refresh Rate: 60Hz

Keyboard

11° Keyboard angle (Selectric compatible)

Keys: 87, with sculptured keytops

Key Groups: 49 Standard Typewriter Keys

14-key Numeric pad with ENTER Key

15 Function Keys with up to 45 user-programmable functions

9 Additional Symbol/Control Keys

Other Features: N-Key Roll-Over

Full Cursor Control

Special Shift-Lock Keys

Five Shift Modes

Auto Repeat

Disk

Number of drives housed in cabinet:
 Two floppy disk drives, or one hard disk and one floppy disk drive

Floppy disk characteristics:

Standard 5-1/4 inch floppy diskettes
 512 bytes/sector, 10 (hard) sectors/track
 35 tracks/side, 2 sides/diskette
 360Kb storage/diskette (formatted)

Hard Disk characteristics:

Non-removable 5-1/4 inch hard disk media,
 512 bytes/sector, 16 (soft) sectors/track
 5.0Mb or 15.0Mb formatted capacity/drive

	Quad Floppy Disk	5Mb Hard Disk	15Mb Hard Disk
Transfer rate:	250Kb/s	625Kb/s	625Kb/s
Latency (average):	100ms	8.33ms	8.33ms
Access Time (track-to-track):	5ms	3ms	3ms
Settling Time:	20ms	20ms	20ms
Number of Tracks:	70	612	1836
Disk Speed:	300rpm	3600rpm	3600rpm

Input/Output

Slots for up to six plug-in boards:

Serial I/O: RS-232C serial port

Current loop option

Asynchronous: 45 baud to 19.2

kilobaud

Synchronous: 2400 baud to 51

kilobaud

(One provided with each system)

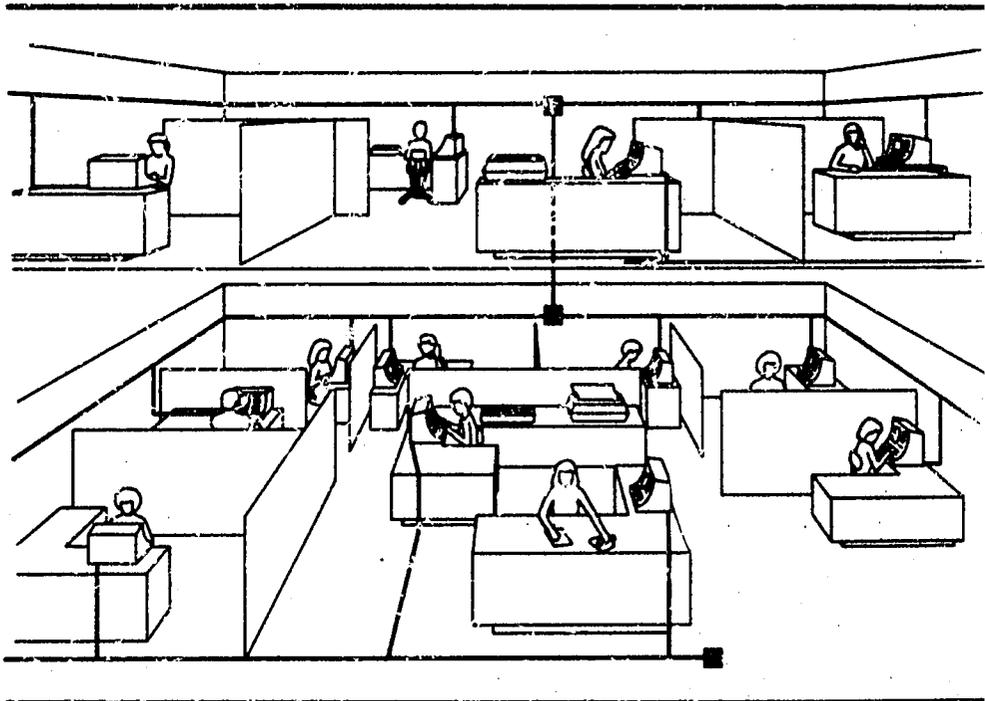
Parallel I/O: 8-bit data in and out with three handshake lines for each port. Maximum speed limited by the processor.

Workstation Board: Turns North Star ADVANTAGE into NorthNet Workstation. Includes separate Z80A processor.

Server Board: Together with Workstation Board turns North Star ADVANTAGE into NorthNet Server. Includes 64K of RAM and real time clock.

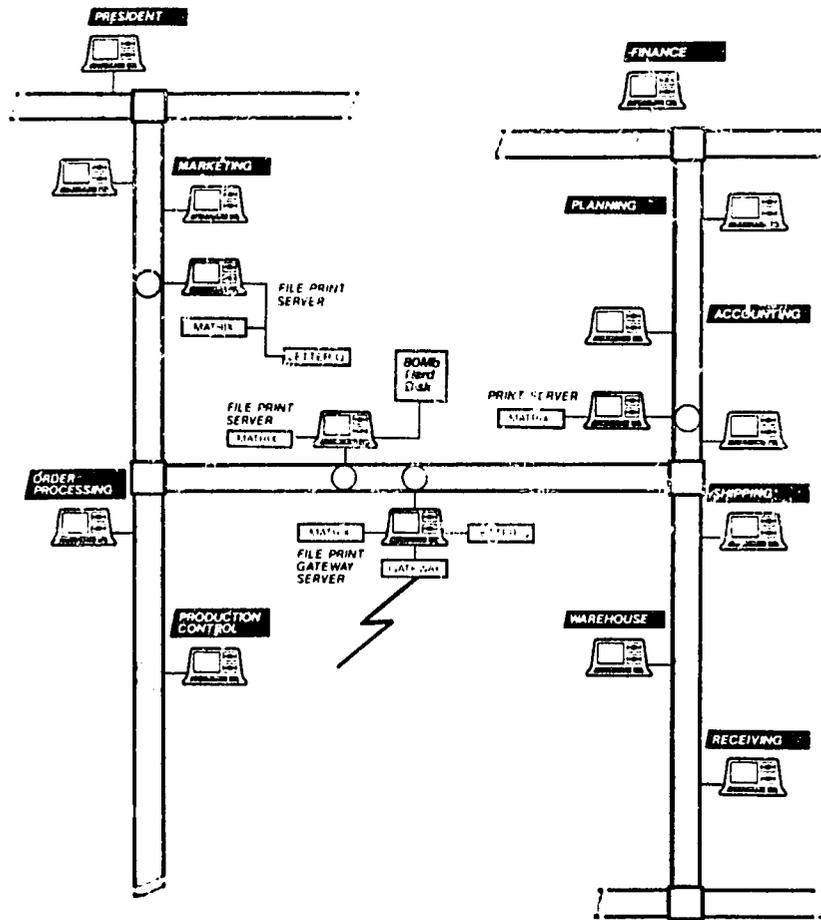
ADV-16 Board: Includes 8088-2 16-bit micro-processor and 64K of RAM. Up to three additional 64K RAM Expansion Boards can be plugged into the ADV-16 Board to bring 8088-2 memory to 256K.

Hard Disk Controller Board: for either 5 Mb or 15Mb Hard Disk



North Star introduces

NorthNet™



at NCC 1982 Booth 7523

Give yourself a North Star ADVANTAGE . . .

. . . then extend your business advantages with NorthNet.

NorthNet is a low cost proprietary local area network linking existing North Star ADVANTAGES by simply plugging one or two inexpensive boards into each North Star ADVANTAGE, converting it into a NorthNet workstation or workstation/server.

NorthNet

PRESIDENT



- Mail
- Calendar
- Filing
- Financial Plan

FINANCE



- Mail
- Financial Plan
- Filing
- Calendar
- Gen Ledger

MARKETING



- WP
- Financial Plan
- Mail
- Calendar
- Filing

PLANNING

- Mail
- Financial Plan
- WP



- Sales Analysis
- Inventory
- Financial Plan
- Mail
- Filing



FILE/PRINT SERVER

MATRIX

LETTER Q

80Mb Hard Disk

FILE/PRINT SERVER

MATRIX



PRINT SERVER

MATRIX



ACCOUNTING

- Invoicing
- Acct Rec ble
- Acct Pay ble
- Gen Ledger
- Payroll
- Mail



ORDER PROCESSING



- Order Entry
- Accts Rec ble
- Filing
- Mail

MATRIX



FILE/PRINT/GATEWAY SERVER

GATEWAY

LETTER Q

SHIPPING



- Shipping
- Inventory Control
- Filing
- Mail

PRODUCTION CONTROL



- Financial Plan
- Inventory
- WP
- Filing
- Mail

WAREHOUSE



- Inventory
- Filing
- Mail

RECEIVING



- Receiving
- Inventory Control
- Filing
- Mail

NorthNet

Whether you have two or twenty, extend your standalone North Star ADVANTAGE with the benefits of multi-user operation:

- ★ Shared files between multiple users
- ★ Shared high quality printers/plotters
- ★ Shared gateways to:
 - Communications services such as TWX, Telex
 - Remote networks or dissimilar networks (Ethernet, etc.)
 - Async or Bisync Serial devices
 - 2780/3780 Bisync Serial communication with local or remote computers.
 - HPIB (IEEE 488) devices

Low Cost

Bring the low cost-per-user benefits of a multi-user shared resource system together with the North Star ADVANTAGE, a powerful graphics desktop computer, and its broad array of personal productivity enhancing and business applications software.

Personal Applications

Each person's North Star ADVANTAGE with the CP/M® based network operating system can increase his or her productivity with integrated user friendly applications requiring no programming or computer knowledge.

- ★ Word Processing
- ★ Financial Planning
- ★ Business Graphics
- ★ Electronic Mail
- ★ Electronic Filing
- ★ Future applications like Electronic Calendar

Business Applications

Each North Star ADVANTAGE can participate in the business data processing system as well:

- ★ Accounts Receivable
- ★ Accounts Payable
- ★ General Ledger
- ★ Payroll
- ★ Order Entry
- ★ Shipping
- ★ Receiving
- ★ Inventory Control

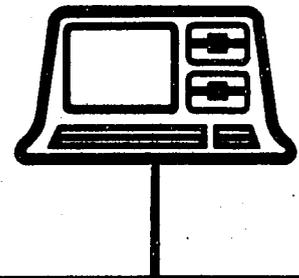


Illustration of Benefits

The benefits of a NorthNet local area network as applied in a typical business are demonstrated by the illustration on the facing page.

Distributed Computing

Powerful graphics desktop North Star ADVANTAGE computers can be located in every department right on the user's desk where each computer becomes a personal workstation.

Multiple Functions

Each workstation can perform the wide variety of personal applications (Word Processing, Electronic Mail) and business applications (Payroll, General Ledger, etc.) required by the daily activities of the user.

Each workstation can operate off the network on its own software as a standalone computer without disturbing the rest of the network.

Shared Resources

The workstations shown in color also control one or more shared resources (e.g. shared files, shared printers or shared gateways). These special workstations are called servers since they provide their resources to all requesting workstations. By this means, a relatively low investment in mass storage and printers is spread across all the workstations.

Flexibility

The unique NorthNet branching feature enables a far simpler cable installation in buildings with multiple floors or in buildings that are spread into several wings.

Reliability

Since there is no central controller of the network and since the failure of any workstation or server will not affect the operation of the rest of the network, the system is far more reliable than a single CPU timeshared system or a local network configured in a "star" configuration. Likewise, distributing several printers, disks and servers through the network provides redundancy that further increases reliability.

NorthNet Description

NorthNet consists of three basic elements:

- ★ Workstations
- ★ Servers
- ★ Cable

Workstations

Workstations on the North Star proprietary network are the 8-bit North Star ADVANTAGE or the combined 8 and 16-bit North Star ADVANTAGE 8/16 microcomputers. Workstations can have:

- ★ Dual 5¼" floppy disks or
- ★ One 5¼" floppy disk and one 5¼" (5Mb) hard disk for private (not shared) storage.

Workstations connect to the network through a WS board that plugs into the North Star ADVANTAGE and a 15-foot access cable that taps into the Network Cable. A workstation can also have a private (not shared) printer.

Servers

Any workstation can be converted into a workstation and server by addition of a server board and the appropriate mass storage device(s), printer(s) or gateway interface(s).

Cable

The cable used in the network is low cost, easily installed twisted pair. Additional attributes are:

- ★ Maximum accessible cable (through branching)—10,000 ft.
- ★ Maximum length end-to-end—4,000 ft.
- ★ Maximum length between branching repeaters—1,000 ft.
- ★ Maximum repeaters permitted from one end to the other—4
- ★ Network Bus Architecture—CSMA/PA (Carrier Sense Multiple Access/Positive Acknowledge)
- ★ Transmission Rate—1M bit/sec

In addition to NorthNet and the North Star ADVANTAGE

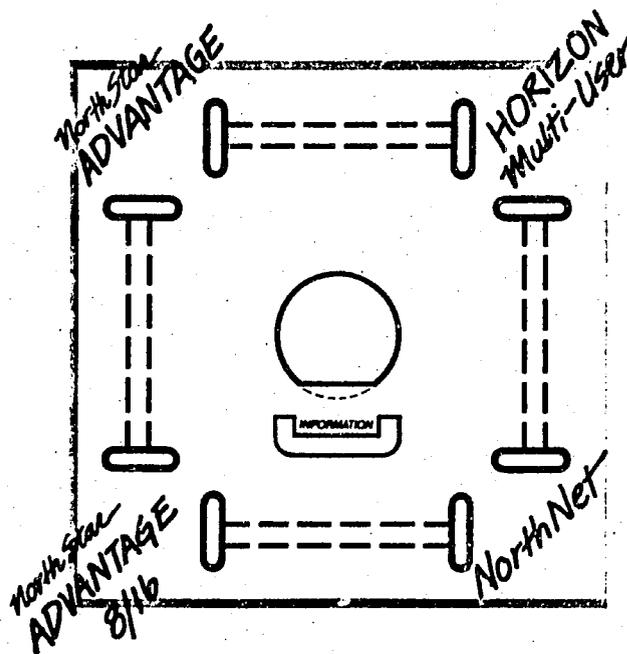
... North Star is showing the North Star ADVANTAGE 8/16 and demonstrating the Multi-User HORIZON® TSS/A and TSS/C systems as shown here in the booth map.

Multi-User HORIZON—TSS/C, TSS/A

- ★ TSS/A—North Star's business applications on the HORIZON computer supporting up to five users, each operating the same or different programs.
- ★ TSS/C—Industry standard CP/M compatible applications on the HORIZON supporting up to five users, each operating the same or different programs.

New North Star ADVANTAGE 8/16

- ★ Single user business applications or personal applications in either 8-bit CP/M or 16-bit MS/DOS™.
- ★ Business Graphics package and Graphics CP/M or MS/DOS supersets for generating bar charts, pie charts and complex figures.
- ★ The power, addressability and MS/DOS compatibility of the 16 bit 8088 microprocessor combined with the popular Z80A®.
- ★ Purchase now as a 16 bit system or as an 8 bit North Star ADVANTAGE today and simply upgrade to 16 bits when you need the extra power and software.



NorthStar™

The North Star logo, NorthNet and HORIZON are trademarks or registered trademarks of North Star Computers, Inc. CP/M is a registered trademark of Digital Research, Inc. Z80A is a registered trademark of Zilog, Inc. MS/DOS is a trademark of Microsoft.

North Star Computers, Inc., 14440 Catalina St., San Leandro, CA 94577

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North Star Computers, Inc.

February 1, 1983

Suggested Retail Price List (Domestic)

Computer Systems

SINGLE USER ¹	NORTH STAR ADVANTAGE	ADVANTAGE 8/16
NorthNet Dedicated WS ² _____	\$2599	\$3099
Dual Floppies (360Kb each) _____	3599	4099
5Mb Hard Disk + 360Kb Floppy _____	4999	5499
15Mb Hard Disk + 360Kb Floppy _____	5999	6499

HORIZON	SINGLE USER	MAXIMUM 5 USERS ³
Dual Floppies (360Kb each) _____	\$3599	N/A
5Mb Hard Disk + 360Kb Floppy _____	4999	\$8149
15Mb Hard Disk + 360Kb Floppy _____	5999	9149
18Mb Hard Disk + 360Kb Floppy _____	7999	11,149

Application Software

NORTH STAR'S TOTAL BUSINESS SOLUTIONS FAMILY⁴

GeneralLedger _____	\$599	NorthWord _____	\$199
AccountsReceivable _____	599	NorthWord II* _____	499
AccountsPayable _____	599	NorthSpell II* _____	299
InventoryControl _____	599	InfoManager II _____	499
OrderEntry & Invoicing _____	599	NorthPlan* _____	499
Payroll _____	599	PROPAC _____	1499

CP/M APPLICATION SOFTWARE FAMILY

Enhanced WordStar _____	\$500	dBASE II _____	\$700
SpellStar _____	250	FORTTRAN _____	499
MailMerge _____	150	Pascal _____	600
Enhanced MicroPlan _____	399	COBOL/M-Sort _____	875
NorthStar BASIC _____	149		

NORTH STAR GRAPHICS FAMILY (GCP/M)

BusiGraph II _____	\$249	GraphicsLibrary-16 _____	\$249
ImageMaker _____	299	GraphMate _____	149
GraphicsLibrary _____	249		

NORTHLINK COMMUNICATIONS FAMILY (GCP/M)

2780/3780 Bisync _____	\$499
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GRAPHICS MS-DOS SOFTWARE FAMILY

BASIC-16 _____	\$399	Pascal-16 _____	\$499
BASIC-16 Compiler _____	399	COBOL-16 _____	499
FORTTRAN-16 _____	499		

NOTES:

*ADVANTAGE and ADVANTAGE 8/16 only.

¹Single-User North Star ADVANTAGE and HORIZON configurations include 64K RAM. North Star ADVANTAGE prices include a diskette containing Business Graphics, demonstration and diagnostics software.

HORIZON prices include a diskette containing DOS/BASIC or HDOS/BASIC and diagnostics software.

²No floppy or hard disk, includes installed Workstation Pack.

³Multi-User HORIZON hardware prices include the necessary 64K RAM per user and one Four Port Serial I/O board per system. Operating system, printer and terminals are extra. TSS/C requires additional 32K RAM.

⁴Requires either TSS/A or North Star Total Business Solutions (TBSOS, HD only).

⁵Graphics CP/M, Graphics DOS/BASIC & North Star Total Business Solutions (TBSOS, HD only) also run on ADVANTAGE 8/16.

⁶Includes 64K RAM.

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Operating Systems

SINGLE-USER

North Star ADVANTAGE

Graphics CP/M _____ \$149 Graphics DOS/BASIC _____ \$149
Total Business Solutions (TBSOS,
HD only) _____ 149

North Star ADVANTAGE 8/16^s

Graphics MS-DOS _____ 149 GMS-DOS Plus G-CP/M _____ 249

HORIZON

CP/M 2.2 _____ 149 TSS/A Total Business Solutions
(HD only) _____ 349

Multi-User HORIZON

TSS/C (CP/M Applications) _____ \$349 TSS/A (Total Business Solutions) _____ \$349
TSS/C (with 32K RAM) _____ 549

NorthNet Options

Work Station Pack _____ \$399 NorthNet O.S. _____ \$349
Server Pack _____ 499

System Upgrades

North Star ADVANTAGE

5Mb Hard Disk System Upgrade _ \$2399 Parallel Interface Board _____ \$200
15Mb Hard Disk System Upgrade _ 3399 Serial Interface Board _____ 175
8/16 Upgrade Board⁶ _____ 499 8/16 RAM Board (64K each) _____ 349

HORIZON

5Mb Hard Disk System Upgrade _ \$2399 32K RAM Memory Board _____ \$499
15Mb Hard Disk System Upgrade _ 3399 Four Port Serial I/O Board _____ 349
18Mb Hard Disk System Add-On _ 5374 Z80A Processor Board _____ 325
Tape Backup System _____ 3895 Floating Point Board _____ 399
64K RAM Memory Board _____ 699 Floppy Disk Controller Bd. _____ 565

Consult your Authorized North Star Dealer for products not listed. Prices and specifications are subject to change without notice. Unless otherwise noted, cables & supplies are extra.

Call (800) 447-4700 for the Dealer nearest you.

North Star Computers, Inc., 14440 Catalina Street, San Leandro, CA 94577

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ARCNET—Revisited

Editor's note: This article is a revised reprint of an article which originally appeared in the November 1981 Microcomputer News.

Tandy will utilize the Datapoint ARCNET (Attached Resource Computer Network) protocols—and a new Datapoint LSI circuit network interface component—to provide high speed, very low cost common data base and peripheral systems using common-resource networking. Datapoint developed ARCNET as a part of its highly reliable, field proven ARC system, in use since 1977.

The network is built from four relatively inexpensive hardware components—thanks to Datapoint's LSI design. First, the ARCNET interface card is needed in each computer on the network to enable it to communicate with the network—this card installs in existing card slots in the rear of the MODEL II/12. The card, 26-6501, retails for \$399.00 (not including required installation) and includes the software needed to run an application processor. For your file processors, you need the ARCNET Interface card (26-6501) and the file processor software. The file processor software (26-6502 \$499.00) is a one-time purchase for your ARCNET system. These prices are substantially less than competitive network offerings.

If you are using Model IIs in your ARCNET system, you may need to add a 16K memory board (26-6503 \$189.00 plus required installation) to the Model IIs. This 16K board is NOT needed if the individual Model II has the VisiCalc 64K memory board (26-4105), has a Model II hard-disk interface installed, or has a Model 16 upgrade installed. This 16K memory board is not required for Model 12s.

The second element is coaxial cable which you buy by the foot to meet your needs. Radio Shack has the following cables to meet your needs:

- A 20-foot cable for \$15.95 (26-6510)
- 50-foot cable for \$24.95 (26-6511)
- 100-foot cable for \$39.95 (26-6512)

or you can buy cable by the foot (26-6513 \$0.21/foot)

Third, you need a junction box or port hub for up to four processors. This "passive hub" or junction box is stock number 26-6504 and retails for \$79.00.

Fourth, for larger systems and distances, an active junction box or port hub that will cost \$995.00 (26-6508) and is designed to support eight terminals.

Literally, this is all you need to simply plug TRS-80s together. In fact, you can just keep on plugging until you have up to 255 processors in the system. A very big computer resource from very small computers.

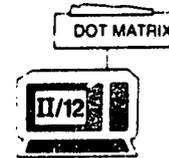
The ARCNET operates at 2.5 million bits per second so that it is transparent to the user, i.e., the user normally does not know that anyone else is on the network. From a technical viewpoint the ARCNET local network for Tandy products is identical to the Datapoint network component of ARC. The interface card installed in the TRS-80 MODEL II/12 uses the same LSI, the active and passive hubs are the same, as is the cable. The software is very similar but has been configured to operate with our standard TRSDOS disk operating system to provide software compatibility with existing MODEL II/12 software and hardware.

ARCNET will permit multiple TRS-80 MODEL II/12 computers, and future TRS-80 computers, to be linked into effec-

tively large scale networks or systems never before possible with personal computers. In fact, ARCNET is the lowest cost network implementation for the office of the future. The owner of a TRS-80 MODEL II/12 does not obsolete his investment. His existing MODEL II/12's are easily modifiable to become part of the network.

Lets trace how a typical TRS-80 user could grow using ARCNET. Many TRS-80 users are now doing their accounting on a floppy disk based TRS-80 MODEL II/12 system with a printer.

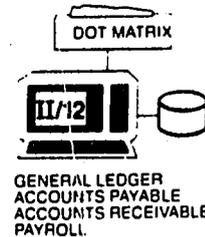
ACCOUNTING DEPARTMENT



This requires a sizeable quantity of floppy disks to change programs and to store data. By adding our new 12 megabyte hard disk, a single MODEL II/12 can operate all the standard accounting functions of General Ledger, Accounts Receivable and Payable, and Payroll without the need for this quantity

2

ACCOUNTING DEPARTMENT

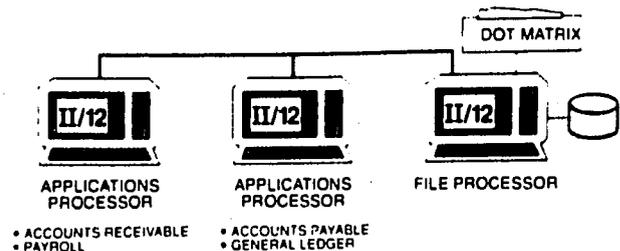


of floppy diskettes. As the business grows, however, the time required to enter all the data will exceed the capability of one operator at one keyboard. Today, while a second MODEL II/12 could be added, that would not be a good solution as the data files on the hard disk and the printer could not be shared by both computers.

The solution is ARCNET. By installing an ARCNET interface board in the existing TRS-80, it becomes a file processor and by adding two more TRS-80s as applications processors, a low cost interconnection hub and some cable we have a starter ARCNET system.

3

ACCOUNTING DEPARTMENT



The accounting tasks will now be split between the two applications processors, each of which is a TRS-80 computer running its own program but sharing the hard disk files and the printer. The accounting department has now doubled

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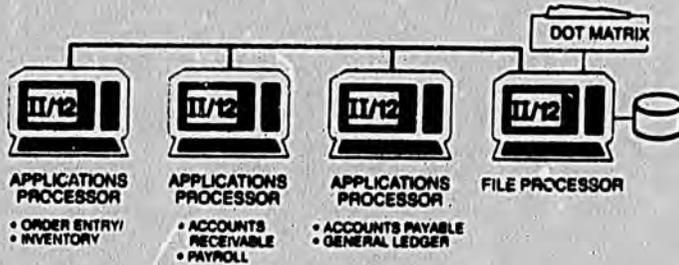
its processing ability at a cost significantly less than adding another entire TRS-80 system and without any reprogramming.

Since ARCNET can be reconfigured by the user at any time by plugging in another TRS-80, as you exceed the capacity of this network you can simply add another TRS-80 application processor or file processor.

In concept and operation ARCNET is very similar to Ethernet, but, unlike Ethernet, ARCNET is based on a proven, reliable technique with over four years of field operation. Today, adding one computer to an Ethernet system would cost 3 to 5 times the cost of the same addition to ARCNET. We selected the ARCNET local network because of its proven ability to handle large business networked applications using hundreds of processors.

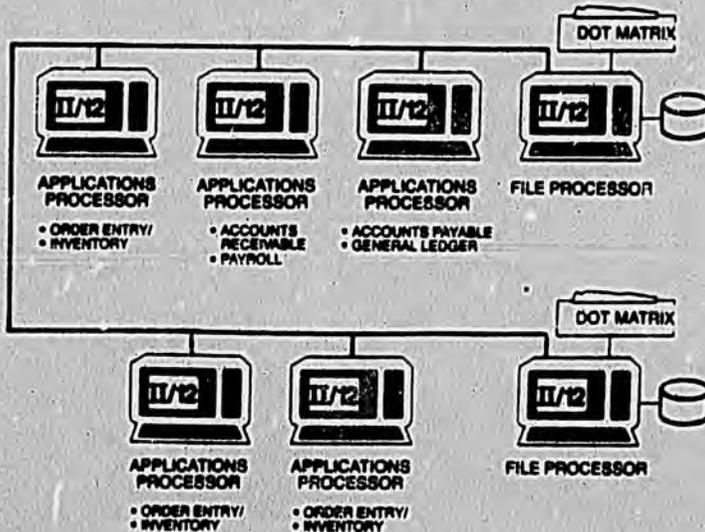
Our small business, who happens to be a Widget distributor, now decides that accounting is under control and it's time to get the inventory on the computer.

ACCOUNTING DEPARTMENT



By plugging in one more MODEL II/12 our distributor adds order entry/inventory control. At this point the total cost of this system is still less than \$20,000. As the widget business thrives, more TRS-80 work stations are needed to handle the increased order volume. Two more TRS-80s can be added to the network, but by now the size of the files and the printing volume pass the ability of the original file processor. Another TRS-80 file processor with hard disk and printer are also added, and our final configuration looks like this.

ACCOUNTING DEPARTMENT



The widget distributor system has grown from a \$10,000 system to about a \$45,000 system in easy, affordable steps.

The additional equipment was added without down time any unit in the ARCNET system can be added or removed without affecting the system. And since the TRS-80s in the system are interchangeable, the loss of any one unit of service does not affect the ability of the system to operate. Perhaps most important of all, this growth has been accomplished without rewriting any software. The system shown, has 5 independent applications processors which can not only be used for the specific applications shown but can be used interchangeably for any of the applications shown when required. There is about 24 megabytes of storage which can be increased to 96 megabytes by adding any additional file processors, and there are 24 line per minute printers.

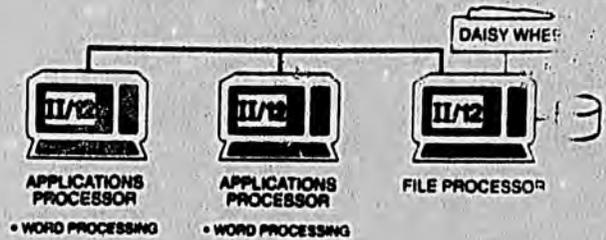
Let's go back to our original starter TRS-80 system now it is in an office of a large corporation as a word processor. The hard disk is the same, but the printer is a letter quality daisy wheel.

ADMINISTRATIVE OFFICE



Typically word processing is very keyboard intensive with only light duty printing. By going to an ARCNET network, additional secretaries can have TRS-80 workstations and share the same daisy wheel printer which is equipped with an automatic paper sheet feeder.

ADMINISTRATIVE OFFICE



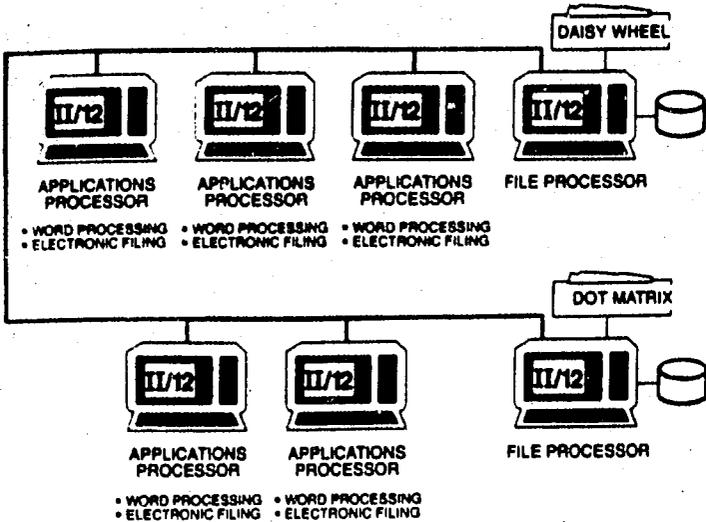
Another application which could be used on this network is electronic filing which would be available to all the TRS-80 workstations. Again we have the software today to support these applications, and both our word processing and electronic filing software include a high degree of security to prevent unauthorized access. Clearly TRS-80 and ARCNET can now be integral components of the office of the future.

Just as with our widget distributor, this office system grows as requirements change, and a typical growth pattern would be to add a second file processor as the number of workstations increase, but this time a high speed dot matrix printer is added to produce draft documents to leave the letter quality printer free to produce final documents.

In the system shown, five workstations share the resources of the two hard disks and the two printers. Additional workstations can be added at any time.

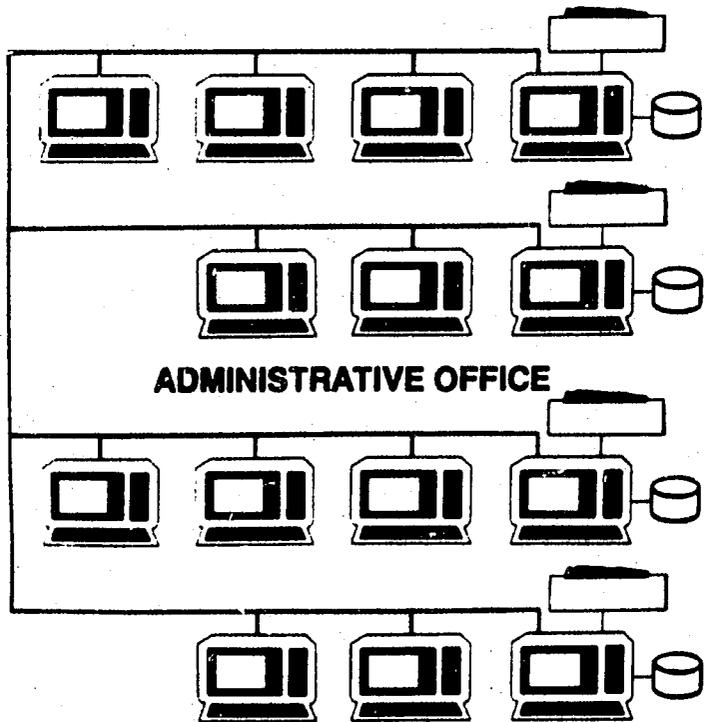
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ADMINISTRATIVE OFFICE



If this office was not in a large company but was the office of our widget distributor, the two systems could be connected into one network for only the cost of the cable.

ACCOUNTING DEPARTMENT

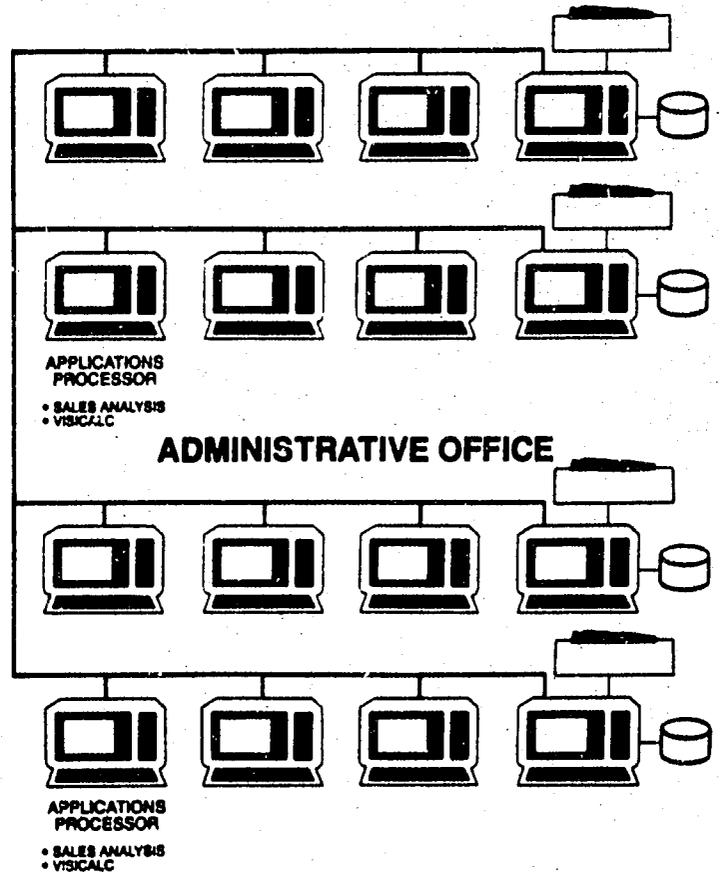


The entire company now has a network with a common database accessible to all users but with security restrictions as needed. To make use of this database, let's go one more step and add two more TRS-80 workstations for the sales manager and president.

These stations can operate our sales analysis program which can query both the order entry and the accounts receivable data bases to provide customer, salesman, or product sales results. They make the power of VisiCalc available to the manager for forecasting and planning as well as making word processing available to ease writing of the keynote speech for the annual convention of widget distributors.

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ACCOUNTING DEPARTMENT



To sum up the advantages of ARCNET:

- It gives both our existing base of TRS-80 owners as well as new buyers a clear path to expand as their needs dictate without obsoleting of present software or hardware and with the assurance that our future hardware and software will be compatible.
- It provides a common data base to all users, allowing implementation of sophisticated software to help managers monitor their business.
- It provides more computing power than is possible with a minicomputer of similar cost.
- It provides system redundancy since the failure of any one unit will not halt operations.
- It can be installed at a low cost, yet its high-speed, reliable operation is already well proven.
- And most important it provides an easy growth path to a large powerful data processing system in affordable steps.

In the decade of the 80's, networking of computers will become commonplace. We believe the Datapoint networking experience has resulted in a reliably proven, low cost networking system which will speed the implementation of networks into common use. Therefore, we will implement ARCNET in some of our future product offerings which implies a high degree of compatibility between these future products and the TRS-80 MODEL II/12.

TDM

Data Management System

TPG

Program Generator



YOUR BEST CHOICE IN DATA MANAGEMENT SYSTEMS

TDM is our general purpose, heavy duty file management and reporting system. We think it compares to other file management systems the way a 16-wheeler compares to the family car — it is designed for big loads and lots of work, not for little errands around town.

TPG gives you a menu-driven way to create ultra-fast, customized Pascal programs for file updating and inquiry. It's the only product we know of that lets you draw data from up to 16 different databases simultaneously, without writing a line of code yourself.

In these products we've tried to **put the power of Pascal in your hands, but with most of the difficulty distilled out.** We've tried to give you a set of flexible, powerful tools to store large volumes of data, and produce the kind of reports you really need, without limiting you to rigid formats and inefficient processing.

We've tried to give you room to grow. Today's little file is tomorrow's huge database, and we know you won't enjoy converting away from an inadequate file management system. We encourage you to look at other products, and think about what you'd really like your system to do for you. We're confident you'll see why people with big system requirements choose our products.

The power of TDM and TPG are reflected in the comments we get from our users. Here are a few samples:

"At last I can get a report that looks the way I want it to. Summary reports are easy, and I can spread things around on the page."

"I didn't think it was possible to do things like that on a micro with an off-the-shelf package. I am even printing some of my reports in four colors, which turned out to be easy."

"I maintain over 200,000 patient records with TDM and TPG, on a Corvus network with 4 Apple IIs. I'm the General Manager of the business, but I was able to set up the entire database system myself, including the TPG update programs."

"We keep over 10,000 job applications in a TDM database. We have over 3000 employees in 30 job categories, with part time and full time work, odd hours, seasonal employment, and a lot of employee turnover. Using TDM we can easily scan our files in one pass to find every candidate with the right combination of background, skills, and availability."

"I am responsible for scheduling and monitoring the facilities management activities of a very large electronics manufacturer. I use TDM to keep track of what needs to be done and when. TDM's date arithmetic and comparisons come in very handy."

"We tried DBMaster, Versiform, and several others and finally switched everything over to TDM. Where were you when we started this project?"

You get the idea.

All this power and versatility takes a little getting used to. You won't learn how to use TDM or TPG in a few minutes, just as you won't learn to handle a 12-speed transmission in a few minutes. (You might learn to use an automatic in a few minutes, but you won't carry much of a load.)

It takes a couple of days to get comfortable with either TDM or TPG — but that's a lot less than the months or years it would take you to do the same things writing your own code.

A word about TPG. TPG lets you create very sophisticated file update programs without becoming an expert programmer, but it does require that you be comfortable with some of the mechanics of programming. It may require that you get more technical than you really like. TPG is designed primarily for people who have at least a little programming background, but who want to eliminate 95% of their work and still do the job they want to do. If you are a total novice in computing, you probably won't want to try TPG, just as you wouldn't want to try long-haul trucking without a little driving experience.

IBM/PC AND APPLE III EXPANDED VERSION

We are very pleased to announce that our versions of TDM and TPG for the Apple III and IBM/PC have been significantly expanded in capability and incorporate features offered by no other data management system we know of. New TDM lets you do all the same old things, but now gives you 100 fields (and lots more sub-fields) per record, larger records, greatly expanded title and heading space

and **COLOR!**

PRINTING REPORTS IN FOUR COLORS

With one of the new color printers, you can print TDM reports in **four colors!** TDM allows you to send the necessary control characters to the printer whenever you want — even in the middle of a line. So, not only can you produce the reports you want, you can highlight critical messages and make important information really stand out. Print your invoices with past due amounts in red, for example.

Compare the price and the power, and think about what you really want out of your computer... then

**TALK TO YOUR DEALER, OR
CALL US AT (415) 321-0761.**

You'll be glad you did.

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T D M - THE DATA MACHINE

TPG-THE PROGRAM GENERATOR

TDM is a data management and reporting system for the Apple II, Apple III and IBM/PC, and soon, the CORVUS CONCEPT. It is intended for serious business users with large data bases or complex reporting requirements. Most TDM users are large corporations with requirements exceeding the capability of other data management systems for microcomputers. Current users include Marriott's Great America, Saga Corporation, Fairchild, Applied Materials, Corvus Systems, Triad, Addison-Wesley, Goldman Sachs, Coherent Radiation, and many others.

TDM may be used with many text formatters to produce word processing quality reports or personalized form letters with automatic paragraph, sentence, or phrase substitution based on database contents.

TDM will produce files which may be used by other programs, and will accept files from other systems for file updating or report generation. A procedure is provided for passing TDM data to Visicalc.

TDM is designed for use by non-technical people. Simple report specifications give the system great flexibility, and make possible the rapid preparation of far more complex reports than is possible using other data management systems.

TDM supports related data bases; data from two different files may be combined and then output to either a sequential file or another database, or input to report processing. For example, a customer number from an order file might be used to retrieve the customer name and address from a customer file, in order to print invoices.

Within memory limitations, TDM allows any number of report titles and headings, and allows reports to be formatted with great freedom. Report procedures may include IF . . THEN . . ELSE statements nested up to 16 levels deep, GOSUB statements, and labelled paragraphs. Page numbers, tabbing, dates, pause for paper change, and other features are included. Date arithmetic allows calculation of elapsed time. Dollar Field Formatting allows insertion of dollar signs, commas, and brackets into reports.

Partial key retrieval and duplicate keys are supported throughout TDM. Sorting is done with keyfiles, and keys may be composed of portions or all of any fields in the data record. Sorted keyfiles are retained and may be used for retrieval or preparation of many reports in the same sequence.

Equipment Required:

Apple II with 65K, 80-column board or terminal, Corvus hard disk or two floppy drives.

Apple III with 256K, Profile, Corvus hard disk, or two floppy drives.

IBM/PC with 256K, Corvus hard disk, or two 320 KB floppy drives.

Coming soon. . .CORVUS CONCEPT

System may be used in the Corvus Constellation or Omninert environments.

Other software required: NONE for Apple, UCSD Pascal P-system + for IBM/PC

Suggested retail price: \$625; additional manuals, \$40 each.

No extra charge for multiple copies used in network environment.

Author: Steve Schwartz, with Sean Findley

Copyright: Pascal Systems, Inc., 1981, 1982.

TPG accepts menu-driven user definition of screen formats, edit requirements, and update processing, and produces a Pascal source code file which is compiled. The resulting program is an interactive inquiry, input, edit, and file update program which accesses TDM files.

The user defines the position and length of the fields on the screen, and labels them as required by the application. Each field on the screen is then related to a field in a TDM database. Up to 17 screens may be defined in this manner. Fields from up to 16 different files may be accessed at the same time to fill fields on the screen, or to check input for validity. Several standard edit types are provided which may be applied to any field, or the user may code his own edits.

TPG requires some familiarity with Pascal programming. It may be used to quickly generate efficient, structured update programs for use in application systems based on TDM. Experienced programmers may add to or change the code generated by TPG to create specialized code.

TPG includes the database access units for TDM.

Equipment Required:

Apple II with 65K, 80-column board or terminal, Corvus hard disk or three floppy drives.

Apple III with 256K, Profile, Corvus hard disk, or two floppy drives.

IBM/PC, and 256K, Corvus hard disk, or two 320 KB floppy drives.

Coming soon. . .CORVUS CONCEPT

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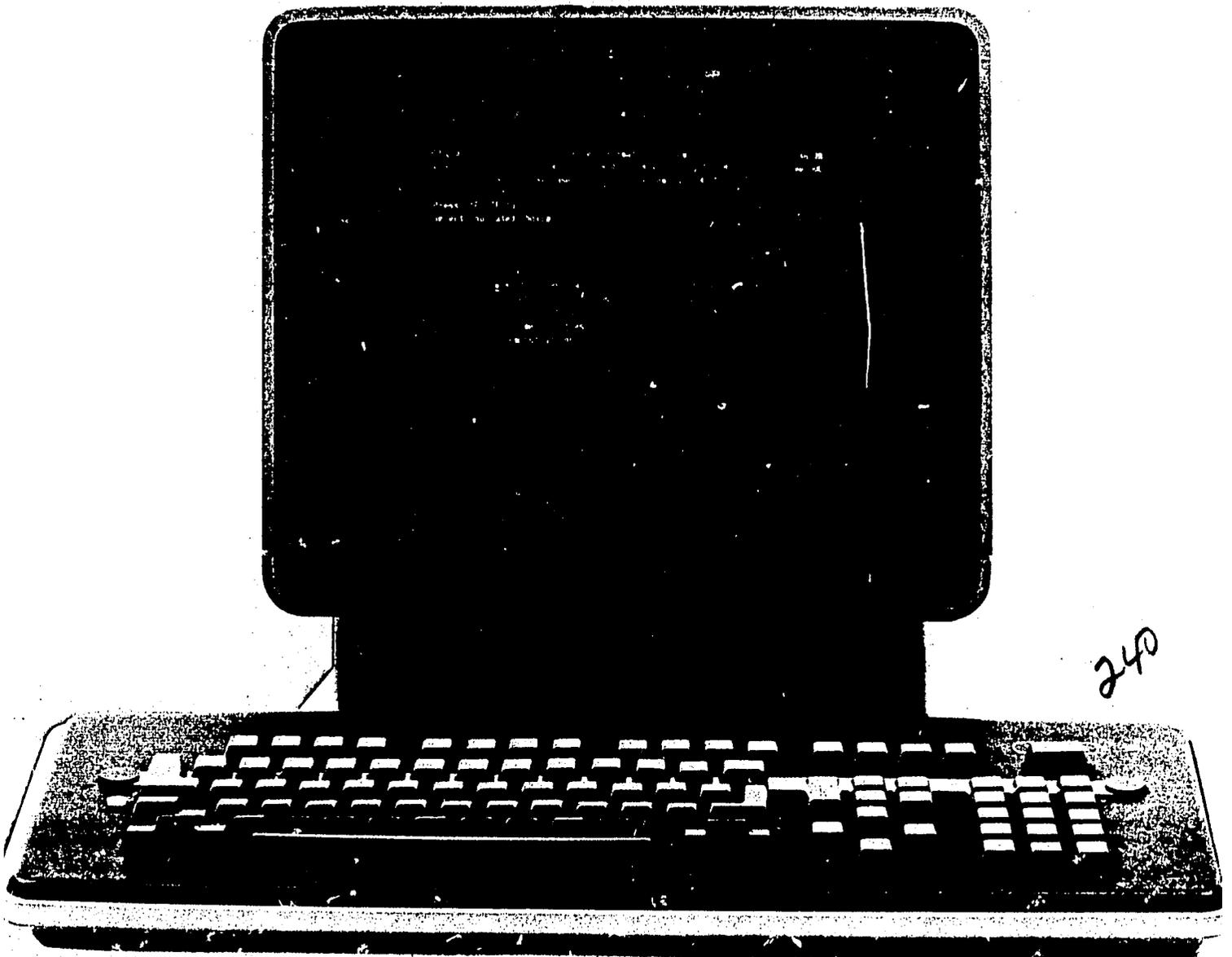
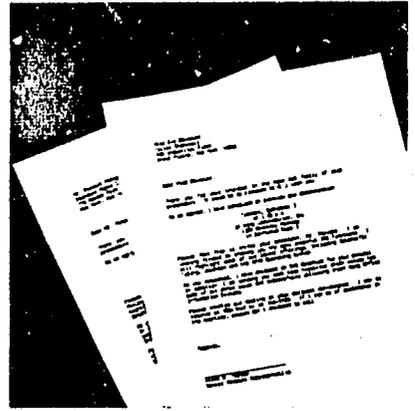
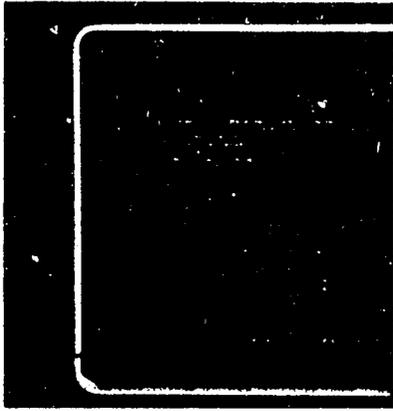
Other Software Required: TDM, UCSD Pascal compiler

Suggested Retail Price: \$625; additional manuals \$30

Author: Sean Findley

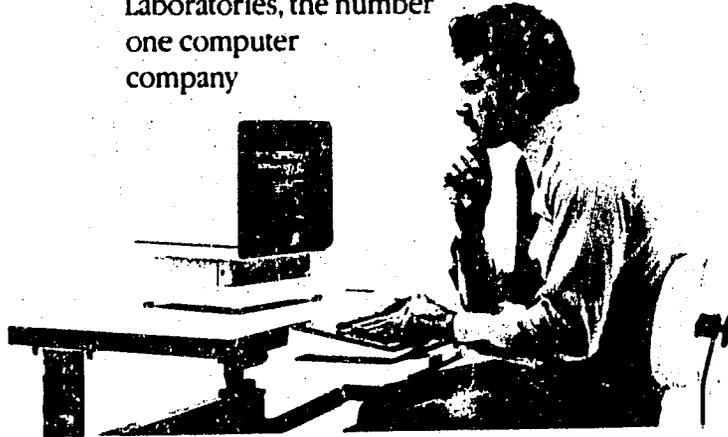
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When the Kind of Business You Run Demands the Best Word Processing There Is

It's been a natural evolution. Typewriters replacing pencils. Now word processing systems replacing typewriters. We've all come to realize what a boon word processing has been to office productivity. But how do you choose the best word processing system for your way of doing business? Turn to Wang Laboratories, the number one computer company



leading in office automation.

We have the systems that can meet your tough standards for fast turnaround and high-quality output: Wang Office Information Systems (OIS). These systems can help your company better manage those information-intensive activities that are essential to your daily operations. Including memos, letters, reports and other written communication. As well as data processing functions—like accounts receivable and accounts payable—to meet some of your data processing needs.

The OIS family demonstrates Wang's continuing commitment to Office Automation—which we define as people using technology to manage and communicate information more effectively. And Wang Office Information Systems are some of the most powerful office automation tools on the market today. Designed to meet the needs of your entire office team.

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When Fast Document Turnaround Is a Priority

Paperwork is everywhere. From the memo you write to your staff, to the reports you give to stockholders, to the literature you mail to prospective customers, fast turnaround is critical. But you don't want to sacrifice quality to meet a deadline. The appropriate word processing equipment can help you do the job: Wang Office Information Systems.

If your people can use a typewriter, they can use OIS word processing. The familiar keyboard layout means minimal training for maximum productivity. And the OIS interactively leads users through document creation, editing and printing so they don't have to memorize complicated commands and codes.

A number of outstanding features result in faster input. Such as automatic word wrap-around (instead of pressing a RETURN key at the end of each line, the system automatically moves text to the next line when you exceed your margin); automatic centering, indenting and decimal alignment; automatic title and page numbering; global search, replace and hyphenation; and right-margin justification, just to name a few.

Powerful text editing features help your staff produce professional-looking final documents: insertion and deletion of characters, words, lines, paragraphs or entire pages of text; movement of text to and from any place in the document; copying of commonly used text from other documents; and many more functions.

The Wang OIS is designed to help users manage their time more efficiently. By eliminating time-consuming retyping when editing a document. By allowing users to create or edit one document while printing another. And by countless other advanced functions that lead to greater productivity, such as automatic paragraph numbering and document merge.

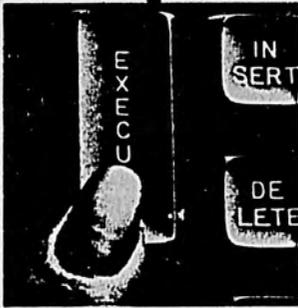
Outstanding library functions help users organize and manage information for easier access. Text can be stored by department or author or any number of other designations, simplifying filing, editing and distribution of information.

Optional functions, such as the Spelling Verifier and Readability Index, can help your people check documents for spelling errors as well as determine how easy they are to read and understand. Especially in correspondence with other companies and individuals, these features help ensure that your ideas will be presented in a clear and professional manner.

The menu-driven Wang CHARTER graphics package on the 6300 Graphics Terminal lets your professionals, managers and secretaries easily produce business graphs, including bar, line and pie charts. Because graphs are easier to read and understand than columns of numbers and complex tables, you'll find them an extremely valuable decision support tool. They instantaneously highlight trends and comparisons, giving you a clearer perception of business activity at a glance.

Another Wang OIS option—the Scientific Typing Package—enables your staff to handle scientific symbols and multi-level equations. So complex formulas can be keyed into a document as easily as any other piece of text.

The versatile, industry-leading word processing capabilities of Wang Office Information Systems put your people at ease with office automation. So they can concentrate on their work, rather than the mechanics of producing text on a computer. And that has a positive impact on everyone's productivity.



INTERNATIONAL SOCIETY OF WANG USERS
 WANG LABORATORIES, INC. 1700 BUCKINGHAM GREENE, LYNNFIELD, MASSACHUSETTS 01902 TELEPHONE 617-476-5000

To: Barbara Jolin
 Personnel Major Administration
 P. O. Box 7021-0000
 Portland, OR

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To: Ann Brown
 New Bureau, Room 410 Chicago
 One South Dearborn Place
 Chicago, IL 60670

Membership No.: 0011
 Lifetime No.: 0000

JUST A REMINDER...
 FROM WANG LABORATORIES

Wang Wang Wang Wang. It is time again. Your membership in the International Society of Wang Users is due to expire in sixty (60) days. If you would like to continue to receive the society publications and also include any changes in your system configuration or address of interest. Your renewal should be to 0011 and the due-date is February 1, 1980.

THANK YOU FOR YOUR MEMBERSHIP!

List Processing and Merge functions
 make form letters easy to produce.

When You Need Data Processing Power, Too

While the OIS family's primary strength lies in its outstanding word processing features, Wang Office Information Systems also support a number of data processing capabilities that can be useful in running your business.

As Wang Integrated Information Systems, they integrate data processing and word processing capabilities into one powerful, easy-to-use system. Their unique design allows users to incorporate data processing files into word processing documents without special programming. With List Processing, you can merge mailing lists with form letters, reformat word processing documents in tabular form for reports, design forms and labels and perform a multitude of other time-saving functions—all without programming a single line of code.

For accurate numeric computations, a Mathpak feature allows users to dispense with external calculators to balance lengthy columns of figures. For sophisticated financial

management and personal computing flexibility, the OIS will support the popular CP/M[®] operating system. OIS users can purchase a wide range of standard off-the-shelf CP/M programs ranging from general business applications (accounts receivable and payable, general ledger and payroll systems) to financial modeling packages (forecasting, electronic spreadsheets and "what if" analysis).

The interactive nature of OIS BASIC—a high-level programming language—gives your company the flexibility to customize applications to meet the unique needs of individual departments. For instance, your staff could be developing programs to evaluate customer demands and long-term market trends. This, in turn, can help your marketing department direct future product development, product promotion and, ultimately, market share.

By combining the strength of its word processing features with the flexibility of its data processing options, the OIS family provides your company with the tools to quickly synthesize critical information and improve your position in the marketplace.



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When Reaching Remote Offices Is Critical

When a company grows beyond a single facility, communication problems often increase. Distance becomes a barrier for exchanging ideas and information. And the potential for time-sensitive data to reach its destination—*after* the appointed hour—escalates.

The Wang OIS offers you a wide range of remarkable options to open the lines of communication among all your sites. Foremost is the Wang Mailway® electronic mail and message system. The Mailway system routes, distributes and tracks electronic mail among Wang system users anywhere, logging the flow of information and confirming mail delivery. When you turn an OIS workstation into a Mailway workstation, you bring your remote offices that much closer to home.

Through WISE, the Wang Inter-System Exchange, you can link multiple OIS within your facility. The connection allows departments to share specialized peripherals, such as the Wang Image Transfer System and the Wang Laser Printer. Through WISE, your OIS can also share documents as well as advanced applications, making every OIS more cost-effective.

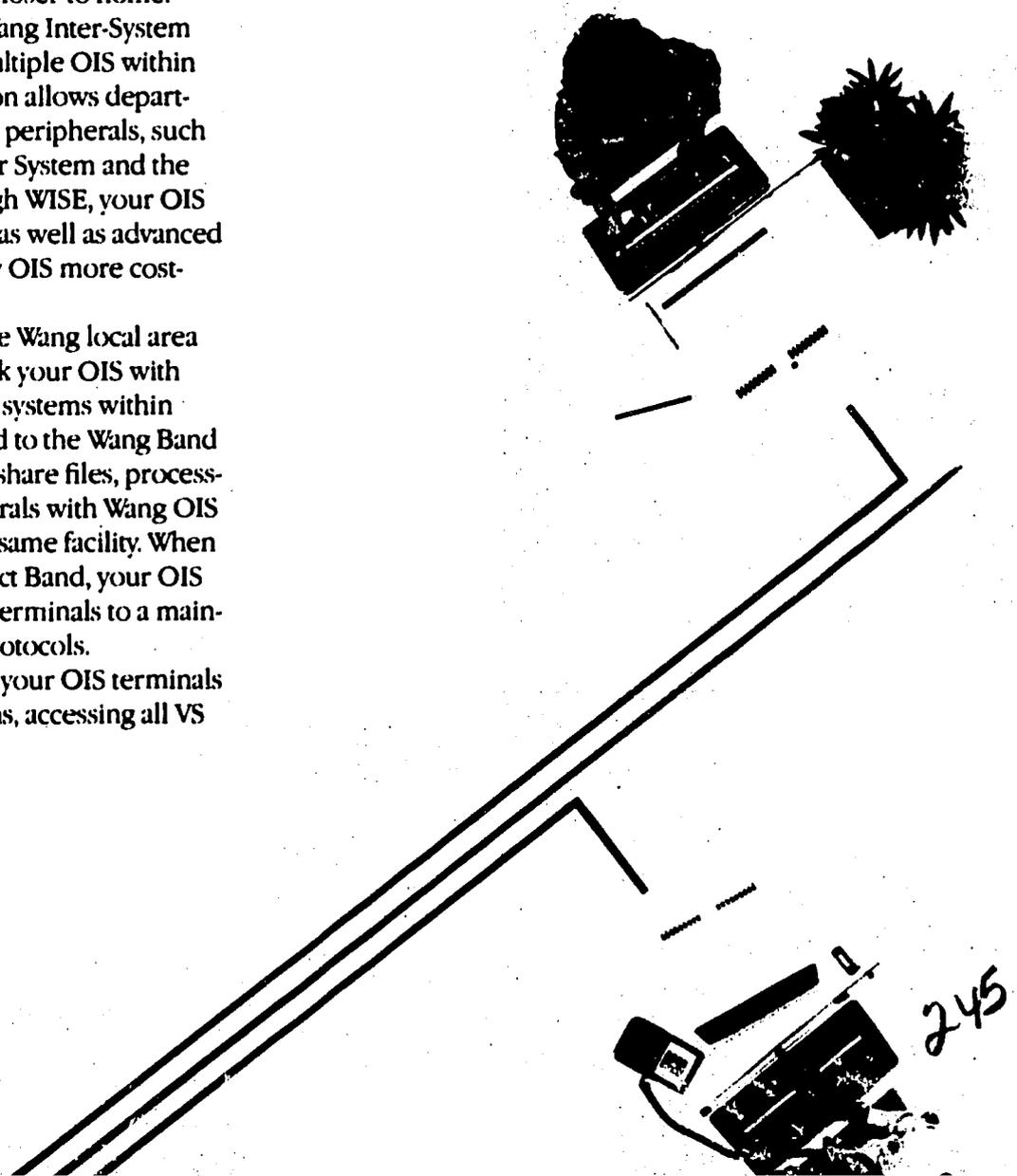
Through WangNet, the Wang local area cable network, you can link your OIS with other Wang and non-Wang systems within your facility. When attached to the Wang Band of WangNet, your OIS can share files, processing resources and peripherals with Wang OIS and VS systems within the same facility. When attached to the Interconnect Band, your OIS workstations can serve as terminals to a mainframe, using a variety of protocols.

Remote WangNet lets your OIS terminals act as Wang VS workstations, accessing all VS

data processing functions. Your word processing users can maintain document archives on a remote host, and even receive documents for editing and storage.

The Wang OIS also supports a variety of industry-standard protocols to enable you to communicate with a mainframe. From the OIS workstation, you can access 3270, 2780/3780, TTY and 2741 emulation, as well as WPS mode.

The assortment of telecommunications and networking options available on the OIS helps your people stay in touch, wherever they may be.



Fitting the Investment to the Workload



Wang offers a completely upgradable family of Office Information Systems to match your operation and budget. For big-system technology at small-system cost, the entry-level OIS-105 can automate the small office or work group at an affordable price. The three models of the OIS-115 help your company make the transition from a small to medium-size office. When you need greater disk capacity, choose the OIS-130A. For extensive processing speed and power—in work groups or information processing centers—there are three OIS-140 models from which to choose. For large volumes of data input, output and storage, the OIS-145 offers the largest text processing capacity in the OIS family.

The OIS-140 and OIS-145 can serve as the entry into Alliance™ 250—which is one of the most advanced information management systems in the industry today. Alliance's Visual Memory structures, categorizes and manages information for free-form access. Under Document Management, the Information Index locates any iteration of a document or record or discrete element of information on your system. Calendar Management automates schedule changes, meeting arrangements, agendas and personal commitments by month, week or day. The Voice Editor gives dictation a whole new dimension by letting you edit voice documents in much the same way as you edit text—with insert, delete and copy functions.

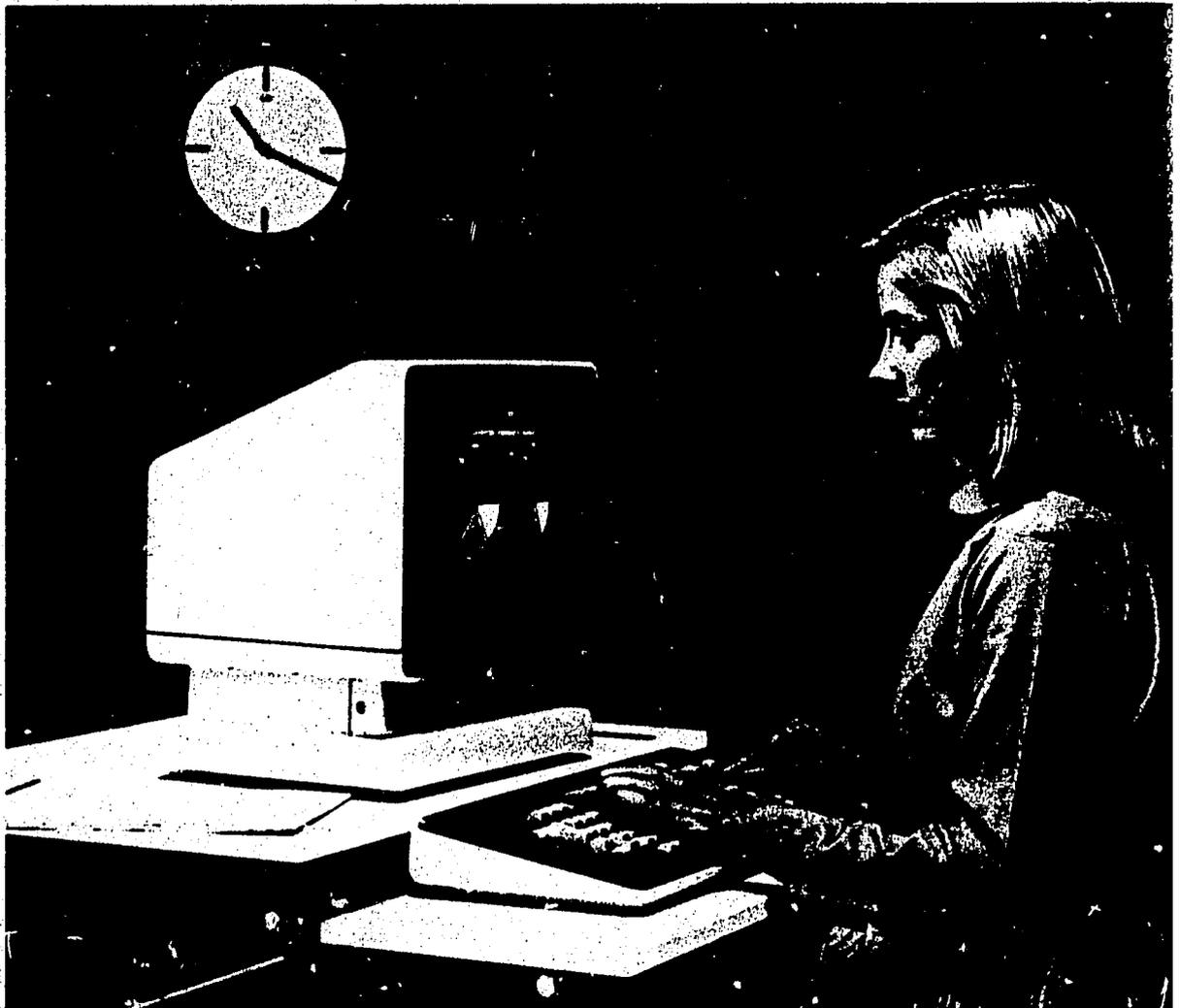
MODEL	TOTAL # OF PERIPHERALS	WORK-STATIONS	DISK CAPACITY* (MB)	TOTAL OPTIONAL DISK CAPACITY (MB)	PAGES** (MAX)
OIS-105-1	3 or 4***	2	4.2	None	1,680
OIS-115-2	8	8	8.4	None	3,360
OIS-115-3	8	8	16.0	None	6,400
OIS-115-4	8	8	32.0	None	12,800
OIS-130A	16	16	10.0	10.0	8,000
OIS-140-I	32	24	26.8	46.8	21,400
OIS-140-II	32	24	53.6	73.6	42,800
OIS-140-III	32	24	80.4	100.4	64,200

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Putting Office Automation to Work

With the world constantly changing around you, you can't afford to have your information network slow you down. With an Office Information System from Wang Laboratories, your company can process and distribute information to everyone in your organization and to the people you do business with—accurately, clearly, concisely and when it needs to be there. Business is always on the move. Don't make your people wait for the information to catch up. To see a demonstration of the Wang Office Information Systems, talk to your local Wang representative, or call toll-free 1-800-225-0643, ext. 206. In Massachusetts, call (617) 459-5000, ext. 5711.

An OIS from Wang Laboratories puts information at the fingertips of those who need it most.



APPENDIX D

Mt. San Antonio College Computer System

Computer Services



Mt. San Antonio College

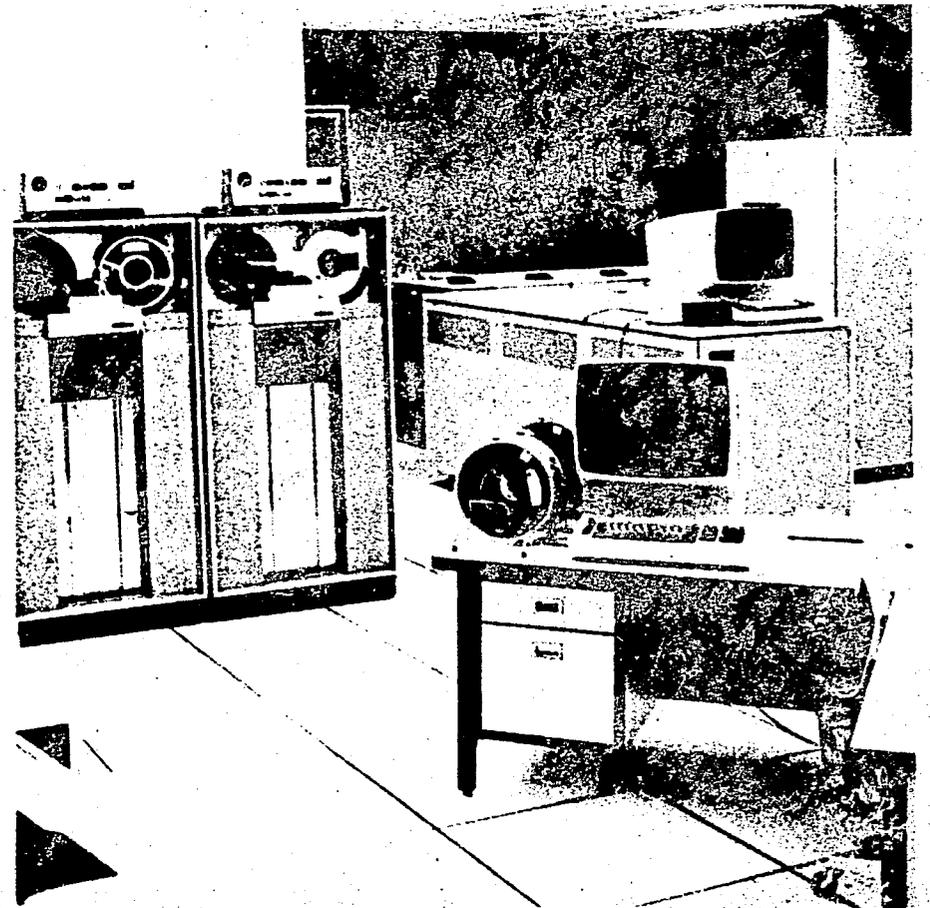
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Mt. San Antonio College
1100 North Grand Avenue
Walnut, CA 91789
714-594-5611



**FOR INFORMATION CONCERNING COMPUTER SERVICES,
PLEASE CONTACT:**

Hal Roach, Manager

Jeff Christiansen, Supervisor of Systems and Programming

Doris Dutton, Supervisor of Operations

Virginia Bohr, Documentation and Training Specialist

A BIT OF BACKGROUND . . .

Although Mt. San Antonio College was founded in 1946, the first data processing equipment, a card tabulating system, did not arrive on campus until 1957. This system was slow and cumbersome by today's standards, but served well until 1968, when the first "real" computer, an IBM Model 1401, was installed. The 1401 was replaced by an IBM System 360, Model 30, in 1970. Computer terminals appeared on campus, and utilization of the information system, along with the enrollment of the College, increased steadily. To accommodate this growth, an IBM System 370, Model 135, was installed in 1972, and upgraded several times over the next six years. In 1978, an IBM System 370, Model 138, replaced the Model 135, and was in use until January of 1981. At that time the present system, an IBM 4341, was installed. The original Model LQ1 has recently been upgraded to a Model M02.

The 4341 is used for administrative purposes, and currently supports the peripherals detailed in the following pages, as well as 96 locally attached communications lines and the associated terminal systems. Additionally, it supports an IBM Series/1 mini-computer which acts as a communications processor for 40 remote communications lines, also dedicated to administrative use.

The System 370, Model 138, which immediately preceded the 4341 has been re-installed, and serves as a host computer to the IBM System 34 located in the Instructional Computer Center, a computer lab facility for data processing students. This configuration allows the System 34 to be used as a remote job entry work station, providing an enhanced environment for student computer use. There are 32 lines available for communications devices on the System 34. Additionally, the 370/138 provides 32 locally attached communications lines and supports a second IBM Series/1 mini-computer with 32 remote communications lines, all dedicated to instructional use.

**CURRENTLY, COMPUTER SERVICES AT MT. SAN ANTONIO
COLLEGE IS PROVIDING COMPUTER SUPPORT TO MAINTAIN . . .**

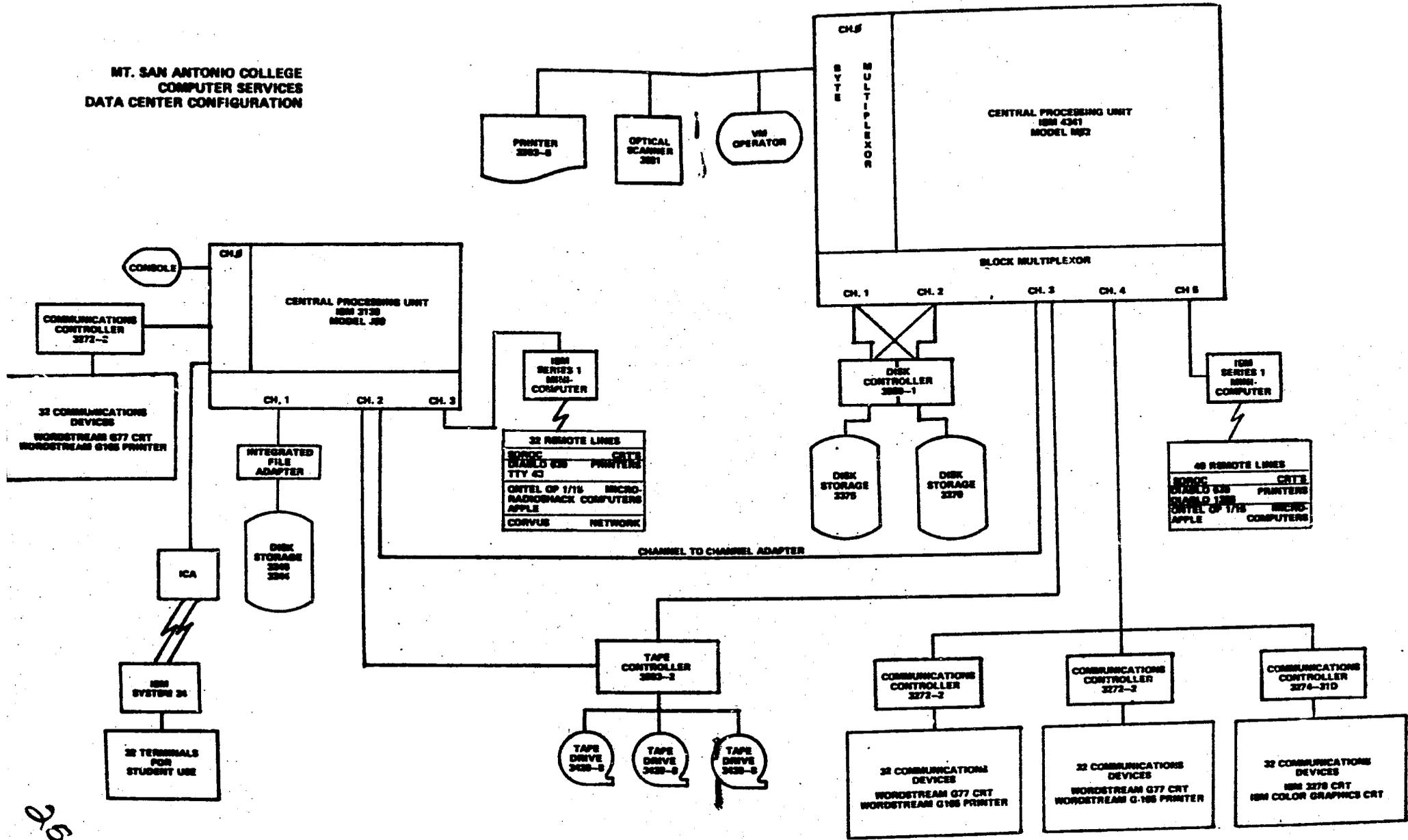
- On-line systems for student admissions and registration
- On-line student Financial Aid processing
- Permanent records for over 325,000 students
- A financial and accounting system, including budget creation, payroll, and inventory
- Attendance collection and reporting for all programs
- Attendance statistics updated daily with prior semester comparison data
- Federally required ethnic and student migration reporting
- On-line systems for creating and updating semester schedules
- On-line personnel records for all campus employees
- Computer assisted instruction aids for Independent Study Courses
- Data collection and state reporting for Occupational Programs
- Veterans status certification and attendance reporting
- Test and survey scoring
- and many other services

FUTURE PLANS . . .

In the dynamic environment of computer technology, predictions may become obsolete before implementation takes place, but future plans for computer utilization at Mt. San Antonio College include:

- Conversion of all District systems to database
- In-house development of purchased software providing access to all files and database systems through terminal inquiry
- Installation of "computing stations" replacing campus terminals and providing word processing, data processing, and terminal capability supported by the IBM 4341
- Computer networking: interactive utilization of computer functions with other public educational agencies
- Development of additional support capability for academic computing on campus, utilizing microcomputers, videodisk, and other electronic technology.

**MT. SAN ANTONIO COLLEGE
COMPUTER SERVICES
DATA CENTER CONFIGURATION**



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SYSTEM CONFIGURATIONS

IBM 4341 SYSTEM

IBM SYSTEM 370/138

DIRECT ACCESS STORAGE DEVICES

3880 Disk Controller
Two Channel Switch

3370 Disk Storage (4)
3375 Disk Storage (2)
—3924 Megabytes—

Integrated File Adapter

3340 Disk Storage (4)
3344 Disk Storage (2)
—840 Megabytes—

MAGNETIC TAPE STORAGE

3803 Tape Controller
Two Channel Switch
3420 Tape Drives (3)

COMMUNICATIONS DEVICES

Channel to Channel Adapter

3272 Communications Controller (2)
Communications Devices (64)

3272 Communications Controller (1)
Communications Devices (32)

3274 Communications Controller (1)
Communications Devices (32)

Integrated Communications Adapter:
Two Binary Synchronous Communication
Lines to IBM System 34

UNIT RECORD DEVICES

3203 Printer
3881 Optical Scanner

MINI-COMPUTERS

Series 1 Mini-Computer (1)
Supporting 40 Remote Lines

Series 1 Mini-Computer (1)
Supporting 32 Remote Lines

SOFTWARE SYSTEMS CURRENTLY UTILIZED WITHIN THE
COMPUTER ENVIRONMENT AT MT. SAN ANTONIO COLLEGE
INCLUDE . . .

Virtual Machine (VM)
Virtual Machine/System Product (VM/SP)
Virtual Machine/Interactive Problem Control System (VM/IPCS)
Remote Spooling Communications Subsystem (RSCS)
Disk Operating System/Virtual Storage Extended (DOS/VSE)
Virtual Storage Extended/Advanced Functions (VSE/AF)
Virtual Storage Extended/Virtual Storage Access Method (VSE/VSAM)
Virtual Storage Extended/Interactive Problem Control System (VSE/IPCS)
Virtual Storage Extended/Basic Telecommunications Access Method (VSE/BTAM)
System Installation Productivity Option/Extended (SIPO/E)
Interactive Productivity Facility (IPF)
Data Interfile Transfer Testing Operations (DITTO)
Priority Output Writer, Execution Processor, Input Reader (POWER)
Graphic Data Display Manager (GDDM)
Graphic Data Display Manager/Presentation Graphics Feature (GDDM/PGF)
Common Business Oriented Language (COBOL)
Report Program Generator II (RPG II)
Series 1 Event Driven Exec (EDX)
Series 1 Yale ASCII Terminal Communication System
University of Waterloo Fortran Compiler (WATFIV)
University of Waterloo Basic (WATBASIC)
University of Waterloo COBOL (WATBOL)
Computer Associates Sort/Merge System (CA-SORT)
Computer Associates Disk Management System (DYNAM/D)
Computer Associates Tape Management System (DYNAM/T)
Computer Associates Full-Screen Terminal Expansion for VM (VTERM)
Cullinane Integrated Database Management System (IDMS)
Cullinane Integrated Data Dictionary (IDD)
Cullinane Report Generator with EDP AUDITOR (CULPRIT)
Cullinane VM Interface
Cullinane OnLine English (OLE)
Cullinane Application Development System/OnLine (ADS/O)
Cullinane Universal Communications Facility (UCF)
Westinghouse Teleprocessing Interface System (WESTI)
Westinghouse Disk Utility System
Westinghouse Disk Utility System/Advanced Functions
Software Concepts Computer Scheduling & Reporting System (CSAR)
Goal Systems International Fast Linkage Editor/Library Maintenance/
Library Copy (FLEE/FLIM/FLIC)
Dylakor Dyl/250 General Utility
Henco Application Development & Utilization System (INFO)
Statistical Package for Social Sciences (SPSS/SCSS)
Eureka California Career Information System
Coordinated Occupational Information Network (COIN)
Time Share Corporation Guidance Information System (GIS)
—Rental: Hacienda La Puente School District
System of Interactive Guidance & Information (SIGI)
—Rental: California State Polytechnic University

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