

# Datapro Reports on PC & LAN Communications

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# Meet Our Advisory Board

*We are proud to present the Advisory Board for Datapro Reports on PC & LAN Communications. Each of these individuals is committed to continuing involvement in our ongoing publication of monthly issues. They are an active resource to us, providing formal review of each issue's contents and informal advice about the technical and editorial direction of the service. We thank them for their continuing support.*

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Bernard David is founder and president of General Information Services, Inc., a company that specializes in connecting dissimilar computers through product provision (both third-party and in-house), evaluation, and consulting. As president, Mr. David has responsibility for overall financial, marketing, and operational management of the firm, which has more than 2,000 clients. He has conceived, designed, and managed development of two connectivity products: Graphics Exchange (PC-based graphics for Wang's WP-Plus editor) and BlueFax (IBM S/3X-to-facsimile). Mr. David has authored a number of articles on connectivity, published or referenced by Datapro, Business Week, The Wall Street Journal, The Philadelphia Inquirer, and several other computer trade publications. He is a lecturer on computer connectivity for Apple, AT&T, Digital, Hewlett-Packard, IBM, Wang, Businessland, Computerland, and Entre Computer Centers. He is also a lecturer in entrepreneurship at The Wharton School, where he teaches "Entrepreneurship and Venture Initiation." Mr. David holds his MBA in marketing and BS in finance from The Wharton School of

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# User's Guide

Welcome to *Datapro Reports on PC & LAN Communications*. In the Datapro tradition, this timely periodical covers the latest products and emerging technologies. The monthly issues provide technical detail that helps you evaluate a system, compare similar products, find out about new product developments, and understand an unfamiliar technology or keep up to date in a technology you already know.

Although you may be eager to explore *Datapro Reports on PC & LAN Communications*, take time first to learn more about how it can serve you and your associates. The monthly issues keep your knowledge current on all the changes that affect the dynamic microcomputer communications industry. This User's Guide points out *Datapro Reports on PC & LAN Communications*' design features, structure, and organization.

Your subscription consists of monthly issues that you may file for future reference in the special loose-leaf binders we provide. Each issue starts off with a Highlights page that draws your attention to the current contents and the important items covered in the issue. An integral and important part of each issue is *Communications Perspective*, a monthly newsletter that covers the latest industry and technology developments.

We encourage you and your associates to read each monthly issue when you receive it so that its timely information can help you in making decisions based on knowledge of the latest available technology.

## Find It Fast

*Datapro Reports on PC & LAN Communications* is designed to help you locate information quickly. The reports in each monthly issue are arranged by subject and identified by a page numbering system that enables you to locate them easily. The binders provided with your subscription contain clearly labeled tabs behind which these reports can be filed. Once you read the monthly issue, we recommend filing all reports in the binders to help you locate important information in the future. The Table of Contents that appears in each issue includes section heads that correspond to the labeled tabs and identify specific subject areas.

The Index (Tab 100) supports the Table of Contents. It provides the means to broaden your search for more specific information. Vendor and product names, concepts, and technologies are cross-referenced to help you quickly find what you seek.

The following describes each section (tab):

### Volume 1 (Survey Reports)

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- LAN Management Product Evaluations (840)
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## The Page Numbering System

*Datapro Reports on PC & LAN Communications'* page numbers consist of two or three parts. This numbering method provides the flexibility to organize the publication by sections and insert new and revised pages each month. The components of a page number (e. g., 650-I048-101) relate to the section/tab, vendor/report identification, and starting page number, respectively. (Note that *only* product report page numbers consist of three parts; all other report types consist of two parts—section/tab and page number.)

**650**—section/tab number

**I048**—vendor/report number (product reports only)

**101**—beginning page number

In this case, **650** represents the **Products • I** tab. The second part of the number, **-I048**, separated

from the first part by a hyphen, represents an identification number for a specific vendor found within a tab section.

The third part of the number, **-101**, also separated by a hyphen, denotes the starting page number of the report. The starting page number will then increase sequentially through the body of the report (for example, -101, -102, -103, and so on).

This page numbering system allows alphabetical arrangement (by vendor name) of reports within a section/tab. For example, a report for a specific model or product line will be grouped with related reports from the same vendor. The first of these reports will carry the page number **-101**; other reports covering the same vendor will start with page numbers **-201**, **-301**, **-401**, etc.

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## Datapro Report Types

*Datapro Reports on PC & LAN Communications* includes a variety of report types, each designed to help you quickly find the information you seek.

### Surveys

A survey is a comprehensive summary of a particular technology, the market and associated vendors, and the products available using that technology. These reports frequently provide background information and offer tips on selection and planning. The key characteristic of a survey report is its comprehensiveness.

Components of survey reports include:

- A *Market Overview*, describing the market, market size, major vendors, and any pertinent survey results.
- A *Technology Overview*, explaining the basic technology, its importance, and future developments.
- The *Comparison Columns*, a quick reference source of company addresses and telephone numbers plus current product specifications and competitive features presented in a tabular format.

### Product Reports

A product report is a detailed examination of a vendor's product or product family. Product reports offer expert evaluations of products, providing both technical and nontechnical data needed to

**Section Name**  
**Report Number**  
**Name of Publication**

**Product Summary**

Speeds your review of the report

**Content Listings**

Show you how to find topics quickly

**Standardized Heads**

Help you locate topics quickly

**datapro** Datapro Reports on Communications Alternatives CA40-738-101  
Fiber Optic Communications

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## Proteon ProNET Fiber Optic Networks

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**Product Summary**

**Editor's Note**  
Many of Proteon's product developments have emerged from the company's continuing involvement in the emerging Fiber Distributed Digital Interface (FDDI) standard. In January 1990, Proteon announced the p4200 multiprotocol FDDI router. This report details the ProNET product line and examines the company's competitive position.

**Description**  
Proteon's ProNET baseband local area networks (LANs) operate at 4M, 10M, or 80M bps and link up to 260 stations per ring over various media, including fiber, using the token-passing media access scheme.

**Strengths**  
Proteon is a leader in providing high-speed LANs. It was an early implementer of the token-passing technique now used by IBM. ProNET's topology supports a variety of fault tolerance schemes. Proteon has announced a free upgrade plan for ProNET-80 users who want FDDI capabilities.

**Limitations**  
To take full advantage of ProNET-80's high bandwidth and variety of interfaces, users must be prepared to develop their own applications and

customized network operating systems. The company once offered installation and programming support for its boards through its Special Systems Development group, but it has discontinued this service. Prices are somewhat higher than those of other third-party vendors.

**Competition**  
Ungermann-Bass Net/One Optical Fiber Network, Codenoll Technology's CodeNet fiber optic Ethernet network, Versitron System Finex, IN-NET Fiber-Talk, other fiber-based Ethernet networks and FDDI networks and routers.

**Vendor**  
Proteon, Inc.  
Two Technology Drive  
Westborough, MA 01581-5008  
(617) 898-2800  
In Canada:  
Proteon ProNET products are sold in Canada through independent distributors and value-added resellers (VARs).

**Price**  
A four-node p6000 ProNET-4 Network Management Kit (see Equipment Prices) costs \$5,000.

**GSA Schedule**  
Yes.

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Delran NJ 08075 USA

MAY 1990

make informed purchase decisions. A product report consists of a one-page product summary, followed by an expert analysis of the product, the vendor, and its position in the marketplace; detailed product characteristics; and pricing.

### **User Ratings**

Datapro's extensive user surveys are compiled into user ratings that tell you what others think of the products they are using. Editors gather survey responses from users of key products and services; these are validated and then tabulated by an independent computer service company. Summary information is prepared in tabular form providing totals, percentages, or mean averages as appropriate for each survey question.

Datapro strongly suggests that readers use the information presented in user ratings with discretion. The ratings are not intended as statistically accurate indicators of represented products' capabilities. Rather, they should be used as guides to potential strengths and weaknesses of those products. Any product decision should be made only after further investigation.

### **Technology Reports**

Technology reports contain how-to information and are tutorials designed to assist you in evaluating practical technologies and in staying informed regarding issues, trends, and new technologies. They cover broad technology concepts, standards, regulatory issues, and other topics. Written in a

management style, they can be used as instructional, planning, and current awareness guides by technology practitioners and their staffs.

### **NSTL Evaluations**

National Software Testing Laboratories, Inc. (NSTL) creates and runs tests that evaluate personal computer and local area network hardware and software. Founded in 1983, NSTL pioneered the use of objective and comparative methodologies to become the leading independent testing and evaluation facility in the microcomputer industry. A member of the Datapro Research Group since 1989, NSTL provides reports generated from its new LAN laboratory to meet the information needs of *Datapro Reports on PC & LAN Communications* subscribers. These reports provide comparative evaluations of LAN hardware and software and are designed to make the subscriber's product selection process easier.

### **Vendor Directories**

Directories are a compendium of information on communications vendors and consultants. Directories frequently provide brief descriptions about the subject areas.

### **Newsletter**

Each monthly issue of your subscription contains a newsletter covering the latest trends, announcements, and industry developments. ■

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# PC-to-Host Communications Products: Market Overview

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## Synopsis

### Editor's Note

This report looks at the current state of the microcomputer-to-host communications market. For information on the technologies behind these products, see the Technology Overview (Report 511-201). In the comparison columns (Report 511-301), we list, in detail, products available from PC-to-host communications vendors.

### Market Highlights

Though not as active as it once was, the PC-to-host communications marketplace is still important to the growing number of companies that want access to information and applications residing on mainframes or minicomputers. This report examines the state of today's market, including a look at some of the major vendors and the roles they have played in the market's growth.

In the past, companies such as DCA, Novell, and AST Research found themselves at the forefront as the PC-to-host marketplace enjoyed tremendous growth and expansion. These companies, particularly DCA, led the way with products ranging from simple 3270 terminal emulation products to remote emulation products to LAN gateways.

Recently, though, the market has slowed somewhat. The dynamic growth of previous years has been replaced by a market now saturated with a wide variety of vendors and products. Many companies, unable to compete with the extensive product lines of vendors such as DCA and Novell, have found a home in niche markets such as micro-to-minicomputer links or Macintosh-to-host connectivity products.

# Analysis

## Market Leaders

### The Top Competitors

Digital Communications Associates (DCA), a pioneer in the PC-to-host market, quickly established itself as the dominant vendor (claiming an installed base of over 500,000 users and approximately 50 percent of the market). The company established its reputation with the IRMA board, a hardware-based, add-in terminal emulation board acquired from Technical Analysis Corporation (TAC). IRMA was the first product to offer a coax interface to an IBM mainframe by emulating the IBM 3278 family of terminals.

IRMA soon became the emulation board that all other boards were measured against. In a clever strategy, DCA provided source code to third-party vendors, widening the use of the IRMA board even more. DCA also offers products that provide remote terminal emulation, connectivity with IBM System/3X minicomputers, and local area network (LAN) gateway products.

Although the PC-to-host market is based on IBM products, IBM is not generally recognized as one of the leaders in this market. Many other companies followed DCA's lead before IBM released its first PC-to-host product. IBM and IRMA are, however, accepted as the de facto standards with which products must comply.

Other major PC-to-host vendors include AST Research, Novell Communications Division, National Semiconductor (Quadram Products Group), and BlueLynx. With the exception of National Semiconductor, these companies provide both 3270 and 5250 environment solutions. AST's strength lies in System/36, System/38, and RJE terminal emulation, while Novell's strength is gateway communications. National Semiconductor concentrates solely on 3270 emulation and offers board products that are both IBM and IRMA register-level compatible. National Semiconductor

sells its products with and without terminal emulation software, so that users can purchase only an IRMA-like board if PC-to-host communications are already in place. BlueLynx offers 3270 and 5250 emulation products that function in local, remote, or cluster configurations.

### Marketing Strategies

Although the products' purpose is identical—providing a PC communications link to a mainframe—vendors' technical approaches and sales strategies differ. Novell's product line, for instance, is modular. Interface boards providing specific connections (coax, twinax, remote, gateway, etc.) are sold separately from the software. In effect, users choose from a menu of products, choosing the type of connection, the type of software, and options such as graphics capabilities. Other companies, such as BlueLynx, bundle the software and the hardware, enabling users who want a product that provides a 5250 cluster connection to buy one package that includes hardware and software.

Each selling strategy has its advantages; which one is better depends on the knowledge of the user. The menu approach is convenient for customers who have sharply defined needs and goals, but it may be confusing to novices faced with choosing from a wide array of selections. Novell Communications, however, has been very successful with its menu approach, and the company has fared well because of its already strong reputation in the LAN market.

Users who have attempted to set up a system by reading countless product manuals and coordinating selected elements attest that an all-in-one product is easier to install than modular components. Attachmate, a company that offers completely IBM-compatible connectivity software, offers an "all-in-one" product called EXTRA!, a software package that supports remote-modem, LAN, and coaxial connections. Most vendors offer products based on the different types of connections, (i.e., coax, remote), but Attachmate supports all connections within a single package.

### Trends and Issues

There was a time when PC users did not understand the need to connect to a mainframe; today,

almost any corporation with PCs in place recognizes that need. Although their PCs may have been installed to perform standalone, independent application processing (such as word processing, graphics programs, and spreadsheet analysis), a need soon developed to access and manipulate data that has traditionally been under the mainframe's control.

All currently noncommunicating PCs are potential candidates for PC-to-host links, and purchasing policies for PCs, mainframes, and any intermediaries between them need to consider the possibility of interconnection. New, more cost-effective and powerful multitasking PCs will make downloading mainframe applications more feasible. Recognizing the place of PC-to-host products, larger corporations are increasingly developing a company-wide strategy of including both mainframes and PCs within their overall computing capability.

DCA was the first to respond to the need for mainframe connectivity, with the introduction of IRMA—the first PC-to-IBM mainframe terminal emulation board. IRMA's initial success opened the industry floodgates, and soon a wave of vendors was introducing micro-to-mainframe connectivity products. For years the PC-to-host marketplace was one of the most volatile in the computer industry. Vendors began to expand their product lines' capabilities in offering such products as Digital Equipment Corporation emulation for accessing VAX minicomputers; 5250 emulation for communications with IBM minis; and even software-only products that eliminated the need for add-in emulation boards.

Users have long been calling the tune in the PC-to-host market. Accustomed to the friendliness of microcomputers, they demanded that packages be equally easy to install, access, and use. The users also wanted transparent access to the host so that they could work on host applications using the capabilities of the PC. Both users and vendors strive for pure peer-to-peer communications, but the PC is still distinctly different from the host, and access is not truly transparent.

Vendors have improved basic PC-to-host capabilities by adding several features that make their products friendlier. Many software programs now contain context-sensitive Help screens, on-line tutorials, and menus to lead the user through installation, configuration, and reconfiguration. Most of the top vendors offer all these features as well as a common user interface among their products. The few major vendors that do not are quickly upgrading their products to remain competitive. Multiple sessions, hot keys to DOS, pop-up windows, multiple windows, and printer emulation are other features that add to the value and ease of use of a package.

Recently, however, market growth has slowed. The marketplace is now saturated with a variety of connectivity options, and new vendors would seem hard pressed to make any serious inroads in this heavily populated area. In addition, with the increasing popularity of the LAN in the corporate environment, more customers are looking toward LAN gateway products as a means of gaining mainframe access. How much impact this will have on the more traditional PC-to-host products remains to be seen, but it is apparent that the products are not likely to be as much in demand as in previous years. ■



# PC-to-Host Communications Products: Technology Overview

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**Synopsis**

**Editor's Note**

This report examines the technologies that drive the PC-to-host marketplace. For a detailed list of available microcomputer-to-host products and their capabilities, see the Comparison Columns (Report 511-301). For a better idea of the current marketplace, see the Market Overview (Report 511-101).

**Technology Highlights**

The first section of this report, Technology Basics, outlines the technology behind microcomputer-to-host communications. This section looks at important topics such as the actual hardware and software involved in establishing a host link; communications protocols; communications networks; and codes and character sets.

The Products section provides a general overview of the products needed to establish a PC-to-host link. For the most part, these requirements can be broken down into the add-in boards for the microcomputers and the microcomputer/host software components, which provide terminal emulation and file transfer functions along with a host of other possible enhancements.

The report's final section, Selection Guidelines, addresses issues and concerns likely to arise while implementing a microcomputer-to-host link. These factors include cost justification for purchasing a PC-to-host link, important questions in selecting a terminal emulator, integrated applications, and security and data integrity issues.

# Analysis

## Technology Basics

PC-to-mainframe communications can be viewed as merely the substitution of PCs for dumb terminals. PCs were not designed for this role, however, and therefore have characteristics that must be accommodated through the technology and through careful user planning. To determine the best PC-to-host link for a particular situation, users must gain a basic understanding of the differences between mainframes and PCs and the elements that any communications system must employ.

Some fundamental operating characteristics are quite different. Mainframes and communications systems are both heavily involved with controlling a variety of concurrent tasks, whereas most of the 20 million PCs in use are designed to handle a single task at a time for a single user at a time. Most PC users have already encountered frustrations from the limitations of single-tasking systems. While many look with hope toward IBM's new multitasking PS/2-OS/2, its capabilities fall short of handling the complexities faced by PCs when connecting to large communications networks.

## Mainframe Communications

Mainframes have a different hardware architecture, usually with multiple supporting processors to expedite different I/O functions and multiprogramming, and so can efficiently handle large complex networks and databases. People who look at the fast-rising power of the processors in smaller, cheaper systems and predict the subsequent demise of the mainframe tend to forget these architectural differences that support various applications and greater system throughput. It may be cost effective to download certain jobs to a lower level processor (especially since the last generation's large system is this generation's midrange). Some complex jobs

are always left over at the high end and new applications are becoming cost effective, as big mainframes can handle ever larger, more complex jobs.

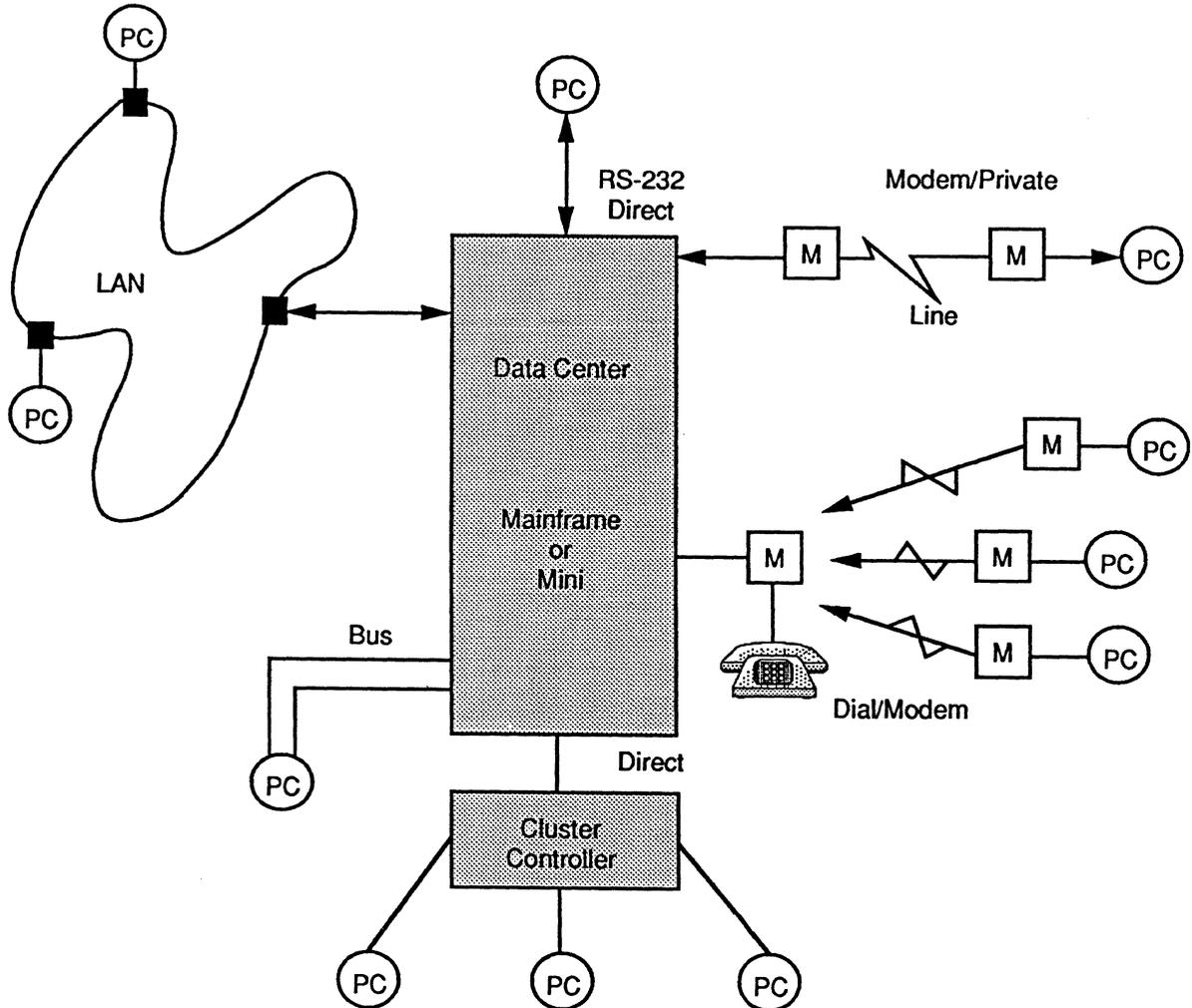
Communications on a mainframe are usually handled by a separate, freestanding front-end processor (FEP) attached to an I/O channel. Small mainframes and most superminis substitute an integrated communications adapter capable of handling fewer lines. In IBM systems, the front end is tightly bound to the mainframe because the telecommunications access method software ("VTAM" for SNA networks) resides in the mainframe central processor; the Network Control Program (NCP) that serves as the operating system for the front end must be generated by another mainframe program, the System Support Program (SSP). Some mainframe vendors have all this software in the front end, allowing more functional independence between the two processors.

The incoming communications lines attach to ports on boards that, in turn, are often organized into several groups or subsystems, depending on the system type, front-end model, and so forth. A single front end almost always handles a variety of line speeds and, less often, more than one line protocol and code. The front end, in turn, attaches to one of the mainframe's numerous general-purpose I/O channels that, on larger systems, are parallel-transfer multiplexer channels handled by a separate I/O processor. The front end may or may not share the channel with a subsystem of another type—disk or tape, for instance.

To provide configuration flexibility, mainframes have multiple I/O channels, each usually designed to attach up to eight subsystems with multiple devices per subsystem. Therefore, one channel can attach up to eight current IBM 3725 front ends, for instance, and the 3725 can conceivably attach up to 256 lines, each supporting multiple subsystem controllers that in turn attach 32 terminals in a cluster. Putting all this on one channel would create an impossible bottleneck, but the flexible attachment capabilities allow configuration adjustments for better performance. All large mainframes are designed to comfortably handle a number of front ends, and each physical front end can handle a number of logical networks.

These hardware elements form the backbone of the communications systems, but the real definition and management of the network reside in the software. Communications software on big systems

Figure 1.  
Hardware Connection Options



is almost always in a strictly defined layer, separate from the application programs; earlier amalgamations of the two led to too much confusion and duplication of effort. PC communications usually require applications interfacing software added to the mainframe, as well as a program and/or board in the PC; users need to check whether they are expected to write the applications interfacing programs themselves if they are missing from a product. Most off-the-shelf products run on IBM or Digital systems, so this task is almost surely needed if the mainframe is from another vendor.

**PC Communications Hardware and Software**

Most PCs cannot concurrently process an application and serve as a communications link to a host. A single-task computer can undertake only one function at a time—word processing, spreadsheet, database, or communications. The user must decide when to invoke the particular function, based on current needs. This type of serial work scheduling is normally suitable for human interactions; people's work habits are also typically single minded. The limitations of single tasking, however, are apparent when quick access to a spreadsheet program is needed in the middle of writing a large report on a word processor. To get it, a user would

probably have to save his/her work, exit the word processor, and enter the spreadsheet program.

Communications interactions are quite different from the characteristically serial processing of most PC tasks. Communicating between a PC and the data center is not an end in itself, but rather an intermediary step in the handling of information. As such, it occurs as part of a job (from the user's point of view) and rarely as a job in itself. Putting it another way, communications between a PC and the data center is naturally interactive. Single-task PCs, on the other hand, are serial oriented. Their "interactive" requests for communications service are therefore normally made outside the application, leaving the user with the problem of manually integrating the data received with local work or extracting and formatting data to send.

The most common communications implementation consists of a board with software support that allows rudimentary dumb terminal emulation. For example, the most basic 3270 emulation allows the incoming code to be displayed, but screen-by-screen printing must occur. Ways have evolved to allow file transfer, but not necessarily in the desired format. Of course, communications programs can be and have been written for the PC, adding multitasking and/or the specific code needed, so that integrating incoming code might be automatic; but this is difficult to implement on most existing systems due to the 640K-byte memory ceiling. Third-party vendors must be careful to find applications widespread enough to justify development costs.

### **The Data Communications Network**

The mainframe is a foreign architecture that requires compatibility adjustments. A PC user who wants to link with a mainframe soon discovers that he or she must interface to a separate networking world that requires a much more intimate knowledge of hardware. Regardless of the complexity of the PC-to-mainframe link, there are certain elements that must be considered and adjusted for before communications can occur at all.

### **Codes and Character Sets**

The majority of current computers are fundamentally encoded in either the ASCII code, which uses six-, seven-, or eight-bit characters plus a parity bit, or EBCDIC, which uses eight-bit characters. IBM

and IBM-compatible PCs, and all other PCs based on Intel microprocessors, use ASCII code, as do Digital VAX and 8000 series superminis and IBM Series/1, IBM System/36, System/38 minis, and System/370-compatible mainframes and superminis (3080, 3090, 4300, and 9370 product lines) all use EBCDIC. This means, ironically, that an IBM PC communicating with an IBM mini or mainframe requires code translation, whereas an IBM PC communicating with a Digital supermini does not. Admittedly, code translations are not complicated, except that special symbols in one character set that do not exist in the other are usually lost. Translation, however, must occur somewhere during the transmission—either at the outset in the PC, in a protocol converter or departmental node en route; in the receiving program in the front end; or in the destination application program.

### **Protocols**

*General Definition:* A protocol is a set of rules for formatting the transmission control codes and data; as such, it is the key to how the logical and physical networks interconnect. In all current protocols, headers and trailers are added to the data message to provide information on the source and destination application, the source and destination computers, network routing, validity checking, security codes, clocking bits, and so on. There may or may not be start/stop bits on individual characters. There are two classes of protocols: asynchronous and synchronous. Because protocols are added to the message to be transmitted and then stripped away as the data reaches its destination, they are completely transparent to the end user. Protocols are an important compatibility consideration.

*Asynchronous Protocols:* Asynchronous protocols are lower speed connections with irregular timing, requiring start/stop bits to be added to each character after the session has been established. Session control information is rudimentary, and complex routing is not directly supported, although DECnet's sophistication and success shows there are various methods to get around this. Digital's VT52 and VT100, IBM's 3101 and 3160 series, and Teletype terminals all use asynchronous protocols with the ASCII code.

*Synchronous Protocols:* Synchronous protocols depend on finely tuned clocking to distinguish characters or bits that have been grouped together; this allows higher transmission speeds and better reliability (at the cost of more complex implementation logic). There are two types of synchronous protocols: byte oriented and bit oriented.

*Byte-Oriented Protocols:* Past implementation of byte-oriented protocols such as BSC have tended to be somewhat machine dependent, with certain characters having explicit control functions; as a result, there are slightly different versions for the IBM 3270 interactive terminals, the 2780/3780 batch terminals, etc. This relative lack of transparency also means that different terminal types usually cannot be mixed on a line.

*Bit-Oriented Protocols:* Most bit-oriented protocols, such as IBM's SNA/SDLC and ISO's X.25/HDLC, on the other hand, are packet-switching bit-oriented protocols. They are designed to get around these limitations by defining the "data" as a completely unpredictable bit stream that is allowed to have any sequence of bits except one (the data delimiting markers), whereas control characters with specific functions are recognized primarily by their position before and after the delimiting markers. This system easily transmits any type of data or coding, including graphic material. It also provides great routing flexibility, since a new address, or any other new information, can be added by just attaching new headers/trailers and delimiters around both the message and its original headers/trailers, for an intermediate destination. This treats the original headers as if they were part of the "data" bit stream. At the intermediate destination, the new headers/trailers are stripped off, and the original ones emerge. Multiple "envelopes" can be used for routing to a number of nodes. Since the control and data fields are firmly separated and the control code standardized across all products, multiple device types can share a leased line.

#### **Attachment Mode**

Data communications support in existing facilities can be classified according to the type of information exchange supported. Older batch terminal systems, such as the IBM 2780/3780, were designed to upload/download large files after the file had been

created off-line on punched cards or data entry systems. Keyboard-oriented interactive terminals, such as the Digital VT100, IBM 3270, or IBM 5250, were designed to work on files that remained on the mainframe by sending or receiving data in smaller amounts, usually a screen at a time, in conversational mode, with some optional printing capabilities. PCs are far more likely to emulate existing interactive terminals and add batch file transfer capabilities by software extensions.

#### **Attachment Method**

The actual attachment hardware consists of a plugged-in circuit board with a cable connection either directly to the computer or to a modem. The most common interface for serial devices and communications is an RS-232-C plug with only a subset of the pins implemented (4 to 7 pins for asynchronous communications, 9 to 12 pins for synchronous communications). The IBM first-generation PC is standardized on this interface, but wide variations are permitted by this "standard." The wire leading from the board is connected to a modem, and the wire leading from the modem is connected to the telephone system.

Boards for terminal cluster device emulation expose other interfaces and require the appropriate cabling. In the case of 3278 emulation, a coaxial cable connects the PC to the communications cluster controller or an integrated controller on a low-end mainframe. In the case of 5251 emulation, a twinaxial cable connects the PC to the cluster controller or to an integrated controller on a System/36 or System/38.

PCs connected to local mainframes do not require modems; their cabling, therefore, can be a little different. If the computer is nearby (it must be within 50 feet to use the RS-232-C interfaces), asynchronous terminals can use a null modem cable for attachment. Synchronous terminals, however, need the clocking signals from the modem for proper transmission. They must use a different device with a clock, called a modem eliminator. A local device that is farther away—on another floor, perhaps—can be reached by a limited-distance/short-haul modem.

#### **Facility Layout**

PCs are rarely used close to the data center, so consideration must be given to the impact of the relative locations of the equipment. This is particularly

important where the attachment will not use a conventional phone/modem connection. RS-232-C cable has a nominal limit of 50 feet and, even the extended-distance cable is rarely usable beyond 250 feet. While other interface methods such as RS-449 support greater distances, these may not be offered either at the PC or on the data center equipment. Multiplexers and concentrators can solve some of these problems and reduce the wiring load. Use of existing wiring can save money, but walls and ceilings filled with unidentified cables can also be difficult to sort out. Installing a cabling system, with coaxial or optical fiber backbone cables between floors, may therefore be cost effective.

### Speed and CPU Port Capacity

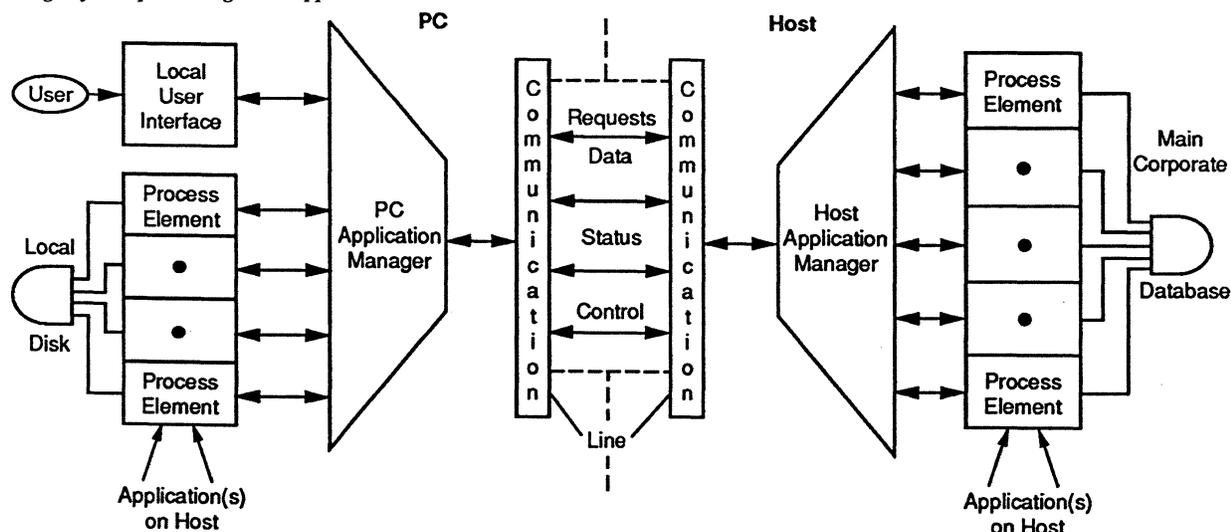
The most popular PC interfaces are 1200 bps asynchronous interfaces, but there are a growing number of higher speed synchronous interfaces as well. Since front-end processors handle a variety of data rates, it is rarely a problem to interface a line of the right speed to the mainframe. Since many PCs are occasional mainframe users, however, it may be quite cost effective to investigate multiplexers, concentrators, and/or departmental systems that allow a higher speed line on the mainframe. This would be particularly true if the number of spare hardware ports on the mainframe is limited, or if adding new ports requires expensive configuration expansions.

### Terminal Emulation versus Integrated Links

As we have seen, the networks on the mainframe host are often so large and complex that changes must be carefully architected. This network characteristic provides the first limit to the choices available to the PC. Most users find the easiest way to connect their PCs to the data center is to have the PC emulate the dumb terminal that is already supported by the application(s) they want to access and, hence, is already integrated into the data center network. This seems straightforward enough, but, in reality, there are a number of qualifications that can have repercussions if the user wants to expand the system's capabilities beyond the basic query and data entry functions of dumb terminals or if more than one computer in incompatible networks must be accessed.

The evolution of the PC link beyond mere terminal emulation has proceeded cautiously. The first step was extending emulation so that entire files could be downloaded, instead of having them printed out and then rekeyed into the PC if the PC user wanted to work on them locally. This did not have a direct effect on the mainframe, but certain activities, such as uploading files, generating queries that extract only portions of a file to be downloaded, storing "virtual diskettes" (files formatted in PC formats on the host), and reformatting files so that they can be directly loaded into PC applications, move the PC more and more toward integrated cooperative processing with the host.

Figure 2.  
A Tightly Coupled Integrated Application



### Terminal Emulation

The key questions for basic applications are the type of terminal to emulate and the configuration of the connection. IBM's System/3X and AS/400, which compete with Digital for the departmental computer market, attach the 5250 synchronous terminal series. Digital systems operate best with terminals emulating the asynchronous VT52 or VT100 terminals or their descendants. IBM S/370-compatible mainframes and superminis, which encompass three quarters of the large mainframe market, are almost always served by the interactive display terminals of the synchronous 3270 family. In a few cases it is important not to overlook the "almost," because IBM mainframes (including the 4300 and 9370 supermini versions) can operate under several different operating systems, and not everyone participates fully in SNA. For example, IBM's IX/370 UNIX system, even though it runs on a mainframe under VM, supports only asynchronous ASCII terminals such as the 3101 and, thus, must be connected to an auxiliary Series/1 as a networking front end. Some IBM users may also find products that emulate the batch workstations, such as the 2780 and 3780, suit their operating environment, but such devices are less common than the interactive terminals.

Once the type of terminal has been defined, or a range of acceptable devices has been identified, the issue of connection mode can be considered. A surprising variety of choices exists. Using as an example the emulation of a 3270 clustered system (3274 communications controller attaching up to thirty-two 3278 local displays) on a standard IBM PC, we find that the user would adopt one of six basic attachment methods.

*Terminal Emulation Only:* Emulate only the 3278/3279 and attach the PC to the 3274 as if it were one of the displays. This involves adding a board and any necessary software to the PC, cabling the board to the 3274 with a coaxial cable, and reconfiguring the 37XX front end and 3274 addressing and control microcode (as is usual when a terminal is added). This is one of the simplest methods because it essentially consists of cabling the PC into an existing communications system. The method is also less expensive, since there is no modem, and a higher speed communications line is usually shared by a number of terminals.

*Terminal and Controller Emulation:* Emulate both the 3278/3279 and the 3274 with a board that emulates the combined logic of both the terminal and controller. In its most common and basic form, this method involves adding a board and its associated software to the PC, cabling the board to a synchronous modem, interfacing the modem to the appropriate data communications lines, and adjusting the software on the remote host so that it recognizes that a new remote 3270 system has been added to the network.

*Attach to Front-End Processor:* Emulate both the 3278 and the 3274 as in the second method, but this time attach the PC to the front end on a host at the same site, so there is no transmission over a communications line. Again, the host must be adjusted to recognize that a new 3270 system has been added to the network. Since the 3270 board uses BSC or SDLC protocols that require a clock (located in the modem) for synchronization, locally attached systems must be cabled to either a modem eliminator cable (for short distances) or a limited-distance/short-haul modem (for longer distances, between floors, etc.). Existing telephone wiring can handle everything, but some users prefer coaxial cable or optical fiber between floors in a large building for performance reasons.

*Interfacing Programs:* Emulate a totally different terminal (an asynchronous terminal, for example) and allow all adjustments of code, protocol, syntax, etc. to be made by a special set of interfacing programs on both the PC and host.

*Departmental System:* Have the PC attached to a local "departmental computer" that is, in turn, attached to the front end. In this case the departmental system acts both as a file server and communications processor for local PCs. The PCs use emulation boards consistent with the departmental system (asynchronous VT100 for VAX, or synchronous 5250 for IBM System/36, for example), and then the departmental system takes care of communicating compatibly with the mainframe. Departmental systems range widely in size and support complex wide area networks (WANs) and local area networks (LANs) in their own right, so they are not discussed at length in this report.

*Attach to LAN:* The PC may be attached to a LAN, and the LAN can in turn be attached to the mainframe (or to a departmental system). There are a number of LANs on the market, including Digital's Ethernet and IBM's Token-Ring. Ethernet users may find that attachment to the Digital host is an attractive option, providing that DECnet support is available in the data center. In cases where Ethernet is already used or where a large number of PCs will be emulating Digital terminals, Ethernet may be an economical connection option. Several vendors supply PC links to Ethernet, and these products support high data rates. Since Ethernet attachment is not as common as the more traditional RS-232-C or modem attachment, product selection based on features will be restricted.

#### **File Upload/Download, Virtual Diskettes, and Other Extensions**

The first IBM PC was delivered in 1981; the first terminal emulation board, in 1982; and the first file transfer to the PC product using interactive terminal emulation, in 1983. The market for interactive terminal emulation blossomed immediately, and its primary limitations (from the PC user's point of view) were felt at once. The user not only wanted to query a file and view the data but also needed to retain whole files and manipulate them at the PC site.

This was a problem for systems using 3270 or ASCII terminal emulation, because these terminals were screen oriented; data was transferred in screen-sized blocks, usually 1,920 characters at a time. It was a step forward just to initiate a program allowing the host to download a fill-in-the-blank screen format that could be stored locally and receive back only the new entry records. The 3270 procedure was to download the screen format again for every new screen to be filled out and then strip it of incoming records—thus nearly doubling the total traffic, as well as the size of upload record.

The answer for 3270 emulators was to provide a set of packages that divided files into 1,920-character segments, allowing the file to be downloaded to the PC or uploaded to the host. Very few "pure" emulators presently exist; most also have file download capabilities as well.

It shortly became obvious that simply dumping an enormous mainframe file into a PC created a lot of work, although it was still better than rekeying from a printout. The mainframe file

needed to be structured, edited, and reformatted before the PC could use it, and if the data were to be used by two different programs (Lotus 1-2-3 and dBASE, for example), more than data format was needed. In some cases, users wanted to upload files as well as download them. Flexibility was needed in interfacing to different mainframe file formats and different databases, for automatic generation of JCL code and queries in the right format, and so on. One popular approach pioneered by Micro-Tempus' Tempus-Link was to create separate file extracts in PC formats (virtual diskettes) for PC users during the overnight batch updates.

As the market continued to evolve, a variety of features were offered to users in independent packages, in various combinations. Some merely expanded communications flexibility, but many added to processing flexibility as well. The following are some of the most important broad categories.

*Data/File Manipulation:* Included in this category are data search and extraction with conditional retrieval, data compression, data format restructuring, and automatic query generation.

*Virtual Diskettes:* In addition to providing easy-access data extracts, as previously mentioned, virtual diskettes allow the PC to use the mainframe as secondary storage, as backup, and as a file server by uploading files in PC formats instead of translating them into mainframe formats. Sometimes provision is made for mainframe access of the data as well. This capability is frequently combined with transparent file sharing, with the mainframe acting as a file server for the PCs.

*Communications Extensions:* Features in this category include auto dial, auto logon, unattended operations, transparent access to network resources, data compression, multiple sessions, emulation of a variety of terminals on one board, remote operation of other PCs, and remote troubleshooting.

*Ease of Interface* includes menu-driven interfaces, on-line help, macros, and prompts.

*Script Processing and Security Features* includes single/multilevel passwords, transmission encryption, and script languages for programmability.

### **Integrated Processing**

Integrated processing can be viewed from two perspectives: the recognition and use of the PC's unique characteristics and the integration of PC-link software with host software so that they operate as more of a unit.

Some of the impediments to more integrated processing come from the PC's very nature. PC systems that support a continuously active communications function and "coresident" communications programs may permit the operator to switch keying and display between local programs and emulation of a data center terminal. This allows the operator to interlace local and remote functions, but only by acting as a common element in two dialogs—one with the local application on the PC and the other with the data center application. Software can be added to the PC to provide these capabilities, but the 640K-byte memory ceiling can present a problem.

In order for the PC's processing and disk storage capabilities to be recognized directly by the mainframe, terminal emulation must be abandoned because interactive terminals typically have printers but not disks or user-programmable controllers. Instead, the PC must be addressed as a processor or a node. This is what makes the advent of LU6.2 protocols for Type 2.1 units so exciting to IBM SNA network users, because the Type 2.1 specification is for a programmable terminal that can participate in a peer-to-peer network.

Packages for integrated processing vary according to the degree to which the PC and host software are linked. In a tightly integrated package, the PC user makes requests without knowing where the data or resources needed to carry them out actually reside. This type of application limits the ability of the PC user to operate with nonintegrated software and prevents the integrated files from being used with any other software package. Loosely integrated applications generally provide only a facility to download data from the host, translate it into a usable format for local processing with many different software packages, and upload it to the host to replace or update the database. Highly integrated packages are easier for users to handle because they present a consistent, request-oriented operating environment; however, such packages are almost always functionally limited. Choosing a level of integration involves measuring the degree to which the package corresponds with

the ideal model of user interaction developed in the previous phase. This must then be balanced against any loss of functionality or compatibility with existing software that is associated with the package. Figures 2 and 3 illustrate these differences.

While the processing elements of the applications in the host and in the PC may be generally similar between the two architectures, those of the integrated application must be designed to operate on requests that are generated internally by the software and not through the action of a terminal operator. In other words, they are automatic, not manual. Each element in an integrated application must be modular in structure because it may perform only a small part of a total task that may span several structures.

In general, the systems with the widest range of compatible integrated applications are those where the PC vendor provides proper technical facilities for mainframe communications. Software vendors, given a consistent and preferred hardware environment, tend to build to it. The IBM host communications support, for example, is the preferred attachment method for many of the PC's third-party integrated application software. Vendors also agree on complementary packages.

Data validation and control in an integrated environment may be totally within the package's capability, making data handling at the PC as safe as or safer than the same process at a mainframe terminal. The potential for this level of validation exists with integrated packages, but the promise may not be realized in practice. As the level of integration decreases, from the ideal tight coupling shown in Figure 2 to the looser structure shown in Figure 3, so does the capability of the application to manage the data flow and to ensure that proper validation rules are applied at each update.

One area of concern is the ability to perform local data manipulations on data resident in the PC, either as a normal practice for loosely integrated applications or in tightly integrated applications when the communications link is down. This may be a useful feature from the standpoint of immediate production requirements, but its availability opens the door to divergence of the local and central databases. Tightly integrated applications that provide almost transparent host access and full distribution of files and computer resources are likely to be restricted to a single application, but

they offer the highest level of control over the information resources of the company. Loose structures may be applied to more PC and mainframe software so the processing flexibility provided is high, but the potential for data corruption through poor control on the PC is significantly greater. Users must evaluate the benefit of wide application flexibility against the potential loss of control.

**Operational Issues in PC-to-Host Links**

**User Interface**

The user interface, which comprises the instructions and procedures that a user is expected to understand in order to use a piece of software, is notorious for its lack of standardization in the PC world. As previously mentioned, vendors have at least attempted to make these various interfaces user friendly, usually by means of menu-driven interactions.

A PC acting as a mainframe terminal, however, is normally governed by logic that emulates the functioning of the terminal's less friendly user interface, as well as its technical characteristics.

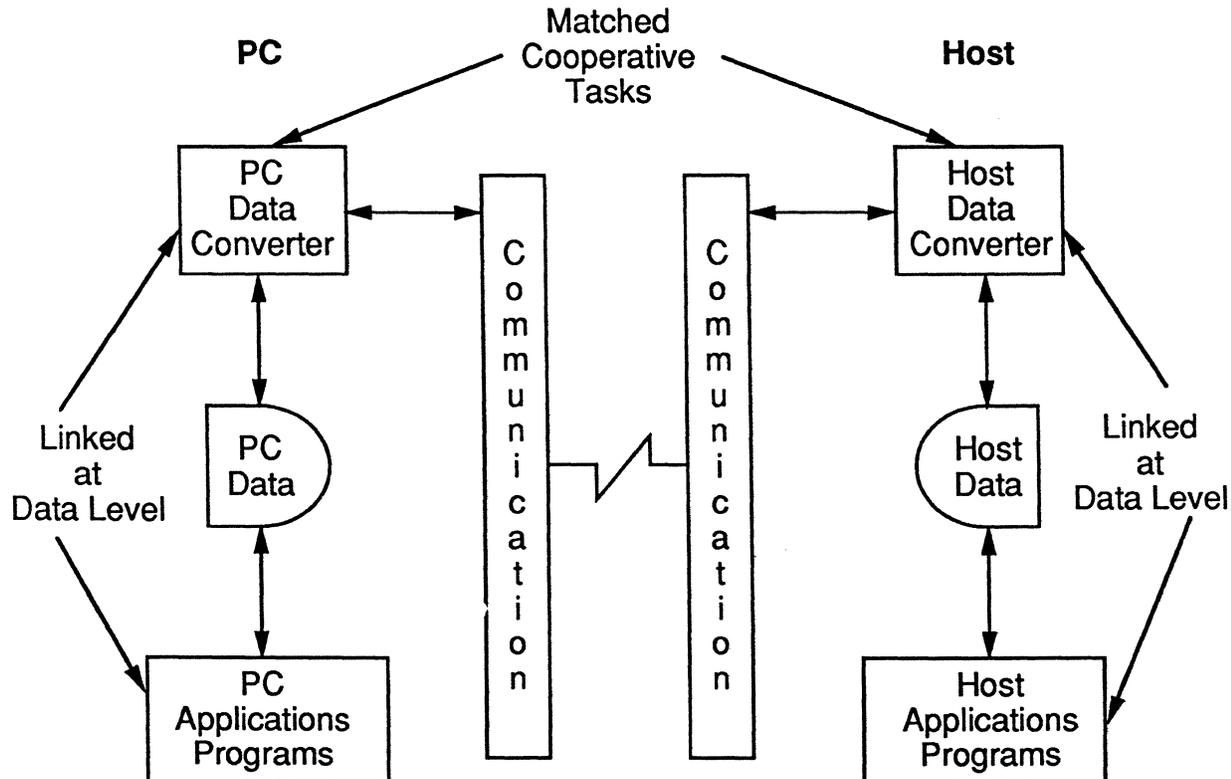
This may involve more than one set of operating rules that must be memorized, if there are no menus or prompts as guides, and each set of rules can differ if more than one application or more than one mainframe is accessed. A New York bank PC operator, switching between 3270 emulation to an IBM host and a local spreadsheet package, was heard to remark, on sitting down at the computer after a break, "Let's see . . . who am I now?"

**Local Data Integrity Problems**

First-generation PCs are single-user systems and can function quite readily with simple file handling and security procedures. This simplicity is part of the reason for their cost-effectiveness. When two or more users of separate freestanding systems want to work on the same file, or if multiple copies of the same file are to be distributed around a network, there can be significant difficulties in maintaining file integrity.

User departments and workgroups normally lack the DP department's editing and control expertise. Therefore, they may be unaware of the proper procedures to ensure data reliability and

Figure 3.  
 A Loosely Coupled Integrated Application



consistency. Their primary orientation is toward the end-user task, not toward data processing techniques. It may be perfectly obvious to local department supervisors that an expense report date cannot be in the future, but it may not occur to them to incorporate the necessary coding into the programs to properly handle this data in the file. As a result, reports that display expense data in current-month form may fail to show the item at all, and such an item is very likely to be in the wrong place when it eventually does appear.

Lack of a properly organized central collection point for data used by a number of different freestanding systems results in multiple "versions" of information in the PC files of several departments, or even in several systems in the same department. This is no problem with what-if or other isolated applications, but it causes complications if a merged update is needed. For example, it can be disastrous if attempts are made to collect and use the information to update mainframe files at a later date.

#### **PC Links and Mainframe Data Integrity**

At first it would seem that linking PCs to the mainframe (or to a departmental system) would solve this problem, since all of the PCs would be working on centralized files as if they were the mainframe's own terminals. Since PCs are distributed systems and are rarely scheduled and controlled in the same way that the mainframe's own terminals are, however, they do not work the same way. In fact, the most significant problems in the use of terminal emulators may be in the area of data control, at least initially.

When a PC captures a segment of a mainframe database and moves it to local storage, that data becomes subject to manipulation outside the application framework intended to validate it. In many cases, the movement of data to a PC—its editing and return to the host—will bypass host editing or validation functions. Even if the data is sent to the PC by an application program and returned by that same program, there is a good chance that some of the changes made while the data was "remote" will not be fully edited on its return. The host database is thus gradually computed.

The problem is magnified if several PCs access the same information. A major insurance company had an application where file segments were

sent to PCs via a batch terminal emulator and processed locally. There was no protection against several PC users concurrently calling for the *same file segment*, and when the data was returned to the file later, each user's version wrote over the previous version.

#### **Data Integrity in Distributed Databases**

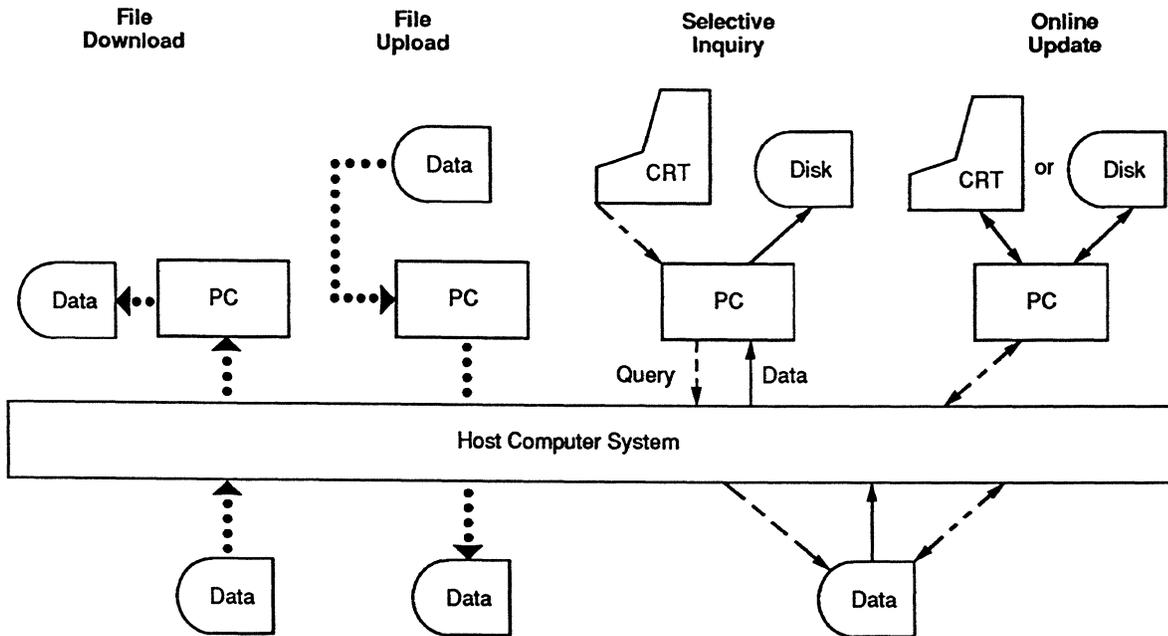
Ideally, corporations would like PCs and data center equipment to relate to each other in a way that would make the exact location of the data and the processing power being harnessed for any particular user task to be transparent to the user. This implies distributed databases, distribution of function, and cataloging of locations. The key element, the catalog, exists on all processors in the network in some schemes, and only on some processors (departmental systems, mainframes) in other schemes. Either method might be workable on small networks, but current catalog types would grow to an unmanageable size on large networks, resulting in performance problems and enormous overhead.

Data integrity problems can be very complex when databases are distributed around different parts of a network, especially when several transactions require that data be transferred between several computers. This requirement has also slowed the development of this type of database, which is still in its infancy.

A commonly cited example of the potential data integrity problems that everyone can relate to is that of a user who has bank accounts in several cities. The user might want to use a terminal in Philadelphia to transfer funds from a Boston account to a New York account and then authorize multiple payments from the New York account to designated companies. It would cause a data integrity problem if the networked system debited the Boston account but failed to credit the New York account. The second level of transactions, which might appear to have been authorized against insufficient funds, compounds the complication.

To carry the example further into a multiuser situation, if this were a joint account the user shared with a spouse, the other person could initiate the same set of transactions. This time the transfer could be performed successfully, but if the amount transferred is more than enough to cover the first set of transactions but not enough to pay double for all the transactions, the result now could

Figure 4.  
File Interactions with Remote PCs



be two debits against the Boston account, one credit to the New York account, some payments made twice, some payments made once, and some payments authorized against insufficient funds. If the data integrity error had not occurred, the mistake would have been easy to recognize, but the result of the error is quite confusing.

### Reducing the Risks

Some steps can be taken to reduce the risk of corrupting data center files through the use of PCs emulating terminals.

- Limit "out of data center" updates. If PC copies of files are used only for read access, there is no danger of poor edit control producing bad data.
- Review update applications to ensure that the data quality measures taken by the data center system are also applied to the PC.
- Provide a "staging" area where PC files that have been updated are returned for review and validation, prior to being accepted into the main database.
- Initiate a form of access control on data that can be loaded into PCs to prevent multiple users from requesting the same data elements at the same time.

### Products

PC-to-host products comprise software packages or hardware/software combinations that offer, at the very least, terminal emulation and file transfer. For example, simply by emulating a 3270 terminal (the terminal most used in accessing IBM mainframe computers), a PC can communicate with a mainframe. Other functions, of course, are usually added, and PC-to-host products often support features such as file translation and conversion, unattended operation, data compression, virtual disks, and Applications Program Interfaces (APIs). Connections to the host are most often established in three ways: directly from the PC via coaxial or twinaxial cable, remotely via a modem, or through a gateway connection to a LAN. Direct, coax attachment of the PC to the host is the oldest and remains the most common method in place, although remote and LAN connections are now preferred.

*Add-In Boards:* DCA's IRMA board was the first add-in board to offer a coaxial connection to IBM mainframes, and it quickly established itself as the product against which all emulation boards would be measured. The boards plug into expansion slots in the microcomputer and provide a coaxial (and in some cases a twinaxial) connection to controllers, mainframes, or minicomputers. This segment

of the market has shown limited growth recently, although DCA has begun marketing the IRMA 3 Convertible emulation board—the most recent version of its original IRMA product—which is the only board that can be configured by the user to function with both the traditional Personal Computer Architecture (PCA), as well as the newer Micro Channel Architecture (MCA).

*Software:* In their most basic form, PC-to-host software packages will provide terminal emulation and file transfer capabilities (though most go considerably beyond this point). Generally, the software is used in conjunction with an emulation board, as with the IRMA products or Novell's NetWare 5250 line. One development enjoying increased popularity is that of software-only links such as PACKET/PC's line of software-based products. These links consist of microcomputer and host software components, thus eliminating the need for emulation boards for each connected PC.

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### **Selection Guidelines**

Implementing a PC-to-mainframe link is difficult because it involves expertise from several areas, overlaps responsibilities from several managers, and implies changes in the corporate data flow. For these reasons, it is almost mandatory that such a link be designed by a committee. If a committee is unworkable for any reason, data center management must still get involved, regardless of how elementary the connection will be. The data center should provide information on the current configuration, hardware, software support, application programs, and security measures.

It is advisable to evaluate an application in terms of both terminal emulation and integrated application. One way to do this is to "walk through" the interactions associated with the application to discover what the PC user will experience. Potential users will most likely need the input of the data center professionals to help with the way in which the terminal emulator will interact with the data center equipment. It is a good idea to do three walk-throughs: one for interactive terminal emulation, one for batch terminal emulation, and one for integrated applications. The purpose is not to be too specific to any package, but to see whether the general interaction is acceptable to both the PC users and the data center.

### **Cost Justifying an Acquisition**

#### **PC Justification**

Cost justification can be a single-step process, where both the PC and its communications features are considered as a single package for an application that requires communications. Because of the size of the current installed base, however, it is more common for communications to be added to an existing system as the second step in a two-step procurement process.

In some types of applications, studies have shown an inexplicable leap in user productivity when a system can provide subsecond terminal response time. The gains are more than those accounted for by the increase in machine speed and have led to conjectures about the nature of attention, memory, and mental functioning in creative design tasks. Subsecond response time is more commonly obtained from dedicated PCs or from terminals attached to local computers than from terminals attached to mainframes. These increases and decreases in productivity should also be factored into cost comparisons for some applications.

Thus, the justification for obtaining PCs for high-level management is rarely based on simple cost savings at a local site or relevant to a particular application. This is not a serious problem because there are fewer PCs involved with high-level managers than there are with middle management, data entry, programming, and other jobs that require frequent use of the PC.

As PC use travels down the corporate hierarchy, cost justification is more and more important; the numbers involved are so much greater. Justification for the PC is likely to be expressed in two basic ways. The PC will be automating a particular, relatively controlled set of applications (sometimes called the mainframe's "hidden" backlog) that were previously done manually and were unlikely to ever have been done on the mainframe. Or, the PC will automate a needed function that would normally have been done on the mainframe, but is amenable to the PC instead. Usually the former is cost justified in terms of local needs and manual processing costs, while the latter is cost justified in terms of a comparison of equipment processing and operating costs.

Office automation, for example, using special-purpose word processors and/or data entry, was already under way before the general-purpose

PC began to proliferate in the business environment. It was already becoming clear that secretarial productivity could be increased by providing local screen formatting and data entry functions on terminals attached to either a mainframe or a local special-purpose system (or by using local special-purpose terminals). The flexibility, improved response time, and greater accuracy of an automated system can tip the scales in favor of automation even if costs are only at a break-even point. One of the alternatives was a terminal attached to a mainframe, but since the mainframe software was developing very slowly, this application could be considered part of the mainframe's "hidden backlog" of potential applications that were constantly being set aside as impractical because of the importance of more familiar types of work.

### PCs versus Terminals

The PC has particularly altered the price/performance relationships on which the decisions for clerical automation have been based. When general-purpose PCs with word processing packages are compared with special-purpose word processors, the comparable costs and greater flexibility of the ubiquitous PCs have inclined most users to choose this solution over office systems based on dedicated specialized equipment. Economies of scale have meant that a PC with a word processing package can successfully compete with word processing equipment specifically developed for the office automation market. Packaged PC software of all kinds can be purchased from a retail store and modified if necessary, rather than developed at considerable time and expense by corporate data processing organizations.

Depending on the terminal's flexibility, the PC configuration being compared, and the manufacturer, the price of PCs based on current microprocessor technologies can be comparable to, or even less expensive than, traditional dumb terminals for data center mainframe applications. This is a constantly shifting relationship due to the effect of price wars in both segments of the marketplace. It is especially true of applications that could be shifted entirely to the PC. When the costs of communicating with and processing on the mainframe are calculated into the price of the dumb terminal, there is no question that the cost of mainframe processing is considerably greater than performing the same task on a PC. The trade-offs are

not nearly so clear cut when the terminals are attached to a local departmental mini or supermini, however, because these systems tend to be terminal oriented and cost effective.

Cost justification of communications equipment can bring into play the same range of factors as the justification for the original PCs, but since the local financial outlay for adding communications boards and supporting software is less than the cost of the original system, the hidden financial implications of the addition are more likely to be overlooked. The Pandora's box of linking PCs and mainframes without sufficient controls has already been intimated by the discussion of data integrity. The cost of those controls depends highly on the application. One new user of LANs stated that the first year's increase in local management costs was three times that of the cost of the LAN hardware itself; certainly numbers like these would be likely for new cooperative processing applications where data integrity disciplines need to be established where none existed before.

### Limitations of Justification by Cost Alone

The clarity of locally defined price/performance benefits over previously existing solutions and the "free" power increase can be a deceptive cloud covering the issues of great importance to the competitive/financial performance of the company as a whole. One price for the productivity gains of PCs is often paid in the area of information resource management. A corporation's operating information base is itself a significant asset, and management information systems rely on proper maintenance of the basic operating data to provide summaries of current activities and to project future trends. Freestanding PCs can trap vital information before it reaches the data center, making it unavailable to corporate MIS, upper management, or other areas of the organization that need it to operate more competitively.

On the other hand, local managers frequently find that localizing computer power provides greater potential to increase efficiency, because there is less need to conform to standards that reflect irrelevant applications. Furthermore, they have more power over what is processed when; they can thus fine-tune their own operations better and avoid irritating delays that they were previously powerless to resolve.

Here the question of the relationship of the parts to the whole becomes tricky. A department may maintain its own budget more efficiently on a local PC, but is that gain in efficiency worth the loss of the information to the business as a whole? A PC that is linked to a mainframe so that key operations are performed cooperatively usually implies mainframe access to the PC data, at least to some extent. This is a key argument that should not be lost when considering price and the probable negative impact of improperly controlled PCs on mainframe data integrity.

### **A Checklist of Concerns**

As management meets to plan for new PC-to-mainframe links, it is helpful to compile a checklist of questions from several different points of view to ensure nothing has been overlooked. The following core questions provide a springboard for expanded checklists, which should be tailored to the company's individual situation.

### **Basic Choices**

A user faced with linking PCs to the data center is confronted by choices in several areas:

*Operating Strategy:* The PC can emulate a terminal to an existing application on the mainframe, with or without support for direct transfer of files. It can also link with the mainframe in a joint application supported by custom software in both places.

*Mode of Attachment:* The PC can connect directly via data cables (usually an RS-232-C interface), through a modem, via coaxial cable to a cluster controller, over a local area network, directly to the computer bus, or in other mutually supportable ways.

*Product Source:* The necessary equipment and software can be acquired from a single source or multiple sources; those sources can be computer vendors, modem vendors, third-party hardware or software suppliers, or system integrators.

*Information Management and Control:* Figure 4 shows some of the forms of PC data interaction that can take place and the impact on data center files.

### **Terminal Emulation**

Questions important to consider when selecting any terminal emulator are as follows:

*Emulation and Protocol Support:* Does the product emulate a terminal type and protocol that are already supported at the data center or that can be supported easily?

*Attachment:* Will the method of attaching the product to the data center equipment be satisfactory, given the location of the systems and the types of wiring, etc., which are available?

*Hardware/Software Compatibility:* Is the product compatible with any special hardware or software that is already in use on the system?

*Operational Mode:* Is the mode of operation of the product suitable for the current PC operator's level and for the type of work which is expected to be done with the product?

*Operating Procedures:* Are the operating procedures so different from those associated with the PC's local operation that they will be difficult to complete properly?

*Environment:* Can the combined environment created by the product between the PC and the host be controlled from the viewpoint of access security, data integrity, and information resource management?

*Memory Requirements:* How much memory does the communications board require? The more complex the operation, the greater the amount of memory needed. On first-generation IBM PCs, with their 640K-byte memory ceiling, packages requiring 150K bytes are more likely to prevent a large application from running than one requiring 80K bytes. This problem will be resolved with OS/2 and the new PS/2 systems.

### **Integrated Applications**

Evaluating an integrated application can be approached in phases.

*Phase One:* During the first phase, the user identifies "target applications" for such systems and indicates the host and PC software (if any) which are already in place in the application areas.

*Phase Two:* The second phase requires the construction of an "ideal access" scenario, where the system's operation is described as the user would like to see it work. These phases provide an idea of the current environment for the task, the investment in it, and the way in which the task should operate (economic constraints aside).

*Phase Three:* The third phase of evaluation is the actual investigation of integrated application alternatives. These alternatives may be identified based on competitive survey publications, advertising, or contact with software vendors.

Technical communications support selection with integrated application software is usually a matter of following the supplier's requirements. Most of these packages will not support wide varieties of communications protocols, modems, or custom interface boards, so selection of hardware in advance of selecting the integrated package could create a problem. There is also a danger that two separate integrated applications may require different hardware support. Users should prioritize their needs for such software and watch for incompatibilities in supporting hardware.

### **If Several Products Fill the Bill**

If several products are generally available that meet the needs of the targeted applications, the following guidelines may help narrow the choice:

*Board Functionality:* Select products that pack several facilities onto one board, to conserve slot space inside the system unit and avoid having to add an external box for more slots later. Some vendors supply both asynchronous and synchronous communications on the same board, for example.

*Enhancement:* Select products that enhance the capabilities of the device emulated without requiring host support for those enhancements. Integral printing support for terminals that cannot normally drive a satellite printer is an example of this.

*Modem Interface:* Select communications products with an interface to an external modem over

one with similar features but using an integral modem. Modem technology is changing very rapidly. Furthermore, the modularity gained allows both the PC and the modem to be swapped around as workgroup needs change.

*Expansion:* PC users will want to grow in unexpected directions and are not likely to remain at the level of the target applications. If the PC vendor supplies a package that meets individual needs and price requirements, give it preference over comparable products from third parties. The chances of the vendor's own product tracking future changes in the PC line are better than those of a third-party product.

*Vendor Support:* Avoid products that rely on the combination of third-party software from one vendor and hardware from another third-party vendor.

*Interface Boards:* If a product contains an interface board that plugs into the PC directly, buy from a company that supplies many types of such boards over one that supplies only the board used in the product. Broad familiarity with the PC's bus architecture will translate into fewer compatibility problems with other board-level products.

*Warranties:* Check the warranties; there can be some surprising differences.

### **Security, Data Integrity, and Management**

Provision of a microcomputer-to-host connection affects security in a number of ways. Most host access techniques use terminal emulation, allowing the user to take advantage of such standard host security as password protection and usage logs. Any security provisions used with terminal access may be used with microcomputer access, provided that only terminal emulation is permitted. Packages that allow unhindered uploading from the microcomputer to any host files will, of course, create genuine hazards, but this is a terminal control problem. The real threats lie in the dramatic proliferation of microcomputers. Terminal proliferation becomes a security problem in situations where limiting physical access to terminals has played a part in the security system. This situation is rather

uncommon, but it does happen. The cure is adequate security via logons and passwords, thus placing security at the individual, rather than the terminal, level.

Local microcomputer storage presents a more serious problem. Highly confidential material, such as salary information, new product descriptions, and customer files, may be downloaded by authorized personnel. This information can later be tapped by unauthorized users if it is stored on disk. Disks may be stolen or copied, or the user may fail to end the local application, leaving part of the file resident in RAM. The only solution to this problem is adequate physical security for the microcomputer, with a provision for secure storage of disks. Because this form of security is not at the host level and is not easily implemented in software, many organizations overlook it. With the microcomputer-to-host connection, the risk of microcomputer vulnerability is magnified.

The use of microcomputers, and their growing familiarity within organizations, also poses a problem independent of the microcomputer-to-host connection. Increased computer literacy leads, inevitably, to increased vulnerability of data processing centers. As more people know more about how to enter a system, the potential for abuse increases. Connections established through telecommunications must be carefully guarded, and any non-terminal connection should be examined to ensure that security measures are adequate.

The following are some questions to help in evaluating the data integrity, security, and information resource management implications of a PC link.

*Access Control:* Are requests for data made from the PC subject to satisfactory levels of access control, such as password control? PC access controls should be at least as strong as those controlling terminal access.

*PC Access:* Can similar control be provided at the PC for operator access to data once the data is downloaded? It is pointless to protect data in the data center and leave it available to all the world once it is loaded onto a PC.

*Outstanding Data:* Can several copies of the data be outstanding in different PCs at the same time?

Can this be controlled in any way at the host end? Multiple copies of the same file are invitations to information corruption. If a file cannot be protected from access by several users at once, it may be better to require that the file remain in the data center and be accessed only for use and not for storage at the PC.

*Update Controls:* Can the return of data to the mainframe result in the loss of any update controls? This situation may arise from a lack of control over the update process or from the inability to provide all the transaction editing at the PC due to lack of other key data files. In any case, relaxing the validation rules may result in a lowering of data quality standards, and this should be specifically understood and approved by management.

*Out-of-File Data:* How long will information be "out of file"—resident in a newer version on the PC than in the main database? Long intervals when the data center does not have current data are highly undesirable, so if data is to be held on the PC for more than a day or so, the application should be reviewed. The data center should check the possible impact of "out-of-file" data on key reports that are run periodically for corporate management or external distribution; conflicts may indicate that PC production schedules will need adjustment for the period near the report cycle.

*New Users:* How is the impact of new PC users on the mainframe to be controlled and budgeted? If, as PC users are added, overall system response time suddenly goes down, how can the data center locate problem areas? How are problems to be controlled? Is time on the mainframe charged to the local department?

*Responsibility:* Who is responsible for what and to whom? If PC access to mainframe files does result in problems with data integrity, security, mainframe performance, etc., who is the person at the remote site responsible for remedying this? Does the reporting structure make it likely that he or she will favor local interests over central mainframe interests? Does that person have enough time to study problems and come up with solutions and enough power to enforce those solutions, which could involve restrictions on local users in middle and upper management? ■



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# PC-to-Host Communications Products: Comparison Columns

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**Synopsis****Editor's Note**

This report provides a detailed list of microcomputer-to-host products, as well as a listing of product specifications and pricing. For information on the recent trends and history of this market, see the Market Overview (Report 511-101). Further details on the technologies behind these products can be found in the Technology Overview (Report 511-101).

**Comparison Column Highlights**

The following comparison columns summarize the characteristics of 307 commercially available PC-to-host products from 80 vendors. The products all allow PCs to communicate with a host mainframe or minicomputer. For the most part, vendors supplied Datapro with this information in December 1989; their cooperation is greatly appreciated.

Datapro sent requests for information to approximately 120 North American vendors known or believed to be in the PC-to-host business. The absence of any vendor from this report means that the company failed to respond to repeated requests for product information or has discontinued marketing PC-to-host links. Those PC-to-host vendors not listed here but wish to be in future updates, are urged to contact the editorial staff of *Datapro Reports on Microcomputers*.

Many types of products are marketed as PC-to-host links. Datapro has tried to be as flexible as possible when including products in the comparison columns. Therefore, some products may not directly correspond to the specification headings listed in the columns. We have tried to fit in these products to provide the most useful information possible. For additional product information, or to clarify a column entry, please contact the appropriate vendor.

# Vendors

**Adacom**

8871 Bond Street  
Overland Park, KS 66214 (913) 888-4999

**Agile**

825 Alfred Nobel Drive  
Hercules, CA 94547-1899 (415) 724-1600

**Andrew Corp. (Local Data, Inc.)**

2771 Plaza Del Amo  
Torrance, CA 90503 (213) 320-7126

**ANNATEK Systems, Inc.**

4760 Walnut Street, Suite 105  
Boulder, CO 80301 (303) 444-6675

**AST Research, Inc.**

16215 Alton Parkway  
Irvine, CA 92713-9568 (714) 863-1333

**Attachmate Corp.**

13231 SE 36th Street  
Bellevue, WA 98006 (206) 644-4010

**Avatar Corp.**

65 South Street  
Hopkinton, MA 01748 (508) 435-6872

**Barr Systems, Inc.**

4131 NW 28 Lane  
Gainesville, FL 32606 (904) 371-3050

**BlueLynx**

101 Winston Street  
Cumberland, MD 21502 (301) 777-3307

**Cambridge Computer Corp.**

80 Mt. Sanford Road  
Mt. Carmel, CT 06518 (203) 288-6004

**cfSoftware, Inc.**

2454 E. Dempster, #201  
Des Plaines, IL 60016 (312) 824-7180

**Cincom Systems, Inc.**

2300 Montana Avenue  
Cincinnati, OH 45211 (513) 662-2300

**CLEO Communications**

3796 Plaza Drive  
Ann Arbor, MI 48108 (313) 662-2002

**Commtext Inc.**

1655 Crofton Boulevard, Suite 300  
Crofton, MD 21114 (301) 721-3666

**Computer Associates International, Inc.**

711 Stewart Avenue  
Garden City, NY 11530 (516) 227-3300

**Computer Corp. of America**

4 Cambridge Center  
Cambridge, MA 02142 (617) 492-8860

**Computer Logics, Ltd.**

75 International Boulevard  
Rexdale, ON, Canada M9W 6L9 (416) 674-1111

**Core Technology Corp.**

7335 Westshire Drive  
Lansing, MI 48917 (517) 627-1521

**CQ Computer Communications, Inc.**

4695 N. Monroe Street  
Tallahassee, FL 32303 (904) 562-4255

**Data Interface Systems Corp.**

P.O. Box 4189  
Austin, TX 78765 (512) 346-5641

**Data Race, Inc.**

12758 Cimarron Path  
San Antonio, TX 78249 (512) 692-3909

**Datability Software Systems, Inc.**

322 Eighth Avenue  
New York, NY 10001 (212) 807-7800

**Digital Communications Associates, Inc. (DCA)**

1000 Alderman Drive  
Alpharetta, GA 30201 (404) 442-4000

**Direct Aid, Inc.**

31332 Via Colinas, #102  
Westlake Village, CA 91362 (818) 889-1013

**Diversified Computer Systems, Inc.**

3775 Iris Avenue, Suite 1B  
Boulder, CO 80301 (303) 447-9251

**DTSS, Inc.**

Buck Road, P.O. Box 70  
Hanover, NH 03755 (603) 643-6600

**Eicon Technology**

2196 32nd Avenue  
Lachine, PQ, Canada H8T 3H7 (514) 631-2592

**Emerald Technology, Inc.**

18912 N. Creek Parkway  
Bothell, WA 98011 (206) 485-8200

**Emulex Corp.**

3545 Harbor Boulevard, P.O. Box 6725  
Costa Mesa, CA 92626 (714) 662-5600

**FEL Computing**

10 Main Street, P.O. Box 72  
Williamsville, VT 05362 (802) 348-7171, (800) 728-6829

**FTG Data Systems**

10801 Dale Street, Suite J-2  
Stanton, CA 90680 (714) 995-3900

**Gateway Communications, Inc.**

2941 Alton Avenue  
Irvine, CA 92714 (714) 553-1555

**General Micro Systems**

P.O. Box 5330  
Hopkins, MN 55343 (612) 937-1442

**Hawkeye Grafix, Inc.**

P.O. Box 1400  
Oldsmar, FL 34677 (813) 855-5846

**ICOT Network Systems Div.**

One Apple Hill  
3801 Zanker Road, P.O. Box 5143  
Natick, MA 01760 (800) SNA-3270

**IDEAssociates, Inc.**

29 Dunham Road  
Billerica, MA 01821 (617) 663-6878

**Information Technologies, Inc.**

14505 N. Hayden Road  
Scottsdale, AZ 85260 (602) 998-1033

**Innovative Electronics, Inc.**  
10110 USA Today Way  
Miramar, FL 33025 (305) 624-1644

**International Business Machines (IBM)**  
Old Orchard Road  
Armonk, NJ 10504  
Contact your local IBM representative.

**JDS MicroProcessing**  
22661 Lambert Street, Suite 206  
El Toro, CA 92630 (714) 770-2263

**KEA Systems Ltd.**  
2150 W. Broadway, Suite 412  
Vancouver, BC, Canada V6K 4L9 (800) 663-8702

**KMW Systems Corp.**  
6034 W. Courtyard Drive  
Austin, TX 78730 (512) 338-3000

**Management Science America, Inc.**  
3445 Peachtree Road, NE  
Atlanta, GA 30326 (404) 239-2000

**McCormack & Dodge**  
1225 Worcester Road  
Natick, MA 01760 (617) 655-8200

**Micro Decisionware, Inc.**  
2995 Wilderness Place  
Boulder, CO 80301 (303) 443-2706

**Micro Tempus Inc.**  
440 Dorchester Boulevard W., #300  
Montreal, PQ, Canada H2Z 1V7 (514) 397-9512

**Microcom Software Div.**  
55 Federal Road  
Danbury, CT 06810 (203) 798-3800

**MicroGate Corp.**  
9501 Capital of Texas Highway, #105  
Austin, TX 78759 (512) 345-7791

**MicroPlot**  
1897 Red Fern Drive  
Columbus, OH 43229 (614) 882-4786

**Modems Plus, Inc.**  
3180 A Presidential Drive  
Atlanta, GA 30340 (404) 458-2232

**Multi Soft, Inc.**  
123 Franklin Corner Road  
Lawrenceville, NJ 08648 (609) 896-4100

**Multi-Tech Systems**  
2205 Woodale Drive East  
New Brighton, MN 55112 (612) 631-3550

**National Semiconductor**  
Quadram Products Group  
One Quad Way  
Norcross, GA 30093 (404) 923-6666

**Network Research Corp.**  
2380 N. Rose Avenue  
Oxnard, CA 93030 (805) 485-2700

**Network Software Associates, Inc. (NSA)**  
22982 Mill Creek  
Laguna Hills, CA 92653 (714) 768-4013

**Novell, Inc.**  
Communications Products Div.  
890 Ross Drive  
Sunnyvale, CA 94089 (408) 747-4000

**OBS Software**  
115 Sansome Street  
San Francisco, CA 94104 (415) 391-9555

**On-Line Software International, Inc.**  
Two Executive Drive  
Fort Lee, NJ 07024 (201) 592-0009

**Packet/PC Inc.**  
270 Farmington Avenue  
Farmington, CT 06032 (203) 678-1961

**Pansophic Systems, Inc.**  
2400 Cabot Drive  
Lisle, IL 60532 (312) 505-6000

**Passport Communications**  
240 Lincoln Centre Drive  
Foster City, CA 94022 (415) 345-6666

**Performance Software, Inc.**  
575 S. Lake Boulevard  
Richmond, VA 23236 (804) 794-1012

**Persoft, Inc.**  
465 Science Drive  
Madison, WI 53711 (608) 273-6000

**POINT 4 Data Corp.**  
15442 Del Amo  
Tustin, CA 92680 (714) 259-0777

**Rabbit Software Corp.**  
7 Great Valley Parkway  
Malvern, PA 19355 (215) 647-0440

**The Santa Cruz Operation, Inc.**  
400 Encinal Street  
Santa Cruz, CA 95061 (408) 425-7222

**Simware Inc.**  
20 Colonnade Road  
Ottawa, ON, Canada K2E 7M6 (613) 727-1779

**Softel Inc.**  
Shedd Hill Road  
Stoddard, NH 03464 (408) 432-6000

**Software Clearing House, Inc.**  
895 Central Avenue  
Cincinnati, OH 45202 (513) 579-0455

**Software Corporation of America**  
800 Summer Street  
Stamford, CT 06901 (203) 359-2773

**Software Synergy, Inc.**  
230 Park Avenue, Suite 539  
New York, NY 10169 (212) 697-0360

**Sterling Software**  
Systems Software Div.  
11050 White Rock Road, #100  
Rancho Cordova, CA 95670 (916) 635-5535

**Structured Software Solutions Inc.**  
4031 W. Plano Parkway, Suite 205  
Plano, TX 75093 (214) 985-9901

**Synex Systems Corp.**  
800-1176 W. Georgia Street  
Vancouver, BC, Canada V6E 4A2 (604) 688-8271

**Tangram Systems Corp.**  
188 MacKenan Drive  
Cary, NC 27511 (919) 481-4444

**Tymnet/McDonnell Douglas**  
2710 Orchard Parkway  
San Jose, CA 95134 (408) 435-7744

**Universal Data Systems**

5000 Bradford Drive  
Huntsville, AL 35805 (205) 721-8000

**Walker Richer & Quinn, Inc.**

2825 Eastlake Avenue E.  
Seattle, WA 98102 (206) 324-0350

**Wall Data Inc.**

17769 NE 78th Place  
Redmond, WA 98052 (206) 883-4777

**Waterloo Microsystems, Inc.**

3597 Parkway Lane, Suite 300  
Norcross, GA 30092 (404) 441-9252

# PC-to-Host Communications Products Comparison Column Entry Descriptions

## Specifications

**Product Function.** This entry lists the function of the product. Many products perform several of the functions listed. Choices include local terminal emulation, remote terminal emulation, network gateway, standalone protocol converter, host-application-specific link, and non-host-application-specific link. Some vendors indicated that the entries listed did not properly categorize what the product does.

**Users Supported.** PC-to-host products support single or multiple users. If multiple users are supported, vendors were asked to write how many.

**Components.** PC-to-host products can contain different components, including PC software, PC hardware, standalone hardware, host software, and host hardware. The components for each product are listed here.

**Copy Protected.** Vendors stated whether their software is copy protected.

**Microcomputers Supported.** This entry indicates which microcomputer systems the product is compatible with, including IBM PC/XT/AT, IBM PS/2 Micro

Channel Architecture (MCA), IBM PS/2 Non-Micro Channel Architecture (Non-MCA), and Apple Macintosh. Vendors also wrote in any additional PCs that their products support.

**Operating Systems Supported.** This section lists the PC operating environments that the product supports, including Apple ProDOS, Apple Macintosh Finder, CP/M-80/86, OS/2, MS-/PC-DOS, UNIX, and Xenix. Vendors also wrote in additional operating systems supported.

**Local Area Network Support.** For this entry, vendors have indicated which LANs their products support. Choices we included are ARCnet, Ethernet, Token-Ring, AppleTalk, and Starlan. Many vendors added that their products are compatible with NETBIOS LANs. No answer is indicated by "Vendor did not specify."

**Minimum Memory Required (bytes).** Vendors were asked to indicate the minimum RAM memory required in order for their products to function properly. Some vendors also wrote in the recommended memory. All responses are in kilobytes (K) or megabytes (M).

**Terminals/Controllers Emulated.** This section lists the types of terminals that the product emulates, including TTY; IBM 327X/317X DFT, 327X/317X CUT, and 5250 and 2780/3780 Series; Data General; Hewlett-Packard; Digital VT52/100 and VT200 and VT300 Series; and Unisys.

**User Interface.** Users often call a program easy or difficult to work with based on the presentation of the package, also known as the user interface. Vendors indicated which of the following features are supported to make the user interface friendlier: installation program, on-line Help facility, mouse support, command driven, on-line tutorial, graphic icons, menu driven, pop-up windows, and diagnostics.

**Programmability.** Vendors reported whether their products support script languages and unattended operation, which is commonly referred to as the programmability of a package.

**API Compatibility.** The Applications Program Interface allows PC programs to access the functions of the terminal emulation card without interrupting the application. The APIs with which the product is compatible are listed, including IBM API, DCA IRMA API, IBM LU6.2 API, and proprietary APIs.

**Microcomputer Security.** Security is critical when PC users access a corporate database. Much effort is involved in entering

and organizing data in any system, but this effort can be wasted without proper security. A program can control access through a variety of schemes, including the use of single- or multilevel passwords, interface-to-host control software, file encryption, and transmission encryption. Vendors also indicated what other security measures their product supports.

**Number of Concurrent Sessions.** The number of concurrent sessions that the product supports is detailed here.

**DOS Access During Session.** If the product supports DOS access during a host session, the vendor indicated it here.

**File Transfer.** The vendor noted if the product is capable of transferring files.

**File Formats.** This section indicates which file formats are supported: ASCII and/or binary.

**File Conversion.** If the product supports file conversion, it is indicated here.

**Host Interface Systems Supported.** Most of the products included in the columns are for use with IBM mainframes, e.g., the 43XX or 30XX Series. In addition, some products are designed to operate with IBM System/36/38, IBM AS/400, Data General systems, Digital VAX or DECsystems, Bull (Honeywell) systems, Hewlett-Packard (HP) Systems, Unisys, or systems based on UNIX. Vendors also

listed other host systems with which their products can run.

#### **Software Environment.**

Vendors indicated the host operating system environment that supports the PC-to-host link listed. Possible choices are IBM DOS, OS/VS, MS, VM, TSO, CMS, IMS, CICS, SSP, OS/400; Digital VAX/VMS; Data General (DG) AOS; Bull GCOS; UNIX System V; and Berkeley 4.X BSD. Vendors also listed other host operating systems supported.

**Protocols.** The communications protocols used to control the link are listed. Protocols include BSC (bisync), SNA, HDLC, SDLC, HASP, and TCP/IP. Vendors also indicated if any other protocols are supported.

#### **Applications Supported.**

In this section, the host applications that the PC link is designed to support are listed, for example, virtual drives on the host and access to host-resident applications.

#### **Communications Characteristics**

**Physical Connection.** The type of connection supported by the product, such as coaxial cable, twinaxial cable, or RS-232-C cable, is listed here.

**Transmission Mode.** This refers to the type of synchronization of data transfer employed between the sending and receiving device. Normally, data is sent in a serial-bit, *asynchronous* mode or *synchronous* mode.

**Transmission Speed (bps).** This entry lists, in bits per second, the rates of data transmission that the package supports.

**Communications Features.** Communications between the PC and host are made easier with features such as dialing directories and support for auto dial/redial, auto answer, macros, and unattended execution. Vendors indicated which of these features their products support and additional features, where applicable.

#### **Pricing and Availability**

**Microcomputer Software/Hardware (\$).** Shown here is the list price for products dealing with the PC side. If the product comprises both PC software and hardware, which can be purchased separately, we indicated the price for each with (s) or (h) after the product. If the product is sold with the PC software and hardware bundled, we indicated that price. Some products consist only of PC software or only of PC hardware. In that case, a single price is listed; readers should refer to the **Components** category for the corresponding component.

**Host Software/Hardware (\$).** Shown here is the list price for products meant for the host side. If the product is sold with the host software and hardware bundled, we have indicated that price. Some products consist only of host software or only of host hardware. In that case, a single price is listed; readers should refer to the **Components**

category for the corresponding component.

#### **Date of First Delivery.**

This entry lists the date on which the vendor first commercially delivered the product.

#### **Number Installed to Date.**

Many vendors regard installed-base information as proprietary. This entry lists, where available, the number of products currently installed. If the vendor did not answer, we wrote "Vendor did not specify."

**Warranty.** Today, users are not only interested in product functionality and pricing, but also in product servicing. This entry lists the length of time the product is warranted.

**Distribution.** This section describes the method of distribution that the vendor uses, including direct, through distributors/dealers/retail chains, mail order, OEMs, and VARs.

#### **Comments**

This entry includes space for any features, functions, or products not covered by the entries above.

Vendor	Adacom Corp.	Adacom Corp.	Agile	Agile
Product	ADAFILE	ADAGATE	3278/79 Emulation with File Transfer	6287 Ultra
<b>Specifications</b>				
Product Function	Local terminal emulation	Vendor did not specify	Local terminal emulation	Standalone protocol converter
Users Supported	Single user	Multiuser; 16	Single user	Multiuser; up to 3
Components	Microcomputer software	Standalone hardware	Microcomputer hardware & software	Standalone hardware
Copy Protected Microcomputers Supported	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles	Yes Macintosh, IBM, any ASCII PC
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	Vendor did not specify	Not applicable
Local Area Network Support	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Minimum Memory Required (bytes)	256K	Vendor did not specify	Vendor did not specify	Vendor did not specify
Terminals/Controllers Emulated	IBM, 327X/317X CUT	IBM, 327X/317X DFT, 327X/317X CUT	IBM, 327X/317X CUT	Vendor did not specify
User Interface	Install program, pop-up windows	Vendor did not specify	Install program, on-line help	Vendor did not specify
Programmability API Compatibility	No IBM API	No Vendor did not specify	No IBM LU 6.2	Yes Not applicable
Microcomputer Security	Password protection	Password protection	Optional	Vendor did not specify
Number of Concurrent Sessions	Vendor did not specify	Up to 80	Vendor did not specify	1
DOS Access During Session	No	Vendor did not specify	Vendor did not specify	Vendor did not specify
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	Binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX
Software Environment	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	IBM, OS/VS, TSO, CMS, CICS	Vendor did not specify
Protocols	RS-232 async	IBM 3270 type A	BSC	BSC, SDLC
Applications Supported	Access to host-resident programs	Access to host-resident programs	Vendor did not specify	Vendor did not specify
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	Coax	Coax	Coax
Transmission Mode	Asynchronous	Asynchronous, synchronous	Vendor did not specify	Vendor did not specify
Transmission Speed (bps)	300, 600, 1200, 2400, 4800, 9600	300, 600, 1200, 2400, 4800, 9600, 19.2K	Vendor did not specify	Vendor did not specify
Communications Features	Dial directory, auto dial/redial	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	300	Vendor did not specify	295 software, 425 hardware	Vendor did not specify
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	July 1989	June 1986	January 1986	1987
Number Installed to Date	250	400	Vendor did not specify	Over 10,000
Warranty	90 days	1 year	Two years	Two years
Distribution	Dist., dlrs, retail	Dist., dlrs, retail	Direct, dist., dlrs, retail	Direct, dist., dlrs, retail, OEMs, VARs
<b>Comments</b>	—	—	—	—

Vendor	Agile	Andrew Corp.	Andrew Corp.	Andrew Corp.
<b>Product</b>	62871C	ComLynx/5251	ComLynx/5294	DataLynx/5294
<b>Specifications</b>				
Product Function	Standalone protocol converter	Local terminal emulation	Remote terminal emulation	Standalone protocol converter
Users Supported	Multuser; up to 3	Single user	Single user	Multuser; 32
Components	Standalone hardware	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer software
Copy Protected Microcomputers Supported	Yes Macintosh, IBM, any ASCII PC	No IBM, PC/XT/AT & compatibles, PS/2 MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No Macintosh, IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	Not applicable	MS-/PC-DOS	MS-/PC-DOS	Apple ProDOS, Macintosh Finder, CP/M-80, CP/M-86, OS/2, MS-/PC-DOS, UNIX, Xenix Ethernet
Local Area Network Support	Vendor did not specify	Vendor did not specify	Vendor did not specify	
Minimum Memory Required (bytes)	Vendor did not specify	90K	182K	100K
Terminals/Controllers Emulated	Vendor did not specify	IBM, 5250 Series	IBM, 5250 Series	TTY, IBM, 327X/317X DFT, 327X/317X CUT, 5250 Series, 2780/3780, DEC, VT52/100, VT200 Series, VT300 Series DG; HP; Honeywell Bull Unisys
User Interface	Vendor did not specify	Install program, on-line help, pop-up windows	Install program, on-line help, pop-up windows, diagnostics	Install program, on-line help, diagnostics
Programmability API Compatibility	Yes Not applicable	Yes IBM API	Yes IBM API	Yes IBM API
Microcomputer Security	Vendor did not specify	Vendor did not specify	Vendor did not specify	Password protection
Number of Concurrent Sessions	1	7	Up to 9	32
DOS Access During Session	Vendor did not specify	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	Binary	ASCII	ASCII	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM, System/36/38, AS/400	IBM, System/36/38, AS/400	IBM, System/36/38, AS/400
Software Environment	Vendor did not specify	IBM, SSP, OS/400	IBM, SSP, OS/400	Vendor did not specify
Protocols	BSC, SDLC	5250	SDLC	SNA
Applications Supported	Vendor did not specify	Host virtual disk, access to host-resident programs, file transfer	Host virtual disk, access to host-resident programs, file transfer	Host virtual disk, access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	Coax	Twinax, Balun	RS-232-C	RS-232-C
Transmission Mode	Vendor did not specify	Vendor did not specify	Synchronous	Asynchronous, synchronous
Transmission Speed (bps)	Vendor did not specify	Up to 1M	19.2K	300 to 38.4K
Communications Features	Vendor did not specify	Vendor did not specify	Auto dial/redial, unattended execution	Dial directory, auto dial/redial, auto answer, macros, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	Vendor did not specify	895 both	795	150
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	1987	January 1990	March 1990	Vendor did not specify
Number Installed to Date	Over 10,000	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	Two years	1 year	1 year	Vendor did not specify
Distribution	Direct, dist., dlrs, retail, OEMs, VARs	Direct, dist., dlrs, retail, VARs	Direct, dist., dlrs, retail, VARs	Direct, dist., dlrs, retail, VARs
<b>Comments</b>	—	—	—	—

Vendor	Andrew Corp.	Andrew Corp.	Andrew Corp.	Andrew Corp.
Product	InterLynx/400	InterLynx/5251	NetLynx/5251	NetLynx/5294
<b>Specifications</b>				
Product Function	Standalone protocol converter	Standalone protocol converter	Local terminal emulation, network gateway	Remote terminal emulation, network gateway
Users Supported	Multiuser; up to 7	Multiuser; up to 7	Multiuser; up to 224	Multiuser; up to 9
Components	Microcomputer software, standalone hardware	Microcomputer software, standalone hardware	Microcomputer hardware & software	Microcomputer hardware & software
Copy Protected	No	No	No	No
Microcomputers Supported	Macintosh, IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	Macintosh, IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	Apple ProDOS, Macintosh Finder, CP/M-80, CP/M-86, OS/2, MS-/PC-DOS, UNIX, Xenix	Apple ProDOS, Macintosh Finder, OS/2, MS-/PC-DOS, UNIX, Xenix	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Ethernet	Ethernet	ARCnet, Ethernet, IBM Token-Ring, STARLAN	ARCnet, Ethernet, IBM Token-Ring, STARLAN, NetBIOS compatible
Minimum Memory Required (bytes)	100K	Vendor did not specify	66K for server, 100K per node	90K server, 160K per node
Terminals/Controllers Emulated	TTY, IBM, 327X/317X DFT, 327X/317X CUT, 5250 Series, 2780/3780, DEC, VT52/100, VT200 Series, VT300 Series DG; HP; Honeywell Bull Unisys	TTY, IBM, 327X/317X DFT, 327X/317X CUT, 5250 Series, DEC, VT52/100, VT200 Series, VT300 Series; DG HP	5250 Series	IBM, 5250 Series
User Interface	Install program, diagnostics	Diagnostics	Install program, on-line help, pop-up windows, diagnostics	Install program, on-line help, pop-up windows, diagnostics
Programmability	Yes	Yes	Yes	Yes
API Compatibility	IBM API	IBM API	IBM API	IBM API
Microcomputer Security	Password protection	Password protection	Vendor did not specify	Vendor did not specify
Number of Concurrent Sessions	Vendor did not specify	7	7	Up to 9
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII	ASCII
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, AS/400	IBM, System/36/38, AS/400	IBM, System/36/38, AS/400	IBM, System/36/38, AS/400
Software Environment	IBM, OS/400	SSP, OS/400, CPF	IBM, SSP, OS/400	IBM, SSP, OS/400
Protocols	Twinax	Twinax	5250	SDLC
Applications Supported	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs, file transfer	Host virtual disk, access to host-resident programs, file transfer
<b>Communications Characteristics</b>				
Physical Connection	Twinax	Twinax, RS-232-C	Twinax	RS-232-C
Transmission Mode	Asynchronous	Asynchronous	Vendor did not specify	Synchronous
Transmission Speed (bps)	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K, up to 38.4K	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K	Up to 1M	19.2K
Communications Features	Dial directory, auto dial/redial, auto answer, macros, unattended execution	Dial directory, auto dial/redial, auto answer, macros, unattended execution	Vendor did not specify	Auto dial/redial, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Software/Hardware (\$)	150 software	150	1,995 both	1,995 both
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	Vendor did not specify	Vendor did not specify	December 1989	March 1990
Number Installed to Date	Vendor did not specify	6,000	Vendor did not specify	Vendor did not specify
Warranty	1 year	1 year	1 year	1 year
Distribution	Direct, dist., dlrs, retail, mail, OEMs, VARs	Direct, dist., dlrs, retail, mail, OEMs, VARs	Direct, dist., dlrs, retail, VARs	Direct, dist., dlrs, retail, VARs
<b>Comments</b>	—	—	—	—

Vendor	ANNATEK Systems, Inc.	AST Research, Inc.	AST Research, Inc.	AST Research, Inc.
Product	Network Navigator Dispatcher	AST 3270 Gateway Option	AST 5250 Gateway Option	AST-3270/CoaxII-CUT
<b>Specifications</b>				
Product Function	Local/remote terminal emulation	Local terminal emulation	Network gateway	Local terminal emulation
Users Supported	Single user	Single user	Multiuser; unlimited	Single user
Components	Microcomputer software, host software	Microcomputer hardware & software	Microcomputer software	Microcomputer hardware & software
Copy Protected	Yes	No	No	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	OS/2, MS-/PC-DOS
Local Area Network Support	IBM Token-Ring, STARLAN, 3COM	Ethernet, IBM Token-Ring	ARCnet, Ethernet, IBM Token-Ring, NetBios	Did not specify
Minimum Memory Required (bytes)	200K	512K	146K (server), 126K (node)	256K
Terminals/Controllers Emulated	TTY, 327X/317X CUT, DEC, VT52/100, VT200 Series, VT300 Series, TVI925, IBM 3101	IBM, 327X/317X DFT	IBM, 5250 Series	327X/317X CUT
User Interface	Install program, on-line help, diagnostics	Install program, on-line help	Vendor did not specify	Install program, on-line help, diagnostics
Programmability API Compatibility	Yes IBM API, DCA IRMA API, proprietary	Yes IBM API, DCA IRMA API, HLLAPI	Vendor did not specify IBM API, proprietary	Yes IBM API, DCA IRMA API, EEHLLAPI
Microcomputer Security	Password protection, interface to host software, user ID, password encrypt.	Password protection, interface to host software, Config. emulator security	Password protection	Interface to host software
Number of Concurrent Sessions	Up to 4	Five per PC	7	One
DOS Access During Session	Vendor did not specify	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, System/36/38	IBM, 43XX/30XX
Software Environment	IBM, OS/VS, MVS, VM, TSO, IBM MVS VTAM	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	IBM, OS/400, IBM CPF	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS
Protocols	BSC, SNA, SDLC	SNA, SDLC	Vendor did not specify	BSC, SNA, SDLC
Applications Supported	Access to host-resident programs	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	Coax, RS-232-C	RS-232-C	Twinax, RS-232-C	Coax
Transmission Mode	Asynchronous, synchronous	Synchronous	Ven. did not specify	Synchronous
Transmission Speed (bps)	300, 1200, 2400, 4800, 9600, 19.2K	300-19.K	Vendor did not specify	2.4M
Communications Features	Dial directory, auto dial/redial, auto answer, macros, unattended exec., logon/off w/ script	Did not specify	Vendor did not specify	Did not specify
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	195 software	995	995	895
Host Software/Hardware (\$)	30,000 host software	Vendor did not specify	N/A	Vendor did not specify
Date of First Delivery	Vendor did not specify	December 1985	Vendor did not specify	October 1987
Number Installed to Date	Vendor did not specify	Did not specify	Vendor did not specify	Did not specify
Warranty	90 days	Two years	Two years	Two years
Distribution	Direct	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs
<b>Comments</b>	Dispatcher is an IBM micro-mainframe, store and forward network file transfer system	—	Also available for IBM System/34	—

Vendor	AST Research, Inc.	AST Research, Inc.	AST Research, Inc.	AST Research, Inc.
Product	AST-3270/DFT Option	AST-3270/SNA II	AST-5251/12	Enhanced AST-5251/11 Plus
<b>Specifications</b>				
Product Function	Local terminal emulation	Remote terminal emulation	Remote terminal emulation	Local terminal emulation
Users Supported	Single user	Single user	Single user	Single user
Components	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software
Copy Protected Microcomputers Supported	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	OS/2, MS-/PC-DOS
Local Area Network Support	Did not specify	Ethernet, IBM Token-Ring	Ethernet, IBM Token-Ring	Did not specify
Minimum Memory Required (bytes)	512K	256K	120K	84-100K
Terminals/Controllers Emulated	IBM, 327X/317X DFT	IBM, 327X/317X DFT	5250 Series	IBM, 5250 Series, IBM 3180 Model 2
User Interface	Install program, on-line help, diagnostics	Install program, on-line help	Diagnostics	Vendor did not specify
Programmability API Compatibility	Yes IBM API, DCA IRMA API, HLLAPI	Yes IBM API, DCA IRMA API, HLLAPI	Yes IBM API, proprietary	Yes IBM API, DCA IRMA API
Microcomputer Security	Password protection, interface to host software, Config.emulator security	Password protection, interface to host software, config. emulator security	Password protection	Password protection
Number of Concurrent Sessions	Five	Five	9	Seven
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, System/36/38	Vendor did not specify
Software Environment	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	OS/400, IBM CPF	IBM, OS/400, IBM CPF
Protocols	BSC, SNA, SDLC	SNA, SDLC	SNA, SDLC	Twinax
Applications Supported	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	Coax, twisted pair	RS-232-C	Vendor did not specify	Twinax
Transmission Mode	Synchronous	Synchronous	Synchronous	Vendor did not specify
Transmission Speed (bps)	2.4M	300-19.K	9600	1M
Communications Features	Did not specify	Dial directory, auto dial/redial, macros	Macros	Macros
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	195	895	790	895
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	N/A	Vendor did not specify
Date of First Delivery	May 1988	December 1985	April 1984	November 1984
Number Installed to Date	Did not specify	Vendor did not specify	Vendor did not specify	Did not specify
Warranty	Two years	Two years	Two years	Two years
Distribution	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs
Comments	—	—	—	Upgradable to LAN gateway

Vendor	Attachmate Corp.	Avatar Corp.	Avatar Corp.	Avatar Corp.
Product	EXTRA! Connectivity Software	MacMainFrame DX	MacMainFrame II	MacMainFrame II/DFT
<b>Specifications</b>				
Product Function	Local/remote terminal emulation, network gateway	Local/remote terminal emulation, standalone protocol converter	Local terminal emulation	Local terminal emulation
Users Supported	Single user	Single user	Single user	Single user
Components	Microcomputer software	Microcomputer hardware & software, host software	Microcomputer hardware & software, host software	Microcomputer hardware & software, host software
Copy Protected	No	No	No	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	Macintosh	Macintosh	Macintosh
Operating Systems Supported	MS-/PC-DOS	Macintosh Finder	Macintosh Finder	Macintosh Finder
Local Area Network Support	ARCnet, Ethernet, IBM Token-Ring, STARLAN, NetBIOS compatible	AppleTalk	AppleTalk	AppleTalk
Minimum Memory Required (bytes)	44K	400K	400K	700K
Terminals/Controllers Emulated	IBM, 327X/317X DFT, 327X/317X CUT	IBM, 327X/317X CUT	IBM, 327X/317X CUT	IBM, 327X/317X DFT
User Interface	Install program, on-line help, mouse, graphic icons, pop-up windows	Install program, mouse, graphic icons, pop-up windows, diagnostics	Install program, mouse, graphic icons, pop-up windows, diagnostics	Install program, mouse, graphic icons, pop-up windows, diagnostics
Programmability	Yes	Yes	Yes	Yes
API Compatibility	IBM API	Proprietary	Proprietary	Proprietary
Microcomputer Security	Interface to host software	Document locking	Document locking	Document locking
Number of Concurrent Sessions	4	1	1	5
DOS Access During Session	Yes	Not applicable	Not applicable	Not applicable
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	No	No	No
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX, AS/400	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX
Software Environment	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, OS/400	IBM, MVS, VM, TSO, CMS, CICS	IBM, MVS, VM, TSO, CMS, CICS	IBM, MVS, VM, TSO, CMS, CICS
Protocols	BSC, SNA, SDLC	SNA, SDLC	SNA, SDLC	SNA, SDLC
Applications Supported	Host virtual disk, access to host-resident programs	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	Coax, RS-232-C, token ring	Coax, RS-232-C	Coax	Coax
Transmission Mode	Synchronous	Synchronous	Asynchronous	Asynchronous
Transmission Speed (bps)	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K, 56K	19.2K	2400	2400
Communications Features	Auto dial/redial, auto answer, unattended execution	Vendor did not specify	Dial directory	Dial directory
<b>Pricing and Availability</b>				
Microcomputer Software/Hardware (\$)	475 software	1195 (bundled)	995 (bundled)	1295 (bundled)
Host Software/Hardware (\$)	Vendor did not specify	500 (host file transfer program)	500 (host file transfer program)	500 (host file transfer program)
Date of First Delivery	June 1987	1985	June 1988	May 1989
Number Installed to Date	Over 150,000	Not available	Vendor did not specify	Vendor did not specify
Warranty	90 days	One year limited	One year limited	One year limited
Distribution	Direct, dist., dlrs, retail	Dist., dlrs, retail	Dist., dlrs, retail	Dist., dlrs, retail
Comments	—	MacMainFrame DX provides remote and local Macintosh-to-IBM mainframe comm. for Macintosh	—	495 as software upgrade to Mac MainFrame II; for entire Macintosh II family of computers

Vendor	Avatar Corp.	Avatar Corp.	Avatar Corp.	Avatar Corp.
Product	MacMainFrame SE	MacMainFrame SE/30	MacMainFrame SE/30/DFT	MacMainFrame SE/DFT
<b>Specifications</b>				
Product Function	Local terminal emulation	Local terminal emulation	Local terminal emulation	Local terminal emulation
Users Supported	Single user	Single user	Single user	Single user
Components	Microcomputer hardware & software, host software			
Copy Protected	No	No	No	No
Microcomputers Supported	Macintosh	Macintosh	Macintosh	Macintosh
Operating Systems Supported	Macintosh Finder	Macintosh Finder	Macintosh Finder	Macintosh Finder
Local Area Network Support	AppleTalk	AppleTalk	AppleTalk	AppleTalk
Minimum Memory Required (bytes)	400K	400K	700K	700K
Terminals/Controllers Emulated	IBM, 327X/317X CUT	IBM, 327X/317X CUT	IBM, 327X/317X DFT	IBM, 327X/317X DFT
User Interface	Install program, mouse, graphic icons, pop-up windows, diagnostics	Install program, mouse, graphic icons, pop-up windows, diagnostics	Install program, mouse, graphic icons, pop-up windows, diagnostics	Install program, mouse, graphic icons, pop-up windows, diagnostics
Programmability	Yes	Yes	Yes	Yes
API Compatibility	Proprietary	Proprietary	Proprietary	Proprietary
Microcomputer Security	Document locking	Document locking	Document locking	Document locking
Number of Concurrent Sessions	1	1	5	5
DOS Access During Session	Not applicable	Not applicable	Not applicable	Not applicable
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	No	No	No	No
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX
Software Environment	IBM, MVS, VM, TSO, CMS, CICS	IBM, MVS, VM, TSO, CMS, CICS	IBM, MVS, VM, TSO, CMS, CICS	IBM, MVS, VM, TSO, CICS
Protocols	SNA, SDLC	SNA, SDLC	SNA, SDLC	SNA, SDLC
Applications Supported	Access to host-resident programs			
<b>Communications Characteristics</b>				
Physical Connection	Coax	Coax	Coax	Coax
Transmission Mode	Vendor did not specify	Asynchronous	Asynchronous	Vendor did not specify
Transmission Speed (bps)	Vendor did not specify	2400	2400	Vendor did not specify
Communications Features	Vendor did not specify	Dial directory	Dial directory	Vendor did not specify
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	795 (bundled price)	995 (bundled price)	1295 (bundled)	495
Host Software/Hardware (\$)	500 (host file transfer program)			
Date of First Delivery	July 1987	May 1989	4th quarter 1989	4th quarter 1989
Number Installed to Date	Vendor did not specify			
Warranty	Limited one year	One year limited	One year limited	One year limited
Distribution	Dist., dlrs, retail	Dist., dlrs, retail	Dist., dlrs, retail	Dist., dlrs, retail
<b>Comments</b>				
	For use on the Macintosh SE computer	Available for Macintosh SE/30	495 as upgrade to Macintosh SE II; available for Macintosh SE/30	—

Vendor	Barr Systems, Inc.	Barr Systems, Inc.	Barr Systems, Inc.	Barr Systems, Inc.
Product	BARR/3780	BARR/HASP	BARR/SNA RJE (TRN)	BARR/SNA RJE
<b>Specifications</b>				
Product Function	Remote terminal emulation, network gateway, standalone protocol converter, host app. spfc. link Single user	Remote terminal emulation, network gateway, standalone protocol converter, host app. spfc. link Single user	Remote terminal emulation, network gateway, standalone protocol converter, host app. spfc. link Single user	Remote terminal emulation, network gateway, standalone protocol converter, host app. spfc. link Single user
Users Supported				
Components	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer software	Microcomputer hardware & software
Copy Protected	No	No	No	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	ARCnet, Ethernet, IBM Token-Ring, any DOS-based LAN	ARCnet, Ethernet, IBM Token-Ring, any DOS-based LAN	IBM Token-Ring	Any DOS-based LAN
Minimum Memory Required (bytes)	256K	256K	320K	320K
Terminals/Controllers Emulated	IBM, 2780/3780	IBM 3777-2	IBM 3777-3, PU2, LU1	IBM 3777-3, PU2, LU1
User Interface	Install program, on-line help, diagnostics	Install program, on-line help, diagnostics	Install program, on-line help, diagnostics	Install program, on-line help, diagnostics
Programmability	No	No	No	No
API Compatibility	Proprietary	Proprietary	Proprietary	Proprietary
Microcomputer Security	Password protection, interface to host software	Password protection, interface to host software	Password protection, interface to host software	Password protection, interface to host software
Number of Concurrent Sessions	1	12	16 multiple LUs	16 multiple LUs
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX, System/36/38, AS/400; Data General; Honeywell Bull DEC/VAX, DECsystem; HP Unisys; UNIX-based systems	IBM, 43XX/30XX, any machine w/supported protocol, CDC Cyber, Cray	IBM, 43XX/30XX, any machine with supported protocol	IBM, 43XX/30XX, any machine with supported protocol
Software Environment	IBM, DOS, OS/VS, MVS, VM, SSP; VAX/VMS; DG OAS Honeywell GCOS	IBM, OS/VS, MVS, VM, CEDC/NOS	IBM, DOS, OS/VS, MVS, VM	IBM, DOS, OS/VS, MVS, VM
Protocols	BSC, HASP, 3780, 2780, 3740	BSC, HASP, HASP BSC	SNA, SNA RJE	SNA, SDLC
Applications Supported	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C, V.35	RS-232-C, V.35	Token ring	RS-232-C, V.35
Transmission Mode	Synchronous	Synchronous	Synchronous	Synchronous
Transmission Speed (bps)	2,400 to 64K bps	2,400 to 64K bps	4M or 16M	2,400 to 256K bps
Communications Features	Dial directory, auto dial/redial, auto answer, unattended execution, simulated remote console	Dial directory, auto dial/redial, auto answer, unattended execution	Dial directory, auto dial/redial, auto answer, unattended execution	Dial directory, auto dial/redial, auto answer, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	1,290	1,290	1,590	1,590
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	March 1989	August 1983	March 1989	August 1987
Number Installed to Date	100	6,000	100	3,000
Warranty	Vendor did not specify	1 year	Vendor did not specify	Vendor did not specify
Distribution	Direct, mail, OEMs	Direct, OEMs	Direct, OEMs	Direct, OEMs
Comments	Extension products for nine-track tape support and advanced file transfer available	Extension products for nine-track tape support and advanced file transfer available	Extension products for nine-track tape support and advanced file transfer available	Extension products for nine-track tape support and advanced file transfer available

Vendor	Barr Systems, Inc.	BlueLynx	BlueLynx	BlueLynx
Product	RJE + 3270	BlueLynx/3270 Auto Sync	BlueLynx/3270 Remote Bisync	BlueLynx/3270 Remote Gateway
<b>Specifications</b>				
Product Function	Remote terminal emulation, network gateway, standalone protocol converter, host app. spfc. link	Remote terminal emulation	Remote terminal emulation	Remote terminal emulation
Users Supported	Single user	Single user	Single user	Multuser; 32
Components	Microcomputer hardware & software	Microcomputer software	Microcomputer hardware & software	Microcomputer hardware & software
Copy Protected	No	No	No	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	ARCnet, Ethernet, IBM Token-Ring, any DOS-based LAN	Vendor did not specify	Vendor did not specify	IBM Token-Ring
Minimum Memory Required (bytes)	320K	276K	89K	173K
Terminals/Controllers Emulated	IBM 3777-3, PU2, LU1	327X/317X CUT	327X/317X CUT	Vendor did not specify
User Interface	Install program, on-line help, diagnostics	On-line help, pop-up windows, diagnostics	Diagnostics	On-line help, pop-up windows, diagnostics
Programmability	No	No	No	No
API Compatibility	Proprietary	IBM API	Vendor did not specify	IBM API
Microcomputer Security	Password protection, interface to host software	Password protection	Vendor did not specify	Password protection
Number of Concurrent Sessions	16 multiple LUs, 5 3270 sessions	8	1	32
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	No	Yes
File Formats	ASCII, binary	ASCII, binary	Not applicable	ASCII, binary
File Conversion	Yes	Yes	Not applicable	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX, any machine with supported protocol	IBM, 43XX/30XX, IBM 370 Series	IBM, 43XX/30XX, IBM 370 Series	IBM, 43XX/30XX, IBM 370 Series
Software Environment	IBM, DOS, OS/VS, MVS, VM	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP
Protocols	SNA, SDLC	SNA, SDLC	BSC	SNA, SDLC
Applications Supported	Vendor did not specify	IRMA compatible host file transfer	None	IRMA-compatible, host file transfer
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C, V.35, token ring	RS-232-C	RS-232-C	RS-232-C
Transmission Mode	Synchronous	Synchronous	Synchronous	Synchronous
Transmission Speed (bps)	2,400 to 256K bps	9600	9600	9600
Communications Features	Dial directory, auto dial/redial, auto answer, unattended execution	Auto dial/redial, macros, unattended execution	Macros, unattended execution	Macros, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	1,990	595	895	1,995
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	Vendor did not specify	Vendor did not specify	January 1987	May 1988
Number Installed to Date	100	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	Vendor did not specify	1 year, lifetime on software	1 year, lifetime on software	1 year, lifetime on software
Distribution	Direct, OEMs	Direct, dist., dlrs, retail	Direct, dist., dlrs, retail	Direct, dist., dlrs, retail
<b>Comments</b>	Extension products for nine-track support and advanced file transfer available	—	—	—

Vendor	BlueLynx	BlueLynx	BlueLynx	BlueLynx
Product	BlueLynx/3270 Remote SNA	BlueLynx/3780 RJE Remote	BlueLynx/5250-12 Auto Sync	BlueLynx/5250-12 Remote
<b>Specifications</b>				
Product Function	Remote terminal emulation	Remote terminal emulation	Remote terminal emulation	Remote terminal emulation, non-host app. spfc. link
Users Supported	Single user	Single user	Single user	Single user
Components	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer software	Microcomputer hardware & software
Copy Protected	No	No	No	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Minimum Memory Required (bytes)	239K	128K	182K	182K
Terminals/Controllers Emulated	327X/317X DFT	2780/3780	5250 Series	IBM, 5250 Series
User Interface	On-line help, pop-up windows, diagnostics	Diagnostics	Vendor did not specify	On-line help, pop-up windows
Programmability	No	No	No	No
API Compatibility	IBM API	Vendor did not specify	IBM API	IBM API
Microcomputer Security	Password protection	Vendor did not specify	Keyboard lock	Keyboard lock
Number of Concurrent Sessions	8	1	9	Nine
DOS Access During Session	Yes	No	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Vendor did not specify	No
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX, IBM 370 Series	IBM, 43XX/30XX, IBM 370 Series	System/36/38, AS/400	IBM, System/36/38, AS/400
Software Environment	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM, DOS, OS/VS, MVS, VM, CMS, 3780 batch communications	Vendor did not specify	IBM, OS/400
Protocols	SNA, SDLC	BSC	SNA, SDLC	SNA, SDLC
Applications Supported	IRMA compatible host file transfer	None	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	RS-232-C	RS-232-C	RS-232-C
Transmission Mode	Synchronous	Synchronous	Asynchronous	Synchronous
Transmission Speed (bps)	9600	9600	300, 600, 1200, 2400, 4800, 9600	300, 600, 1200, 2400, 4800, 9600
Communications Features	Macros, unattended execution	Vendor did not specify	Auto dial/redial	Vendor did not specify
<b>Pricing and Availability</b>				
Microcomputer Software/Hardware (\$)	895	895	595	795
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	July 1987	January 1987	Vendor did not specify	March 1987
Number Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	1 year, lifetime on software	1 year, lifetime on software	1 year, lifetime on software	1 year, Lifetime on software
Distribution	Direct, dist., dlrs, retail	Direct, dist., dlrs, retail	Direct, dist., dlrs, retail	Direct, dist., dlrs, retail
Comments	—	—	—	—

Vendor	BlueLynx	BlueLynx	BlueLynx	BlueLynx
<b>Product</b>	<b>BlueLynx/5250-12 Remote Gateway</b>	<b>BlueLynx/5251-11 Local</b>	<b>BlueLynx/5251-11 Local Gateway</b>	<b>BlueLynx/AS/400 PC Support Auto Sync Adapter Handler</b>
<b>Specifications</b>				
Product Function	Network gateway	Local terminal emulation, non-host app. spfc. link	Network gateway, non-host app. spfc. link	Host app. spfc. link
Users Supported	Multuser; 9	Single user	Multuser	Single user
Components	Microcomputer hardware & software			
Copy Protected	No	No	No	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	ARCnet, Ethernet, IBM Token-Ring, STARLAN	Vendor did not specify	ARCnet, Ethernet, IBM Token-Ring, STARLAN	Vendor did not specify
Minimum Memory Required (bytes)	90K for Gateway, 160K for PC	88K	65K for Gateway/ 104K for PC	14K memory in addition to PC support requirements
Terminals/Controllers Emulated	5250 Series	5250 Series	IBM, 5250 Series	IBM, 5250 Series
User Interface	On-line help, pop-up windows	On-line help, pop-up windows	On-line help, pop-up windows	Vendor did not specify
Programmability API Compatibility	No IBM API	No IBM API	No IBM API	No IBM API, IBM LU 6.2
Microcomputer Security	Keyboard lock	Keyboard lock	Keyboard lock	Vendor did not specify
Number of Concurrent Sessions	9	Seven	Seven	Five
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	No	No	No	Yes
<b>Host Interface</b>				
Systems Supported	System/36/38, AS/400	IBM, System/36/38, AS/400	IBM, System/36/38, AS/400	IBM, AS/400
Software Environment	OS/400	IBM, OS/400	IBM, OS/400	IBM, OS/400
Protocols	SNA, SDLC	TDLC	TDLC	SNA, SDLC
Applications Supported	Host virtual disk, access to host-resident programs			
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	Twinax	Twinax	RS-232-C
Transmission Mode	Synchronous	Asynchronous	Asynchronous	Synchronous
Transmission Speed (bps)	300, 600, 1200, 2400, 4800, 9600	1M	1M	300, 600, 1200, 2400, 4800, 9600
Communications Features	Vendor did not specify			
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	1,995	895	1,995	595
Host Software/Hardware (\$)	Vendor did not specify			
Date of First Delivery	October 1987	April 1987	May 1988	November 1989
Number Installed to Date	Vendor did not specify			
Warranty	1 year, lifetime on software			
Distribution	Direct, dist., dlrs, retail	Direct, dist., dlrs, retail	Direct, dist., dlrs, retail	Vendor did not specify
<b>Comments</b>	—	—	—	—

Vendor	BlueLynx	BlueLynx	BlueLynx	BlueLynx
Product	BlueLynx/AS/400 PC Support AutoSync Adapter Handler	BlueLynx/AS/400 PC Support Local Adapter Handler	BlueLynx/COAXSYS Local	BlueLynx/DFT/Local
<b>Specifications</b>				
Product Function	Host app. spfc. link	Host app. spfc. link	Local terminal emulation	Local terminal emulation
Users Supported	Single user	Single user	Single user	Single user
Components	Microcomputer software	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software
Copy Protected	No	No	No	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Vendor did not specify			
Minimum Memory Required (bytes)	145K memory in addition to PC support requirements	5K in addition to PC support requirements	100K	224K
Terminals/Controllers Emulated	IBM, 5250 Series	IBM, 5250 Series	327X/317X CUT	327X/317X DFT
User Interface	Vendor did not specify	Vendor did not specify	On-line help, pop-up windows, diagnostics	On-line help, pop-up windows, diagnostics
Programmability API Compatibility	No IBM API, IBM LU 6.2	No IBM API, IBM LU 6.2	No IBM API	No IBM API
Microcomputer Security	Vendor did not specify	Vendor did not specify	Password protection	Password protection
Number of Concurrent Sessions	Five	Five	1	5
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, AS/400	IBM, AS/400	43XX/30XX, IBM 370 Series	IBM, 43XX/30XX, IBM 370 Series
Software Environment	IBM, OS/400	IBM, OS/400	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP
Protocols	SNA, SDLC	TDLC	BSC, SNA, SDLC, channel attached	BSC, SNA, SDLC, channel attached
Applications Supported	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs	IRMA compatible host file transfer	IRMA compatible host file transfer
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	Twinax	Coax	Coax
Transmission Mode	Asynchronous	Asynchronous	Synchronous	Synchronous
Transmission Speed (bps)	300, 600, 1200, 2400, 4800, 9600	1M	Up to controller specifications	Up to controller specifications
Communications Features	Auto dial/redial	Vendor did not specify	Macros, unattended execution	Macros, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	395	695	895	1,095
Host Software/Hardware (\$)	Vendor did not specify			
Date of First Delivery	Novmeber 1989	August 1989	January 1987	June 1987
Number Installed to Date	Vendor did not specify			
Warranty	1 year, Lifetime on software			
Distribution	Direct, dist., dlrs, retail	Direct, dist., dlrs, retail	Vendor did not specify	Direct, dist., dlrs, retail
<b>Comments</b>				

Vendor	BlueLynx	Cambridge Computer Corp.	Cambridge Computer Corp.	Cambridge Computer Corp.
Product	Transfer 3270	Mac 73/78	PC 73/78	PC 77/78
<b>Specifications</b>				
Product Function	Host app. spfc. link	Local/remote terminal emulation	Local/remote terminal emulation	Local/remote terminal emulation
Users Supported	Single user	Multuser	Multuser; dependent upon memory	Single user
Components	Microcomputer hardware & software, host software	Microcomputer software	Microcomputer software	Microcomputer software
Copy Protected	No	No	No	No
Microcomputers Supported	PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	Macintosh	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA, Zenith Z100
Operating Systems Supported	MS-/PC-DOS	Macintosh Finder	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Vendor did not specify	Vendor did not specify	ARCnet, Ethernet, IBM Token-Ring, STARLAN	Vendor did not specify
Minimum Memory Required (bytes)	164K	1M	256K	256K
Terminals/Controllers Emulated	N/a	DEC, VT52/100, VT200 Series, VT300 Series, ANSI 3.64, Tektronics 4010/4014	Honeywell Bull	Honeywell Bull
User Interface	On-line help, pop-up windows	Install program, on-line help, mouse, graphic icons, pop-up windows, diagnostics	Install program, on-line help, pop-up windows	Install program, on-line help, pop-up windows, diagnostics
Programmability	No	Yes	Yes	Yes
API Compatibility	N/a	Vendor did not specify	Vendor did not specify	Cambridge
Microcomputer Security	N/a	Interface to host software	File encryption, interface to host software	File encryption, interface to host software
Number of Concurrent Sessions	1	Memory dependent	Vendor did not specify	Vendor did not specify
DOS Access During Session	No	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	43XX/30XX, IBM 370 Series	Honeywell Bull; DECVAX, DECsystem; UNIX-based systems	Honeywell Bull	Honeywell Bull
Software Environment	TSO, CMS, CICS	VAX/VMS; Honeywell GCOS UNIX System 5; Berkeley 4.X, Pick	Honeywell GCOS	Honeywell GCOS
Protocols	SNA, SDLC	VIP	VIP	VIP
Applications Supported	IRMA-compatible host file transfer	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	Coax, RS-232-C	RS-232-C	RS-232-C, RS-422	RS-232-C
Transmission Mode	Synchronous	Asynchronous	Asynchronous	Synchronous
Transmission Speed (bps)	Dependent upon emulator specifications	56K	19.2K	38.4K
Communications Features	Unattended execution	Dial directory, auto dial/redial, auto answer, macros	Dial directory, auto dial/redial, auto answer, macros, unattended execution	Macros, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	195	295	295	350
Host Software/Hardware (\$)	295	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	August 1989	November 1988	February 1984	December 1983
Number Installed to Date	Vendor did not specify	500	5,000	8,000
Warranty	1 year, lifetime on software	1 year	1 year	1 year
Distribution	Direct, dist., dlrs, retail	Direct, dist., dlrs, retail, mail	Direct	Direct, mail
<b>Comments</b>	—	—	Product can operate under Desqview multitasking system	Product can operate in a Desqview multitasking environment

Vendor	Cambridge Computer Corp.	cfSoftware, Inc.	cfSoftware, Inc.	Cincom Systems
Product	VX*Connect	Across the Boards	PcMAINFRAME	PC Contact
<b>Specifications</b>				
Product Function	Local/remote terminal emulation	Host app. spfc. link, non-host app. spfc. link	Host app. spfc. link	Host app. spfc. link
Users Supported	Single user	Multuser	Multuser	No limit
Components	Microcomputer software	Microcomputer software, host software	Microcomputer software, host software	Microcomputer software, host software
Copy Protected Microcomputers Supported	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles	Yes IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Vendor did not specify	ARCnet, Ethernet, IBM Token-Ring, STARLAN	Vendor did not specify	Vendor did not specify
Minimum Memory Required (bytes)	512K	50K	128K	Vendor did not specify
Terminals/Controllers Emulated	DEC, VT52/100, VT200 Series, VT300 Series	TTY, IBM, 327X/317X DFT, 327X/317X CUT, DEC, VT52/100, IBM 361	TTY, IBM, 327X/317X DFT, 327X/317X CUT, DEC, VT52/100, IBM 3101	IBM, 327X/317X DFT, 327X/317X CUT
User Interface	Install program, on-line help, mouse, pop-up windows	Vendor did not specify	Diagnostics	On-line help
Programmability API Compatibility	Yes Vendor did not specify	Yes IBM API, DCA IRMA API, proprietary, Novell API	Yes IBM API, DCA IRMA API, proprietary	Yes DCA IRMA API
Microcomputer Security	Interface to host software	Interface to host software	Password protection, interface to host software	Vendor did not specify
Number of Concurrent Sessions	Vendor did not specify	Unlimited	Unlimited	Vendor did not specify
DOS Access During Session	Yes	Yes	Yes	No
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII
File Conversion	Yes	No	Yes	No
<b>Host Interface</b>				
Systems Supported	DEC/VAX, DECsystem	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX
Software Environment	VAX/VMS	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	IBM, DOS, MVS, VM, CICS	IBM, DOS, OS/VS, MVS, VM, IMS, CICS
Protocols	Vendor did not specify	BSC, SNA, SDLC	BSC, SNA, SDLC	BSC
Applications Supported	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs, CICS	Host access to PC files
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	Twinax, coax, RS-232-C	Coax, RS-232-C	Coax
Transmission Mode	Asynchronous	Asynchronous, synchronous	Asynchronous, synchronous	Synchronous
Transmission Speed (bps)	19.2K	300, 1200, 2400, 4800, 9600, 19.2K	300, 1200, 2400, 4800, 9600, 19.2K	Vendor did not specify
Communications Features	Dial directory, auto dial/redial, auto answer, macros, unattended execution	Auto dial/redial, auto answer, macros, unattended execution	Auto dial/redial, auto answer, macros, unattended execution	Vendor did not specify
<b>Pricing and Availability</b>				
Microcomputer Sftware/Hdwre (\$)	245	2,500 to 65,000	1,000	Vendor did not specify
Host Software/Hardware (\$)	Vendor did not specify	1,250 to 2,500 software	7,500	Vendor did not specify
Date of First Delivery	Vendor did not specify	February 1987	November 1983	1984
Number Installed to Date	1,000	Over 25,000	550	500
Warranty	1 year	1 year	1 year	Vendor did not specify
Distribution	Direct	Direct, mail	Direct, dist., dirs, retail, mail	Direct
Comments	—	—	—	—

Vendor	CLEO Communications	CLEO Communications	CLEO Communications	Commtext Inc.
<b>Product</b>	<b>3780 Plus</b>	<b>Data Talker 3270</b>	<b>Data Talker 3270/UX</b>	<b>CX-80 Data Exchange</b>
<b>Specifications</b>				
Product Function	Remote terminal emulation	Remote terminal emulation	Remote terminal emulation	Network gateway, standalone protocol converter
Users Supported	Single user	Multuser; 32	Multuser; 9	Multuser; up to 50
Components	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software	Standalone hardware
Copy Protected	Yes	Yes	Yes	Vendor did not specify
Microcomputers Supported	Macintosh, IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	Macintosh, IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA, any ASCII or Type A coax device
Operating Systems Supported	MS-/PC-DOS, UNIX, Xenix	MS-/PC-DOS, UNIX, Xenix	UNIX, Xenix	All
Local Area Network Support	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Minimum Memory Required (bytes)	128K	128K	128K	Vendor did not specify
Terminals/Controllers Emulated	IBM, 2780/3780	IBM 3278/79	IBM 3278/79	IBM, 327X/317X CUT
User Interface	Install program, on-line help	Install program	Install program, on-line help	On-line help
Programmability	Yes	Yes	Yes	No
API Compatibility	Proprietary, Cleo's API	IBM API, proprietary	IBM API, proprietary	Vendor did not specify
Microcomputer Security	Vendor did not specify	Vendor did not specify	Vendor did not specify	Password protection
Number of Concurrent Sessions	Vendor did not specify	32	32	Up to 5
DOS Access During Session	Yes	Yes	No	Vendor did not specify
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	Vendor did not specify
File Conversion	Yes	Vendor did not specify	No	Vendor did not specify
<b>Host Interface</b>				
Systems Supported	Any system	IBM, 43XX/30XX, AS/400	Any SNA or BSC host	IBM, 43XX/30XX; Data General; DECVAX; HP UNIX-based systems
Software Environment	Vendor did not specify	Any 3270	Any SNA or BSC host	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS VAX/VMS; DG OAS; UNIX System 5; Berkeley 4.X
Protocols	BSC	BSC, SNA, SDLC	BSC, SNA, SDLC	BSC, SNA, HDLC, SDLC
Applications Supported	Vendor did not specify	IND\$ FILE file transfer	IND\$ FILE file transfer	Vendor did not specify
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	RS-232-C	RS-232-C	Coax, RS-232-C, RS-422, current loop
Transmission Mode	Synchronous	Synchronous	Synchronous	Asynchronous
Transmission Speed (bps)	1200, 2400, 4800, 9600, 14.4K, 19.2K	2400, 4800, 9600, 14.4K, 19.2K	300, 600, 1200, 2400, 4800, 9600	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K, 38.4K
Communications Features	Dial directory, auto dial/redial, auto answer, unattended execution	Auto dial/redial, auto answer	Vendor did not specify	Vendor did not specify
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	695 to 2195	995 to 2895	2195 to 2895	Vendor did not specify
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	October 1980	June 1982	June 1987	Vendor did not specify
Number Installed to Date	35,000	10,000	1,000	6,000
Warranty	1 year	1 year	1 year	1 year
Distribution	Direct, dist., dlrs, retail, OEMs	Direct, dist., dlrs, retail, OEMs, VARs	Direct, dist., dlrs, retail, OEMs, VARs	Direct, dist., dlrs, retail, OEMs, VARs
<b>Comments</b>	—	—	—	—

Vendor	Computer Associates International, Inc.	Computer Corp. of America	Computer Logics, Ltd.	Core Technology Corp.
Product	CA-Link	PC/204	PEP for UNIX	CTC/Bridge IBM
<b>Specifications</b>				
Product Function	Local/remote terminal, emulation, host app. spfc. link, non-host app. spfc. link	Local/remote terminal emulation, host app. spfc. link, non-host app. spfc. link	Local/remote terminal emulation	Local/remote terminal emulation
Users Supported	Single user	Single user, multiuser	Multiuser; 32	Single user
Components	Microcomputer software, host software	Microcomputer software, host software	Microcomputer software, standalone hardware	Microcomputer software, host software
Copy Protected	No	No	No	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA, EISA bus	IBM, PC/XT/AT & compatibles	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	UNIX	MS-/PC-DOS
Local Area Network Support	Vendor did not specify	Vendor did not specify	Vendor did not specify	ARCnet
Minimum Memory Required (bytes)	56K	512K	Vendor did not specify	256K
Terminals/Controllers Emulated	TTY, IBM, 327X/317X CUT, DEC, VT52/100	TTY, IBM, 327X/317X CUT	Unisys	Unisys
User Interface	Install program, on-line help, on-line tutor.	On-line help, pop-up windows	Install program, on-line help, diagnostics	Install program, on-line help, pop-up windows
Programmability	Yes	No	Yes	Yes
API Compatibility	Proprietary	Proprietary, IBM HLLAPI	Proprietary	Proprietary
Microcomputer Security	Interface to host software	Vendor did not specify	Password protection	Password protection
Number of Concurrent Sessions	1	Multiple	32	99
DOS Access During Session	No	Yes	No	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	No	No	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM, 43XX/30XX	Unisys	Unisys
Software Environment	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, CICS	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	UNIX System 5	Unisys A-Series, V-Series, and B-Series
Protocols	SNA, SDLC	BSC, SNA, RS-232	Unisys uniscope	Burroughs Poll/Select
Applications Supported	Access to host-resident programs	Host virtual disk, access to host-resident programs, access to Model 204 RDBMS	Access to host-resident programs	Access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	Coax, RS-232-C, SDLC sync modem	Coax, RS-232-C	RS-232-C	Unisys TDI
Transmission Mode	Asynchronous, synchronous	Asynchronous, synchronous	Synchronous	Asynchronous, synchronous
Transmission Speed (bps)	300, 600, 1200, 2400, 4800, 9600, 19.2K	300, 600, 1200, 2400, 4800, 9600	2400, 4800, 9600, 19.2K	300, 600, 1200, 2400, 4800, 9600, 19.2K, 2.4M
Communications Features	Dial directory, auto dial/redial, auto answer	Dial directory, auto dial/redial, macros	Unattended execution	Auto dial/redial, auto answer, macros, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	11,500 to 12,500, additional PC kits \$425	500 hardware	500-800	395
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	600
Date of First Delivery	January 1983	Vendor did not specify	June 1986	Vendor did not specify
Number Installed to Date	Over 5,000	Vendor did not specify	1,600	Vendor did not specify
Warranty	Vendor did not specify	1 year	90 days	90 days
Distribution	Direct	Direct	Direct, dist., dlrs, retail, OEMs	Direct, dist., dlrs, retail, mail, VARs
<b>Comments</b>	—	—	PEP can also be used with MS-DOS, most NetBios LANs, IBM OS/2, and MS-Windows	—

Vendor	Core Technology Corp.	Core Technology Corp.	Core Technology Corp.	CQ Computer Communications, Inc.
Product	CTCBridge IBM Gateway	CTCBridge Mac	CTCBridge Mac Gateway	CQ-3270
<b>Specifications</b>				
Product Function	Local/remote terminal emulation, network gateway	Local/remote terminal emulation	Local/remote terminal emulation, network gateway	Remote terminal emulation
Users Supported	Multuser; 100	Single user	Multuser; 100	Single user
Components	Microcomputer software, host software	Microcomputer software, host software	Microcomputer software, host software	Microcomputer software
Copy Protected	No	No	No	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	Macintosh	Macintosh	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	Macintosh Finder	Macintosh Finder	MS-/PC-DOS
Local Area Network Support	ARCnet, Ethernet, IBM Token-Ring, STARLAN, NetBIOS-compatible	Vendor did not specify	AppleTalk	All DOS V3.x compatible
Minimum Memory Required (bytes)	512K	512K	512K	368K
Terminals/Controllers Emulated	Unisys	Unisys, both Burroughs and Sperry	Both Burroughs and Sperry	IBM, 327X/317X DFT, 5250 Series
User Interface	Install program, on-line help, diagnostics	Install program, on-line help, mouse, graphic icons, pop-up windows, diagnostics	Install program, on-line help, mouse, graphic icons, pop-up windows, diagnostics	Install program, on-line help, mouse, pop-up windows
Programmability	Yes	Yes	Yes	Yes
API Compatibility	Proprietary	Proprietary	Proprietary	IBM API, HLLAPI
Microcomputer Security	Password protection	Password protection	Password protection	Transmission/file encrypt. password protection, interface to host software
Number of Concurrent Sessions	100	99	100	8
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	Binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	Unisys	Unisys	Unisys	IBM, 43XX/30XX, System/36/38
Software Environment	Unisys A-Series, V-Series, and B-Series	Unisys	Unisys	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP, OS/400
Protocols	Burroughs Poll/Select	Burroughs Poll/Select, Sperry Uniscope	Burroughs Poll/Select, Sperry Uniscope	SNA, SDLC
Applications Supported	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C, Unisys TDI	RS-232-C, Unisys TDI	RS-232-C, Unisys TDI	RS-232-C
Transmission Mode	Asynchronous, synchronous	Asynchronous, synchronous	Asynchronous, synchronous	Asynchronous, synchronous
Transmission Speed (bps)	300, 600, 1200, 2400, 4800, 9600, 19.2K	300, 600, 1200, 2400, 4800, 9600, 19.2K	300, 600, 1200, 2400, 4800, 9600, 19.2K	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K, up to 64K bps
Communications Features	Auto dial/redial, auto answer, macros, unattended execution	Auto dial/redial, auto answer, macros, unattended execution	Auto dial/redial, auto answer, macros, unattended execution	Auto dial/redial, auto answer, macros, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	895	395	895	495-795/295
Host Software/Hardware (\$)	600	600	600	Vendor did not specify
Date of First Delivery	Vendor did not specify	Vendor did not specify	Vendor did not specify	1986
Number Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	N/A
Warranty	90 days	90 days	90 days	Hardware one year
Distribution	Direct, dist., dlrs, retail, mail, VARs	Direct, dist., dlrs, retail, mail, VARs	Direct, dist., dlrs, retail, mail, VARs	Direct, dist., dlrs, retail, OEMs, VARs
Comments	—	—	—	—

Vendor	CQ Computer Communications, Inc.	CQ Computer Communications, Inc.	CQ Computer Communications, Inc.	CQ Computer Communications, Inc.
Product	CQ-3270 LAN	CQ-3770	CQ-3770 LAN	CQ-3780
<b>Specifications</b>				
Product Function	Remote terminal emulation, network gateway	Vendor did not specify	Remote terminal emulation	Remote terminal emulation
Users Supported	Multuser; 128	Single user	Multuser; 128	Single user
Components	Microcomputer software	Microcomputer software	Microcomputer software	Microcomputer software
Copy Protected Microcomputers Supported	No IBM, PC/XT/AT & compatibles, PS/2 non-MCA	No Vendor did not specify	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	Vendor did not specify	CP/M-80, CP/M-86, MS-/PC-DOS
Local Area Network Support	ARCnet, Ethernet, IBM Token-Ring, STARLAN, all NetBios and Novell-compatible	Vendor did not specify	ARCnet, Ethernet, IBM Token-Ring, NetBios and Novell	Vendor did not specify
Minimum Memory Required (bytes)	368K	256K	256K	256K
Terminals/Controllers Emulated	IBM, 327X/317X DFT, 5250 Series	IBM 377X	IBM 377X	IBM, 2780/3780
User Interface	Install program, on-line help, mouse, pop-up windows	Install program, on-line help, diagnostics	Install program, on-line help	Install program, on-line help
Programmability API Compatibility	Yes IBM API	Yes Vendor did not specify	Yes Vendor did not specify	No IBM API, proprietary
Microcomputer Security	Transmission/file encryption, password protection	Transmission/file encrypt. password protection, interface to host software	Transmission encryption, password protection	Password protection
Number of Concurrent Sessions	8	6	6	Vendor did not specify
DOS Access During Session	Yes	No	Vendor did not specify	No
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX, System/36/38, AS/400	Vendor did not specify	IBM, 43XX/30XX	IBM, 43XX/30XX, System/36/38, any that supports IBM 3780
Software Environment	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP, OS/400	JES, Power	JES, Power	JES, Power
Protocols	SNA, SDLC	SNA, SDLC	SNA, SDLC	BSC
Applications Supported	Access to host-resident programs	Vendor did not specify	RJE	RJE
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	RS-232-C	RS-232-C	RS-232-C
Transmission Mode	Asynchronous, synchronous	Asynchronous, synchronous	Asynchronous, synchronous	Asynchronous, synchronous
Transmission Speed (bps)	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K, up to 64K bps	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K, up to 64K bps	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K, up to 64K bps	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K, up to 64K bps
Communications Features	Auto dial/redial, auto answer, macros, unattended execution	Auto dial/redial, auto answer, macros, unattended execution	Auto dial/redial, auto answer, macros, unattended execution	Auto dial/redial, auto answer, macros, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	2,395/295	595-795/295	4,995/295	495/295
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	1987	1985	October 1989	1985
Number Installed to Date	N/A	N/A	N/A	N/A
Warranty	Hardware one year	Hardware one year	Hardware one year	Hardware one year
Distribution	Direct, dist., dlrs, retail, OEMs, VARs	Direct, dist., dlrs, retail, OEMs, VARs	Vendor did not specify	Direct, dist., dlrs, retail, OEMs, VARs
Comments	—	—	—	—

Vendor	CQ Computer Communications, Inc.	CQ Computer Communications, Inc.	CQ Computer Communications, Inc.	Data Interface Systems Corp.
Product	CQ-5250	CQ-5250 LAN	CQ-Haste	DI3270
<b>Specifications</b>				
Product Function	Remote terminal emulation	Network gateway	Remote terminal emulation	Local/remote terminal emulation, network gateway
Users Supported	Single user	Multuser; 128	Single user	Single user, multuser; 253
Components	Microcomputer software	Microcomputer software	Microcomputer software	Microcomputer hardware & software
Copy Protected Microcomputers Supported	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	Yes IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	CP/M-80, CP/M-86, MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Vendor did not specify	ARCnet, Ethernet, IBM Token-Ring, STARLAN, NetBios and Novell	Vendor did not specify	ARCnet, Ethernet, IBM Token-Ring, STARLAN, any NetBios
Minimum Memory Required (bytes)	368K	368K	256K	73K
Terminals/Controllers Emulated	IBM, 5250 Series	IBM, 5250 Series	Vendor did not specify	IBM, 327X/317X DFT
User Interface	Install program, on-line help, mouse, pop-up windows, diagnostics	Install program, on-line help, mouse, pop-up windows, diagnostics	On-line help, diagnostics	Install program, on-line help, on-line tutor., diagnostics
Programmability API Compatibility	No IBM API	No IBM API	No IBM API, proprietary	Vendor did not specify IBM API, proprietary
Microcomputer Security	Transmission/file encrypt., password protection, interface to host software	Transmission/file encrypt., password protection, interface to host software	Password protection	Password protection, physical node restriction
Number of Concurrent Sessions	8	1024	Vendor did not specify	Up to 253
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	No	No	Yes	Yes
File Formats	Vendor did not specify	Vendor did not specify	ASCII	ASCII, binary
File Conversion	Vendor did not specify	Vendor did not specify	No	Yes
<b>Host Interface</b>				
Systems Supported	IBM, System/36/38, AS/400	IBM, System/36/38, AS/400	IBM, 43XX/30XX, System/36/38; Data General Honeywell Bull; DECVAX, DECsystem; HP; UNIX-based systems, any that support HASP	IBM, 43XX/30XX
Software Environment	IBM, DOS, OS/VS, VM, OS/400	IBM, DOS, OS/VS, VM, OS/400	N/A	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS
Protocols	SNA, SDLC	SNA, SDLC	HASP	BSC, SNA, SDLC
Applications Supported	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs	RJE	Access to host-resident programs, index file
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	RS-232-C	RS-232-C	Coax, RS-232-C, token ring gateway
Transmission Mode	Asynchronous, synchronous	Asynchronous, synchronous	Synchronous	Synchronous
Transmission Speed (bps)	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K, up to 64K bps	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K, up to 64K bps	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K	9600, 56K bps, 64K bps
Communications Features	Auto dial/redial, auto answer, unattended execution	Auto dial/redial, auto answer, unattended execution	Auto dial/redial, auto answer	Vendor did not specify
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	495-595/295	2,395/295	750/295	1,095-4,495/240-995
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	1988	1988	1984	December 1986
Number Installed to Date	N/A	N/A	N/A	1,000
Warranty	Hardware one year	Hardware one year	Hardware one year	Unltd. free software sup.
Distribution	Direct, dist., drs. retail, OEMs, VARs	Direct, dist., drs. retail, OEMs, VARs	Direct	Direct, VARs
Comments	-	-	-	-

Vendor	Data Race, Inc.	Datability Software Systems, Inc.	Digital Communications Associates, Inc. (DCA)	Digital Communications Associates, Inc. (DCA)
<b>Product</b>	<b>Action 24/32, Race OCS and PC Race</b>	<b>RAF Remote Access Facility</b>	<b>3270 APA Graphics</b>	<b>E78 Plus</b>
<b>Specifications</b>				
Product Function	Local/remote terminal emulation	Local/remote terminal emulation, host app. spfc. link	Local terminal emulation	Local terminal emulation
Users Supported	Single user	Multuser; unlimited	Single user	Single user
Components	Microcomputer hardware & software, standalone hwre.	Microcomputer software, host software	Microcomputer software	Microcomputer software
Copy Protected	Yes	Yes	No	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 non-MCA	Macintosh, IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	Apple ProDOS, OS/2, MS-/PC-DOS, UNIX, Xenix	Macintosh Finder, MS-/PC-DOS	MS-/PC-DOS	OS/2, MS-/PC-DOS
Local Area Network Support	ARCnet, IBM Token-Ring	Ethernet, AppleTalk	Vendor did not specify	Vendor did not specify
Minimum Memory Required (bytes)	Vendor did not specify	70K	180K	62K with E78 Lite
Terminals/Controllers Emulated	TTY, IBM, 327X/317X DFT, 327X/317X CUT, 5250 Series, 2780/3780, DEC, VT52/100, VT200 Series, VT300 Series DG; HP; Honeywell Bull Unisys	DEC, VT52/100, VT200 Series	IBM, 327X/317X CUT	IBM, 327X/317X CUT
User Interface	Vendor did not specify	Install program, diagnostics	Install program, mouse, diagnostics	Install program, mouse, diagnostics
Programmability API Compatibility	Yes IBM API, DCA IRMA API	No Proprietary	Yes IBM API, DCA IRMA API	Yes IBM API, DCA IRMA API
Microcomputer Security	Vendor did not specify	Interface to host software	Interface to host software	Interface to host software
Number of Concurrent Sessions	Vendor did not specify	Unlimited	5	1
DOS Access During Session	Vendor did not specify	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Vendor did not specify	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX, System/36/38, AS/400; Data General; Honeywell Bull DEC/VAX, DECsystem; HP Unisys; UNIX-based systems	DEC/VAX	IBM, 43XX/30XX	IBM, 43XX/30XX
Software Environment	IBM, DOS, OS/VS, VM, OS/400; VAX/VMS; DG OAS UNIX System 5	VAX/VMS	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS
Protocols	BSC, SNA, HDLC, SDLC	Proprietary	BSC, SNA, SDLC	BSC, SNA, SDLC
Applications Supported	Access to host-resident programs	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	Vendor did not specify	Coax, RS-232-C, Ethernet thin wire	Coax	Coax, twisted pair
Transmission Mode	Asynchronous, synchronous	Asynchronous	Synchronous	Synchronous
Transmission Speed (bps)	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K	38.4K	2.4M	2.4M
Communications Features	Dial directory, auto dial/redial, auto answer, unattended execution	Dial directory, auto dial/redial, macros, unattended execution	Macros, unattended execution	Vendor did not specify
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	Vendor did not specify	495 software	495	395
Host Software/Hardware (\$)	Vendor did not specify	299 hardware	Vendor did not specify	Vendor did not specify
Date of First Delivery	June 1988	March 1986	Vendor did not specify	Vendor did not specify
Number Installed to Date	1,000	7,000	Vendor did not specify	Vendor did not specify
Warranty	1 year	90 days	90 days	90 days
Distribution	Dist., dirs, retail, VARs	Direct, dist., dirs, retail, VARs	Dist., dirs, retail, OEMs	Dist., dirs, retail, OEMs
<b>Comments</b>	—	Free 30 day trial available	—	—

Vendor	Digital Communications Associates, Inc. (DCA)	Digital Communications Associates, Inc. (DCA)	Digital Communications Associates, Inc. (DCA)	Digital Communications Associates, Inc. (DCA)
Product	IRMA 3 Convertible	IRMA 3279 Graphics	IRMAremote for Hayes AutoSync	IRMAremote SNA
<b>Specifications</b>				
Product Function	Local terminal emulation	Local terminal emulation	Remote terminal emulation	Remote terminal emulation
Users Supported	Single user	Single user	Single user	Single user
Components	Microcomputer hardware	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software
Copy Protected Microcomputers Supported	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	Vendor did not specify IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Minimum Memory Required (bytes)	Vendor did not specify	Vendor did not specify	250K	250K
Terminals/Controllers Emulated	IBM, 327X/317X DFT, 327X/317X CUT	IBM, 327X/317X CUT	IBM, 327X/317X DFT	IBM, 327X/317X DFT
User Interface	Diagnostics	Install program, mouse, diagnostics	Install program, diagnostics	Install program, diagnostics
Programmability API Compatibility	Vendor did not specify IBM API, DCA IRMA API	Yes IBM API, DCA IRMA API	Yes IBM API, DCA IRMA API	Yes IBM API, DCA IRMA API
Microcomputer Security	Interface to host software	Interface to host software	Interface to host software	Interface to host software
Number of Concurrent Sessions	5	1	5	Vendor did not specify
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	Vendor did not specify	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX
Software Environment	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS
Protocols	SNA	BSC, SNA, SDLC	BSC, SNA, SDLC	SNA, SDLC
Applications Supported	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	Coax	Coax	RS-232-C	RS-232-C
Transmission Mode	Synchronous	Synchronous	Synchronous	Synchronous
Transmission Speed (bps)	2.4M	2.4M	9600	9600
Communications Features	Vendor did not specify	Macros, unattended execution	Auto dial/redial, auto answer, macros, unattended execution	Macros, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	645	1,995	595	895
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Number Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	90 days	90 days	90 days	90 days
Distribution	Vendor did not specify	Dist., dlrs, retail, OEMs	Dist., dlrs, retail	Dist., dlrs, retail
Comments	--	--	--	--

Vendor	Digital Communications Associates, Inc. (DCA)	Digital Communications Associates, Inc. (DCA)	Digital Communications Associates, Inc. (DCA)	Digital Communications Associates, Inc. (DCA)
Product	IRMAX DFT	IRMAX Multisessions	MacIrma Graphics	MacIRMA
<b>Specifications</b>				
Product Function	Local terminal emulation	Local terminal emulation	Local terminal emulation, host app. spfc. link, graphics terminal emulation	Local/remote terminal emulation
Users Supported	Single user	Single user	Single user	Single user
Components	Microcomputer software	Microcomputer software	Microcomputer hardware & software, Macintosh swre.	Microcomputer hardware & software
Copy Protected Microcomputers Supported	Vendor did not specify IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No Macintosh	No Macintosh
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	Macintosh Finder, version 6.0 or later; Multifinder version 1.0 or later	Macintosh Finder
Local Area Network Support	Vendor did not specify	Vendor did not specify	Vendor did not specify	AppleTalk
Minimum Memory Required (bytes)	256K	384K	1M under Finder; 2M under Multifinder	512K
Terminals/Controllers Emulated	IBM, 327X/317X DFT	IBM, 327X/317X DFT	327X/317X CUT, PCLK terminal; APA graphics terminal	327X/317X CUT
User Interface	Install program	Install program	Mouse, graphic icons, pop-up windows, diagnostics	Mouse, graphic icons, pop-up windows, diagnostics
Programmability API Compatibility	Yes IBM API, DCA IRMA API	Yes IBM API, DCA IRMA API	Vendor did not specify IBM API, DCA IRMA API	Yes IBM API, DCA IRMA API
Microcomputer Security	Interface to host software	Interface to host software	Configuration lock	Password protection
Number of Concurrent Sessions	5	5 hosts, 1 DOS, 2 notepads	1 text; 1 graphics	Vendor did not specify
DOS Access During Session	Yes	Yes	No	No
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX, compatibles	IBM, 43XX/30XX
Software Environment	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, GDDM 6.1.1 or later; PCLK/F required	IBM, MVS, VM, TSO, CMS, CICS
Protocols	BSC, SNA, SDLC	BSC, SNA, SDLC	SNA, SDLC	Vendor did not specify
Applications Supported	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs	SAS/Graph	None
<b>Communications Characteristics</b>				
Physical Connection	Coax	Coax	Coax	Coax
Transmission Mode	Synchronous	Synchronous	Sync remote control unit	Synchronous
Transmission Speed (bps)	2.4M	2.4M	Not applicable	2.4M
Communications Features	Macros, unattended execution	Macros, unattended execution	Not applicable	Vendor did not specify
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	395	495	95 upgrade; 1,295 bundled w/MacIrma hardware	1,195
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	Vendor did not specify	Vendor did not specify	September 1989	November 1987
Number Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	90 days	90 days	90 days	Vendor did not specify
Distribution	Dist., dlrs, retail, OEMs	Dist., dlrs, retail, OEMs	Dist., dlrs, retail, VARs	Dist., dlrs, retail
Comments	—	—	Currently only mainframe graphics solution available for Mac	—

Vendor	Digital Communications Associates, Inc. (DCA)	Digital Communications Associates, Inc. (DCA)	Direct Aid	Diversified Computer Systems, Inc.
Product	Maclma Workstation	Windowlink for IRMA	The Impersonator	EM220
<b>Specifications</b>				
Product Function	Local terminal emulation	Local terminal emulation	Local/remote terminal emulation, network gateway	Local terminal emulation
Users Supported	Single user	Single user	Multuser; dependent on LAN	Single user
Components	Microcomputer hardware & software	Microcomputer software	Microcomputer software	Microcomputer software
Copy Protected	No	No	No	No
Microcomputers Supported	Macintosh	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	Macintosh Finder, Multifinder version 6.0 or later	MS-/PC-DOS, Microsoft Windows	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Vendor did not specify	Vendor did not specify	ARCnet, Ethernet, IBM Token-Ring, Novell	Ethernet, many
Minimum Memory Required (bytes)	1M	Vendor did not specify	256K	256K
Terminals/Controllers Emulated	IBM, 327X/317X CUT	IBM, 327X/317X CUT	TTY, DEC, VT52/100, VT200 Series, VT300 Series Unisys, emulates over 16 async terminals	DEC, VT52/100, VT200 Series, VT300 Series
User Interface	Mouse, graphic icons, pop-up windows, diagnostics	Install program, mouse, graphic icons, pop-up windows	Install program, on-line help, on-line tutor., pop-up windows, diagnostics	Install program, on-line help
Programmability	Vendor did not specify	Yes	Yes	No
API Compatibility	IBM API, DCA IRMA API	IBM API, DCA IRMA API	Vendor did not specify	N/A
Microcomputer Security	Configuration lock	Interface to host software	Interface to host software, optional password, key disk security	Password protection
Number of Concurrent Sessions	Up to 5, one of which can be for printer emulation	Vendor did not specify	1	Up to 2
DOS Access During Session	No	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Vendor did not specify
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX, compatibles	IBM, 43XX/30XX	Supports any machine type	IBM, 43XX/30XX, System/36/38, AS/400; Data General; Honeywell Bull DEC/VAX, DECsystem; HP Unisys; UNIX-based systems
Software Environment	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	Supports any host software environment	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP, OS/400; VAX/VMS; DG OAS Honeywell GCOS; UNIX System 5; Berkeley 4.X N/A
Protocols	SNA, SDLC	BSC, SNA, SDLC	Supports any host protocol	N/A
Applications Supported	Vendor did not specify	Host virtual disk, access to host-resident programs	Access to host-resident programs	Host virtual disk, access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	Coax	Coax	RS-232-C	RS-232-C, Ethernet
Transmission Mode	Sync remote control unit	Synchronous	Asynchronous	Asynchronous
Transmission Speed (bps)	Not applicable	2.4M	30 to 9600	300, 600, 1200, 2400, 4800, 9600, 19.2K
Communications Features	Not applicable	Macros, unattended execution	Dial directory, auto dial/redial, auto answer, macros, unattended execution	Dial directory, auto dial/redial, auto answer, macros
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	295; 1,395 w/Maclma hardware	395	245	189
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	N/A	Vendor did not specify
Date of First Delivery	December 1989	Vendor did not specify	January 1982	1984
Number Installed to Date	Vendor did not specify	Vendor did not specify	Over 10,000	10,000
Warranty	90 days	90 days	30 days	30 days
Distribution	Dist., dlrs, retail, VARs	Dist., dlrs, retail, OEMs	Direct, dist., dlrs, retail, mail, OEMs, VARs	Direct, dist., dlrs, retail
<b>Comments</b>	—	—	Supports Xmodem file transfer; built-in language allows customized emulation	—

Vendor	Diversified Computer Systems, Inc.	Diversified Computer Systems, Inc.	DTSS, Inc.	Eicon Technology
Product	EM4010	EM4105	DataPass	Access/QLLC (3270 and 5250)
<b>Specifications</b>				
Product Function	Local terminal emulation	Local terminal emulation	Vendor did not specify	Remote terminal emulation, network gateway
Users Supported	Single user	Single user	Single user	Single user, multiuser unlimited
Components	Microcomputer software	Microcomputer software	Microcomputer software, host software	Microcomputer hardware & software
Copy Protected	No	No	No	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA, Zenith	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Ethernet, many	Ethernet, many	Vendor did not specify	ARCnet, Ethernet, IBM Token-Ring, STARLAN, any NetWare or NetBios
Minimum Memory Required (bytes)	360K	380K	256K	640K
Terminals/Controllers Emulated	DEC, VT52/100, VT200 Series, VT300 Series	DEC, VT52/100, VT200 Series, VT300 Series	TTY, DEC, VT52/100 Honeywell Bull	TTY, IBM, 327X/317X DFT, 5250 Series, DEC, VT52/100
User Interface	Install program, on-line help	Install program, on-line help	Install program, on-line help, diagnostics	Install program, diagnostics
Programmability	No	No	Yes	Yes
API Compatibility	N/A	N/A	Proprietary	IBM API, IBM LU 6.2, proprietary
Microcomputer Security	Password protection	Password protection	Vendor did not specify	Password protection
Number of Concurrent Sessions	Up to 2	Up to 2	2	254 per gateway, 9 per workstation
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Vendor did not specify	Vendor did not specify	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX, System/36/38, AS/400; Data General; Honeywell Bull DEC/VAX, DECsystem; HP Unisys; UNIX-based systems	IBM, 43XX/30XX, System/36/38, AS/400; Data General; Honeywell Bull DEC/VAX, DECsystem; HP Unisys; UNIX-based systems	IBM, 43XX/30XX; Honeywell Bull; DEC/VAX; UNIX-based systems	IBM, 43XX/30XX, System/36/38, AS/400 DEC/VAX, any ASCII host
Software Environment	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP, OS/400; VAX/VMS; DG OAS Honeywell GCOS; UNIX System 5; Berkeley 4.X	IBM, DOS, OS/VS, MVS, VM, CMS, IMS, CICS, SSP, OS/400; VAX/VMS; DG OAS Honeywell GCOS; UNIX System 5; Berkeley 4.X	IBM, VM; VAX/VMS; Honeywell GCOS; UNIX System 5 Berkeley 4.X, Harris VOS Bull HN MOD400	IBM, MVS, VM, TSO, CMS, CICS, SSP, IBM CPF
Protocols	N/A	N/A	SNA, HDLC	SNA, SDLC, X.25
Applications Supported	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs	Access to host-resident programs	Host virtual disk, access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C, Ethernet	RS-232-C, Ethernet	RS-232-C	RS-232-C
Transmission Mode	Asynchronous	Asynchronous	Asynchronous	Synchronous
Transmission Speed (bps)	300, 600, 1200, 2400, 4800, 9600, 19.2K	300, 600, 1200, 2400, 4800, 9600, 19.2K	300, 600, 1200, 2400, 4800, 9600	Up to 128 kbps
Communications Features	Dial directory, auto dial/redial, auto answer, macros	Dial directory, auto dial/redial, auto answer, macros	Auto dial/redial, macros, unattended execution	Dial directory, auto dial/redial, auto answer, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	249	359	295	3,950/1,145
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	1988	1988	October 1989	January 1988
Number Installed to Date	10,000	3,000	5,000	Vendor did not specify
Warranty	30 days	30 days	90 days	90 days, 1 year
Distribution	Direct, dist., dlrs, retail	Direct, dist., dlrs, retail	Direct, dist., dlrs, retail	Dist., dlrs, retail, OEMs, VARs
<b>Comments</b>	-	-	-	-

Vendor	Eicon Technology	Eicon Technology	Eicon Technology	Eicon Technology
Product	Access/QLLC (3270)	Access/QLLC (5250)	Access/SDLC (3270)	Access/SDLC (5250)
<b>Specifications</b>				
Product Function	Remote terminal emulation, network gateway	Remote terminal emulation, network gateway	Remote terminal emulation, network gateway	Remote terminal emulation
Users Supported	Single user, multiuser unlimited			
Components	Microcomputer hardware & software			
Copy Protected	No	No	No	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	ARCnet, Ethernet, IBM Token-Ring, STARLAN, any NetWare or NetBios compatible	ARCnet, Ethernet, IBM Token-Ring, STARLAN, any NetWare or NetBios compatible	ARCnet, Ethernet, IBM Token-Ring, STARLAN, any NetWare or NetBios compatible	ARCnet, Ethernet, IBM Token-Ring, STARLAN, any NetWare or NetBios compatible
Minimum Memory Required (bytes)	640K	640K	640K	640K
Terminals/Controllers Emulated	TTY, IBM, 327X/317X DFT, DEC, VT52/100	TTY, IBM, 5250 Series, DEC, VT52/100	IBM, 327X/317X DFT	IBM, 5250 Series
User Interface	Install program, diagnostics	Install program, diagnostics	Install program, diagnostics	Install program, diagnostics
Programmability	Yes	Yes	Yes	Yes
API Compatibility	IBM API, IBM LU 6.2, proprietary			
Microcomputer Security	Password protection	Password protection	Password protection	Password protection
Number of Concurrent Sessions	254 per gateway, 9 per workstation	254 per gateway, 9 per workstation	254 per gateway, 9 per workstation	254/Gateway, 9/Workstation
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX; DECVAX, any ASCII host	IBM, System/36/38, AS/400 DECVAX, any ASCII host	IBM, 43XX/30XX	System/36/38, AS/400
Software Environment	IBM, MVS, VM, TSO, CMS, CICS, SSP; VAX/VMS	IBM, SSP, OS/400, IBM CPF	IBM, MVS, VM, TSO, CMS, CICS, SSP	SSP, OS/400, IBM CPF
Protocols	SNA, SDLC, X.25	SNA, SDLC, X.25	SNA, SDLC	SNA, HDLC, SDLC
Applications Supported	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs	Access to host-resident programs	Host virtual disk, access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	RS-232-C	RS-232-C	RS-232-C
Transmission Mode	Synchronous	Synchronous	Synchronous	Synchronous
Transmission Speed (bps)	Up to 128 kbps	Up to 128 kbps	Up to 128 kbps	128K
Communications Features	Dial directory, auto dial/redial, auto answer, unattended execution	Dial directory, auto dial/redial, auto answer, unattended execution	Dial directory, auto dial/redial, auto answer, unattended execution	Dial directory, auto dial/redial, auto answer, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	2,750/1,145	2,750/1,145	2,050/1,145	2,050 software, 1,145 hardware
Host Software/Hardware (\$)	Vendor did not specify			
Date of First Delivery	January 1987	November 1987	October 1985	November 1987
Number Installed to Date	5,000	1,000	10,000	1,000
Warranty	90 days, 1 year	90 days, 1 year	90 days, 1 year	1 year
Distribution	Dist., dlrs, retail, OEMs, VARs			
<b>Comments</b>	—	—	—	—

Vendor	Elcon Technology	Emerald Technology	Emerald Technology	Emerald Technology
Product	Access/X.25	3XMate	3XPlus	3XTwin
<b>Specifications</b>				
Product Function	Remote terminal emulation, network gateway	Remote terminal emulation	Remote terminal emulation	Local terminal emulation
Users Supported	Single user, multiuser unlimited	Single user	Single user	Single user
Components	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software
Copy Protected Microcomputers Supported	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS, UNIX, Xenix	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	ARCnet, Ethernet, IBM Token-Ring, STARLAN, NetWare, NetBios compatible	Vendor did not specify	Vendor did not specify	Vendor did not specify
Minimum Memory Required (bytes)	640K	256K	128K	128K
Terminals/Controllers Emulated	TTY, DEC, VT52/100; DG; HP Unisys	IBM, 5250 Series	IBM, 5250 Series	IBM, 5250 Series
User Interface	Install program, diagnostics	Install program	Install program	Install program
Programmability API Compatibility	Yes IBM LU 6.2, proprietary	No IBM API	No IBM API	Vendor did not specify IBM API
Microcomputer Security	Password protection	Vendor did not specify	Vendor did not specify	Vendor did not specify
Number of Concurrent Sessions	254	7	7	7
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII	ASCII	ASCII
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	DEC/VAX, any ASCII host	IBM, System/36/38, AS/400	IBM, System/36/38, AS/400	IBM, System/36/38, AS/400 UNIX-based systems
Software Environment	Dependent on host	IBM, SSP, OS/400	IBM, SSP, OS/400	IBM, SSP, OS/400
Protocols	X.25	Vendor did not specify	Vendor did not specify	Vendor did not specify
Applications Supported	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	Phone	Twisted pair	Twinax
Transmission Mode	Synchronous	Asynchronous, synchronous	Asynchronous, synchronous	Vendor did not specify
Transmission Speed (bps)	Up to 128 kbps	2400, 4800, 9600	Vendor did not specify	Vendor did not specify
Communications Features	Dial directory, auto dial/redial, auto answer, unattended execution	Auto dial/redial, auto answer, macros	Auto answer, macros	Vendor did not specify
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	1,550/1,145	995 to 1,995	750 hardware	795
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	January 1985	Vendor did not specify	Vendor did not specify	Vendor did not specify
Number Installed to Date	10,000	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	90 days, 1 year	1 year	1 year	1 year
Distribution	Dist., dirs, retail, OEMs, VARs	Direct, dist., dirs, retail, OEMs	Direct, dist., dirs, retail, OEMs	Direct, dist., dirs, retail, OEMs
Comments	—	—	—	—

Vendor	Emerald Technology	Emerald Technology	Emulex Corp.	FEL Computing
Product	Handshake-Emulation	Multi-Twin	DCP-88/-186/-286	Mobius
<b>Specifications</b>				
Product Function	Local/remote terminal emulation	Local terminal emulation	Non-host app. spfc. link	Local/remote terminal emulation
Users Supported	Single user	Single user	Multuser; up to 8	Single user, multiuser unlimited
Components	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware	Microcomputer software, host software
Copy Protected Microcomputers Supported	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	UNIX, Xenix	MS-/PC-DOS	MS-/PC-DOS, Xenix	Apple ProDOS, MS-/PC-DOS
Local Area Network Support	Vendor did not specify	Vendor did not specify	Software dependent	Ethernet
Minimum Memory Required (bytes)	128K	256K	256K	125K
Terminals/Controllers Emulated	5250 Series	IBM, 5250 Series	Programmable	TTY, DEC, VT52/100, VT200 Series, VT300 Series
User Interface	Vendor did not specify	Install program	Diagnostics	Install program, on-line help
Programmability API Compatibility	Vendor did not specify IBM API	No IBM API	Yes N/A	Yes Vendor did not specify
Microcomputer Security	Vendor did not specify	Vendor did not specify	N/A	Interface to host software
Number of Concurrent Sessions	16	7	2	Vendor did not specify
DOS Access During Session	Yes	Yes	Yes	Vendor did not specify
File Transfer	Yes	Yes	No	Yes
File Formats	ASCII	ASCII	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	No	No
<b>Host Interface</b>				
Systems Supported	System/36/38, AS/400	IBM, System/36/38, AS/400	Programmable	DEC VAX, DECsystem
Software Environment	SSP, OS/400	IBM, DOS, SSP, OS/400	Programmable	VAX/VMS, DEC Tops 10/20
Protocols	SDLC	Vendor did not specify	BSC, SNA, HDLC, SDLC, HASP	XNS
Applications Supported	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs	Host virtual disk, access to host-resident programs, virtual file system
<b>Communications Characteristics</b>				
Physical Connection	Twinax	Twinax	RS-232-C	Vendor did not specify
Transmission Mode	Vendor did not specify	Vendor did not specify	Asynchronous, synchronous	Asynchronous
Transmission Speed (bps)	Vendor did not specify	Vendor did not specify	300, 600, 1200, 2400, 4800, 9600, 19.2K	Vendor did not specify
Communications Features	Vendor did not specify	Auto answer	None	Dial directory, auto dial/redial, auto answer, macros, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	800-995; 2,340-6,900	495 software, 1,195 to 2,995 hardware	720-1,695 hardware	250-375
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	3,500
Date of First Delivery	Vendor did not specify	Vendor did not specify	1983	March 1984
Number Installed to Date	Vendor did not specify	Vendor did not specify	740,000	1,000+ sites
Warranty	1 year	1 year	Two years	90 days
Distribution	Direct, dist., dlrs, retail, OEMs	Direct, dist., dlrs, retail, OEMs	Direct, dist., dlrs, retail, OEMs, VARs	Direct, OEMs, VARs
Comments	—	—	—	—

Vendor	FTG Data Systems	FTG Data Systems	FTG Data Systems	FTG Data Systems
Product	EMU-TEK 4200 Plus	EMU-TEK Five Plus	EMU-TEK Level 1	EMU-TEK Level 2
<b>Specifications</b>				
Product Function	Local terminal emulation	Local terminal emulation	Local terminal emulation	Local terminal emulation
Users Supported	Single user	Single user	Single user	Single user
Components	Microcomputer software	Microcomputer software	Microcomputer software	Microcomputer software
Copy Protected Microcomputers Supported	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Ethernet, IBM Token-Ring, STARLAN	Ethernet, IBM Token-Ring, STARLAN	Vendor did not specify	Vendor did not specify
Minimum Memory Required (bytes)	640K	640K	256K	256K
Terminals/Controllers Emulated	VT52/100, Tektronix 4010, 4014, 4105	DEC, VT52/100, Tektronix 4010, 4014, 4105, 4107	DEC, VT52/100, Tektronix 4010, 4014, VT-640	DEC, VT52/100, Tektronix 4010, 4014, VT-640
User Interface	Install program, on-line help, mouse, pop-up windows	Install program, on-line help, mouse, pop-up windows, diagnostics	Install program, mouse, pop-up windows	Install program, mouse, pop-up windows
Programmability API Compatibility	No Vendor did not specify	No Vendor did not specify	No Vendor did not specify	No Vendor did not specify
Microcomputer Security	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Number of Concurrent Sessions	4	Vendor did not specify	1	1
DOS Access During Session	Yes	Yes	No	No
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	No	No	No	No
<b>Host Interface</b>				
Systems Supported	1	Any supporting Tektronix 4010, 4014, or 4105	Any supporting Tektronix 4010 or 4014	Any supporting Tektronix 4010 or 4014
Software Environment	1	Any supporting Tektronix 4010, 4014, or 4105	Any supporting Tektronix 4010 or 4014	Any supporting Tektronix 4010 or 4014
Protocols	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Applications Supported	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	RS-232-C	RS-232-C	RS-232-C
Transmission Mode	Asynchronous	Asynchronous	Asynchronous	Asynchronous
Transmission Speed (bps)	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K, 38.4	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K, up to 38.4K	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K
Communications Features	Vendor did not specify	Macros	Macros	Macros
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	495	695 for software	95/295	95/295
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	August 1985	August 1986	August 1983	August 1983
Number Installed to Date	2000	3,500	3,500	3,500
Warranty	30 days	90 days	90 days	90 days
Distribution	Direct, dist., dlrs, retail, mail	Direct, dist., dlrs, retail, mail	Direct, dist., dlrs, retail, mail	Direct, dist., dlrs, retail, mail
<b>Comments</b>	<sup>1</sup> Any system supporting Tektronix 4010, 4014, 4105, 4107, and 4200 Series terminals	Free warranty updates for one year	Free warranty updates for one year	Free warranty updates for one year

Vendor	FTG Data Systems	Gateway Communications, Inc.	Gateway Communications, Inc.	Gateway Communications, Inc.
Product	EMU-TEK Seven Plus	G/Async Gateway	G/Async II Gateway	G/SNA Gateway
<b>Specifications</b>				
Product Function	Local terminal emulation	Network gateway	Network gateway	Network gateway
Users Supported	Single user	Multuser; unlimited	Multuser; unlimited	Multuser; 32
Components	Microcomputer software	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software
Copy Protected Microcomputers Supported	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Vendor did not specify	ARCnet, Ethernet, IBM Token-Ring, STARLAN, Novell NetWare	ARCnet, Ethernet, IBM Token-Ring, STARLAN, Novell NetWare	ARCnet, Ethernet, IBM Token-Ring, STARLAN, IPX (Netware) or NetBIOS
Minimum Memory Required (bytes)	640K	256K	Vendor did not specify	256K
Terminals/Controllers Emulated	DEC, VT52/100, VT200 Series, Tektronix 4010, 4014, 4105, 4107, 4208	TTY, DEC, VT52/100, VT200 Series; DG; HP; Honeywell Bull	TTY, DEC, VT52/100, VT200 Series, VT300 Series; DG HP; Honeywell Bull	IBM, 327X/317X DFT, 327X/317X CUT, IBM 3770 RJE, IBM 3274-51C
User Interface	Install program, on-line help, mouse, pop-up windows	Install program, on-line help	Install program	Install program, on-line help, diagnostics
Programmability API Compatibility	No Vendor did not specify	Vendor did not specify Vendor did not specify	Vendor did not specify Vendor did not specify	Yes Proprietary
Microcomputer Security	Vendor did not specify	Vendor did not specify	N/A	Vendor did not specify
Number of Concurrent Sessions	4	4	4	32
DOS Access During Session	Yes	Vendor did not specify	No	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	No	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	Any supporting Tektronix 4010, 4014, 4105, or 4107	Data General; Honeywell Bull; DECVAX, DECsystem HP; UNIX-based systems, any host with async terminal support	Data General; Honeywell Bull; DECVAX, DECsystem HP; UNIX-based systems, any host with async terminal support	IBM, 43XX/30XX
Software Environment	Any supporting Tektronix 4010, 4014, 4105, or 4107	VAX/VMS; DG OAS; Honeywell GCOS; UNIX System 5 Berkeley 4.X	VAX/VMS; DG OAS; Honeywell GCOS; UNIX System 5 Berkeley 4.X	IBM, TSO, CICS
Protocols	Vendor did not specify	Async	Asynch	SNA, SDLC
Applications Supported	Vendor did not specify	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C, network	RS-232-C	RS-232-C	RS-232-C, V.35
Transmission Mode	Asynchronous	Asynchronous	Asynchronous	Synchronous
Transmission Speed (bps)	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K, 2.4M, up to 38.4K	19.2K	19.2K	Up to 56K
Communications Features	Macros	Dial directory, auto dial/redial, auto answer, macros	N/A	Macros, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	950 for software	1,440	1,895	2,580 to 4,580
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	December 1989	1986	Vendor did not specify	1986
Number Installed to Date	100	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	90 days	1 year	1 year	1 year
Distribution	Direct, dist., dlrs, retail, mail	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs
Comments	Free warranty for up to 1 year	—	—	—

Vendor	Gateway Communications, Inc.	Gateway Communications, Inc.	General Micro Systems	Hawkeye Grafix, Inc.
Product	G/X25 Gateway 64	G/X25 Gateway	PC 220	COMMx
<b>Specifications</b>				
Product Function	Network gateway	Network gateway	Local/remote terminal emulation	Local/remote terminal emulation, non-host app. spfc. link
Users Supported	Multuser; 254	Multuser; 64	Single user	Single user
Components	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer software	Microcomputer software, host software
Copy Protected	No	No	Yes	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA, any CP/M 80 computer
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS, UNIX	CP/M-80, CP/M-86, MS-/PC-DOS
Local Area Network Support	ARCnet, Ethernet, IBM Token-Ring, STARLAN, NETBIOS	ARCnet, Ethernet, IBM Token-Ring, STARLAN, NETBIOS	Vendor did not specify	Vendor did not specify
Minimum Memory Required (bytes)	256K	256K	96K	256K
Terminals/Controllers Emulated	TTY, DEC, VT52/100, VT200 Series, VT300 Series; DG HP; Honeywell Bull; Unisys	TTY, DEC, VT52/100, VT200 Series, VT300 Series; DG HP; Honeywell Bull; Unisys	TTY, DEC, VT52/100, VT200 Series, Tektronix 4010/14 graphics	TTY, DEC, VT52/100; DG; HP
User Interface	Install program	Install program	Install program, on-line help, pop-up windows	Install program, pop-up windows
Programmability	Yes	Yes	Yes	Yes
API Compatibility	Proprietary	Proprietary	Vendor did not specify	Vendor did not specify
Microcomputer Security	Vendor did not specify	Vendor did not specify	Vendor did not specify	Transmission/file encrypt. password protection, interface to host software
Number of Concurrent Sessions	254	64	1	1 marker
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	No	No
<b>Host Interface</b>				
Systems Supported	Data General; Honeywell Bull; DEC VAX, DECsystem HP; UNIX-based systems, any host with X.25 terminal support	Data General; Honeywell Bull; DEC VAX, DECsystem HP; UNIX-based systems, any host with X.25 terminal support	Data General	IBM; DEC VAX, DECsystem; HP, PRIME
Software Environment	VAX/VMS; DG OAS; Honeywell GCOS; UNIX System 5	VAX/VMS; DG OAS; Honeywell GCOS; UNIX System 5	VAX/VMS; UNIX System 5 Berkeley 4.X	IBM, MVS, VM, TSO; VAX/VMS, Primos
Protocols	X.25	X.25	Vendor did not specify	Proprietary
Applications Supported	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs	File transfer, electronic mail
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C, V.35	RS-232-C	RS-232-C	RS-232-C
Transmission Mode	Synchronous	Synchronous	Asynchronous	Asynchronous
Transmission Speed (bps)	19.2K, 64K	19.2K	300, 600, 1200, 2400, 4800, 9600, 19.2K, 38.4K	300, 1200, 2400, 4800, 9600, 19.2K
Communications Features	Dial directory, macros	Dial directory, macros	Dial directory, auto dial/redial	Dial directory, auto dial/redial, auto answer, macros, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	3,445 hardware	1,895 software	159	99
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Optional 1500
Date of First Delivery	1984	1984	February 1983	October 1978
Number Installed to Date	Vendor did not specify	Vendor did not specify	Over 10,000	Over 60,000
Warranty	1 year	1 year	30 days	30 days
Distribution	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs	Direct, dist., dlrs, retail, mail, OEMs, VARs	Direct, dist., dlrs, retail, mail
Comments	Over 25 emulators bundled with products	Over 25 emulators bundled with products	BBS service available to registered users	—

Vendor	ICOT	ICOT	ICOT	ICOT
<b>Product</b>	<b>NetPATH 3770 RJE Gateway</b>	<b>NetPATH Kaaver SDLC Gateway</b>	<b>NetPATH Kaaver X.25 Gateway</b>	<b>NetPATH/SDLC LOOP Gateway</b>
<b>Specifications</b>				
Product Function	Remote terminal emulation, network gateway	Network gateway	Network gateway	Local/remote terminal emulation
Users Supported	Multuser	Multuser; 32	Multuser; 32	Multuser
Components	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software
Copy Protected	No	No	No	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	ARCnet, Ethernet, IBM Token-Ring, STARLAN	ARCnet, Ethernet, IBM Token-Ring, STARLAN, NetBios-compatible	ARCnet, Ethernet, IBM Token-Ring, STARLAN, NetBios-compatible	ARCnet, Ethernet, IBM Token-Ring, STARLAN, NETBIOS compatible
Minimum Memory Required (bytes)	256K	70K gateway, 40K workstations	Vendor did not specify	128K
Terminals/Controllers Emulated	RJE	IBM, 327X/317X DFT, 327X/317X CUT	IBM, 327X/317X DFT, 327X/317X CUT	IBM, 327X/317X DFT, 327X/317X CUT
User Interface	Install program	Install program, on-line help	Install program, on-line help	Install program, on-line help
Programmability API Compatibility	Yes Proprietary	Yes IBM API, proprietary	Yes IBM API, proprietary	Yes IBM API, proprietary
Microcomputer Security	Interface to host software	Interface to host software	Interface to host software	Interface to host software
Number of Concurrent Sessions	6	Up to 32 per gateway; 3 per workstation	32 max.	32
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM 8100
Software Environment	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM DPPX, DPRX
Protocols	SNA, RJE	SNA, SDLC	SNA, X.25	SNA
Applications Supported	Vendor did not specify	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	RS-232-C	RS-232-C	RS-232-C
Transmission Mode	Synchronous	Synchronous	Synchronous	Synchronous
Transmission Speed (bps)	9600	19.2K	19.2K	9600, 38.4K
Communications Features	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	1,595	3,595	3,595	3,585 to 5,595
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	Vendor did not specify	July 1987	July 1987	October 1985
Number Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	Vendor did not specify	1 year	1 year	1 year
Distribution	Vendor did not specify	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs
<b>Comments</b>	—	Optional 53G graphic workstation software available	Optional 53G graphic workstation software available	—

Vendor	ICOT	ICOT	ICOT	ICOT
Product	OmniPATH DFT/Gateway	OmniPATH DFT/PC	OmniPATH SDLC/Gateway	OmniPATH SDLC/PC
<b>Specifications</b>				
Product Function	Network gateway	Local terminal emulation	Network gateway	Remote terminal emulation
Users Supported	Multuser; 40	Single user	Multuser; 64	Single user
Components	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software
Copy Protected	No	No	No	No
Microcomputers Supported	Macintosh, IBM, PC/XT/AT & compatibles, PS/2 MCA	Macintosh, IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA	Macintosh, IBM, PC/XT/AT & compatibles, PS/2 MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	ARCnet, Ethernet, IBM Token-Ring, STARLAN, NetBios-compatible	N/A	ARCnet, Ethernet, IBM Token-Ring, STARLAN, NetBios-compatible	N/A
Minimum Memory Required (bytes)	256K	256K	256K	256K
Terminals/Controllers Emulated	IBM, 327X/317X DFT	IBM, 327X/317X DFT	IBM, 327X/317X DFT, 327X/317X CUT	IBM, 327X/317X DFT, 327X/317X CUT
User Interface	Install program, on-line help, pop-up windows, diagnostics	Install program, on-line help, pop-up windows	Install program, on-line help, diagnostics	Install program, on-line help, diagnostics
Programmability	Yes	Yes	Yes	Yes
API Compatibility	IBM API, proprietary	IBM API, proprietary	IBM API, proprietary	IBM API, proprietary
Microcomputer Security	Transmission/file encryption, interface to host software	Transmission/file encryption, interface to host software	Transmission/file encryption, interface to host software	Transmission/file encryption, interface to host software
Number of Concurrent Sessions	40	5	5 per workstation; 128 per gateway	5
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX
Software Environment	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP
Protocols	SNA	SNA	SNA, SDLC	SNA, SDLC
Applications Supported	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	Coax	Coax	RS-232-C	RS-232-C
Transmission Mode	Synchronous	Synchronous	Synchronous	Synchronous
Transmission Speed (bps)	2.4M	2.4M	Up to 56K bps	9600
Communications Features	Vendor did not specify	Vendor did not specify	Vendor did not specify	Auto dial/redial, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	1,695-3,995 package pricing	1,095 package price	2,995-7,495 package pricing	995
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	October 1989	October 1989	September 1989	August 1989
Number Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	1 year	1 year	1 year	1 year
Distribution	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs
<b>Comments</b>	Software upgradable for 5, 20, or 40 LUs; optional 53G and APA graphics software available	Optional 53G and APA graphics software available; upgradable to 5, 20, or 40 LUs DFT Gateway	Optional 53G and APA workstation software available	Software options support 53G and APA graphics

Vendor	ICOT	ICOT	ICOT	ICOT
<b>Product</b>	pcPATH 2780/3780 RJE	pcPATH 3770	pcPATH Blaynch 3270	pcPATH Ksaver SDLC
<b>Specifications</b>				
Product Function	Remote terminal emulation	Remote terminal emulation	Remote terminal emulation	Remote terminal emulation
Users Supported	Single user	Single user	Single user	Single user
Components	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software
Copy Protected	No	No	No	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Vendor did not specify	Vendor did not specify	Vendor did not specify	N/A
Minimum Memory Required (bytes)	256K	256K	256K	70K
Terminals/Controllers Emulated	IBM, 2780/3780	IBM 3770	IBM, 327X/317X DFT, 327X/317X CUT	IBM, 327X/317X DFT, 327X/317X CUT
User Interface	Install program, diagnostics	Install program, on-line help, diagnostics	Install program, on-line help, diagnostics	Install program, on-line help
Programmability	Yes	Yes	Yes	Yes
API Compatibility	IBM API	Proprietary	IBM API, proprietary	IBM API, proprietary
Microcomputer Security	Interface to host software	Interface to host software	Interface to host software	Interface to host software
Number of Concurrent Sessions	1	6	5	3
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX
Software Environment	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM, DOS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP
Protocols	BSC, RJE	SNA	BSC	SNA, SDLC
Applications Supported	Vendor did not specify	Vendor did not specify	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	RS-232-C	RS-232-C	RS-232-C
Transmission Mode	Bisync	Synchronous	Bisync	Synchronous
Transmission Speed (bps)	9600	9600	9600	19.2K
Communications Features	Vendor did not specify	Unattended execution	Vendor did not specify	Auto dial/redial
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	595	890 package pricing	750	750
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	October 1983	October 1983	October 1983	March 1985
Number Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	20,000
Warranty	1 year	1 year	1 year	1 year
Distribution	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs
<b>Comments</b>	—	—	—	Optional 53G graphics software available

Vendor	ICOT	ICOT	ICOT	ICOT
Product	pcPATH Keaver X.25	pcPATH/SDLC LOOP	ShortCUT	ShortCUT/DFT
<b>Specifications</b>				
Product Function	Remote terminal emulation	Local/remote terminal emulation	Local terminal emulation	Local terminal emulation
Users Supported	Single user	Single user	Single user	Single user
Components	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software
Copy Protected	No	No	No	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	OS/2, MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	ARCnet	Vendor did not specify	Vendor did not specify	Vendor did not specify
Minimum Memory Required (bytes)	70K	70K	128K	256K
Terminals/Controllers Emulated	IBM, 327X/317X DFT, 327X/317X CUT	IBM, 327X/317X DFT, 327X/317X CUT	IBM, 327X/317X CUT	IBM, 327X/317X DFT
User Interface	Install program, on-line help	Install program, on-line help	Install program, on-line help, on-line tutor., pop-up windows, diagnostics	Install program, on-line help, pop-up windows, diagnostics
Programmability	Yes	Yes	Yes	Yes
API Compatibility	IBM API, proprietary	IBM API, proprietary	IBM API	IBM API, proprietary
Microcomputer Security	Interface to host software	Interface to host software	Interface to host software	Interface to host software
Number of Concurrent Sessions	3	3	1	5
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM 8100	IBM, 43XX/30XX	IBM, 43XX/30XX
Software Environment	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM DPPX or DPCX	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP
Protocols	SNA	SNA	BSC, SNA, SDLC	SNA, DFT
Applications Supported	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	RS-232-C	Coax	Coax
Transmission Mode	Synchronous	Synchronous	Synchronous	Synchronous
Transmission Speed (bps)	19.2K	38.4K	2.4M	2.4M
Communications Features	Auto dial/redial	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	850 package price	1,275	200	795 to 895
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	July 1985	March 1984	September 1988	September 1988
Number Installed to Date	Vendor did not specify	30,000	1,000	Vendor did not specify
Warranty	1 year	1 year	1 year	1 year
Distribution	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs
Comments	Optional 53G graphics software available	—	CUT mode emulation standard; software upgradable to DFT	—

Vendor	IDEAssociates, Inc.	IDEAssociates, Inc.	IDEAssociates, Inc.	IDEAssociates, Inc.
Product	IDEAcomm 3270/BSC	IDEAcomm 3270/SDLC Gateway	IDEAcomm 3270/SDLC MC Version	IDEAcomm 3270/SDLC PC Version
<b>Specifications</b>				
Product Function	Remote terminal emulation	Network gateway	Remote terminal emulation	Remote terminal emulation
Users Supported	Single user	Multiuser; 32	Single user	Single user
Components	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software
Copy Protected	No	No	No	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Vendor did not specify	ARCnet, Ethernet, IBM Token-Ring, STARLAN, NETBIOS compatible	Vendor did not specify	Vendor did not specify
Minimum Memory Required (bytes)	64K	93K to 290K	170K to 235K	170K to 235K
Terminals/Controllers Emulated	IBM 3272-2, 3278, 3275-2, 3276	IBM, 327X/317X DFT, 327X/317X CUT	IBM, 327X/317X DFT, 327X/317X CUT	IBM, 327X/317X DFT, 327X/317X CUT
User Interface	Install program	Install program, diagnostics	Install program, diagnostics	Install program, diagnostics
Programmability	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
API Compatibility	Vendor did not specify	IBM API, SRPI	IBM API, SRPI	IBM API, SRPI
Microcomputer Security	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Number of Concurrent Sessions	2	8128 sessions per LAN	8	8
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	No	Yes	Yes	Yes
File Formats	Vendor did not specify	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Vendor did not specify	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX
Software Environment	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS
Protocols	BSC	SNA, SDLC	SNA, SDLC	SNA, SDLC
Applications Supported	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	RS-232-C	RS-232-C	RS-232-C
Transmission Mode	Synchronous	Synchronous	Synchronous	Synchronous
Transmission Speed (bps)	19.2K	19.2K	19.2K	19.2K
Communications Features	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	895	1,995	895	795
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Number Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	1 year	1 year	1 year	1 year
Distribution	OEMs, VARs	OEMs, VARs	OEMs, VARs	OEMs, VARs
<b>Comments</b>	—	—	—	—

Vendor	IDEAssociates, Inc.	IDEAssociates, Inc.	IDEAssociates, Inc.	IDEAssociates, Inc.
<b>Product</b>	<b>IDEAcomm 3278</b>	<b>IDEAcomm 3278/DFT Gateway</b>	<b>IDEAcomm 3278/DFT</b>	<b>IDEAcomm 3770/SNA</b>
<b>Specifications</b>				
Product Function	Local terminal emulation	Local terminal emulation, network gateway	Local terminal emulation	Remote terminal emulation
Users Supported	Single user	Multuser	Single user	Single user
Components	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software
Copy Protected	No	No	Vendor did not specify	Vendor did not specify
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Vendor did not specify	ARCnet, Ethernet, IBM Token-Ring, STARLAN, NETBIOS compatible	Vendor did not specify	Vendor did not specify
Minimum Memory Required (bytes)	68K	52K to 250K	223K	64K
Terminals/Controllers Emulated	IBM, 327X/317X CUT	IBM, 327X/317X DFT	IBM, 327X/317X DFT	IBM 3771-I, 3774-PI, 3775-PI, 3776-I, 3776-2
User Interface	Install program, diagnostics	Install program, diagnostics	Install program, diagnostics	Install program, diagnostics
Programmability API Compatibility	Vendor did not specify IBM API, DCA IRMA API, proprietary	Vendor did not specify Proprietary, SRPI	Vendor did not specify IBM API, SRPI	Vendor did not specify Vendor did not specify
Microcomputer Security	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Number of Concurrent Sessions	1	1270 maximum per LAN	5	1
DOS Access During Session	Yes	Yes	Yes	No
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX
Software Environment	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	IBM, DOS
Protocols	BSC, SNA, SDLC	SNA, SDLC	SNA, SDLC	SNA
Applications Supported	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Communications Characteristics</b>				
Physical Connection	Coax	Coax	Coax	RS-232-C
Transmission Mode	Synchronous	Synchronous	Synchronous	Synchronous
Transmission Speed (bps)	Vendor did not specify	Vendor did not specify	Vendor did not specify	19.2K
Communications Features	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	995	1595	1095	895
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Number Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	1 year	1 year	1 year	1 year
Distribution	OEMs, VARs	OEMs, VARs	Dist., dtrs, retail, OEMs, VARs	OEMs, VARs
<b>Comments</b>	—	—	—	—

Vendor	IDEAssociates, Inc.	IDEAssociates, Inc.	IDEAssociates, Inc.	IDEAssociates, Inc.
Product	IDEAcomm 3780/BSC	IDEAcomm 5051/OS	IDEAcomm 5250/Remote Gateway MC Version	IDEAcomm 5250/Remote Gateway PC Version
<b>Specifications</b>				
Product Function	Remote terminal emulation	Local terminal emulation	Network gateway	Network gateway
Users Supported	Single user	Single user	Multuser; 36	Multuser; 36
Components	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software
Copy Protected	No	No	No	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA, IBM 286 machines	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	OS/2	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Vendor did not specify	Vendor did not specify	Ethernet, IBM Token-Ring, any NetBios compatible LAN	Ethernet, IBM Token-Ring, any NetBios compatible LAN
Minimum Memory Required (bytes)	64K	2K	256K	128K
Terminals/Controllers Emulated	IBM, 2780/3780	IBM, 5250 Series, IBM 3180, 3196	IBM, 5250 Series, IBM 3180	IBM, 5250 Series, IBM 3180
User Interface	Install program, diagnostics	Install program, on-line help, mouse, on-line tutor., graphic icons, windows diagnostics	On-line help, mouse, on-line tutor., pop-up windows, diagnostics	On-line help, mouse, on-line tutor., pop-up windows, diagnostics
Programmability	Vendor did not specify	Yes	Yes	Yes
API Compatibility	Vendor did not specify	IBM API	IBM API	IBM API
Microcomputer Security	Vendor did not specify	Interface to host software	Interface to host software	Interface to host software
Number of Concurrent Sessions	1	7	36 maximum per LAN	36 maximum per LAN
DOS Access During Session	No	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM, System/36/38, AS/400	IBM, System/36/38, AS/400	IBM, System/36/38, AS/400
Software Environment	IBM, DOS, OS/VS	IBM, SSP, OS/400, IBM CPF	IBM, SSP, OS/400, IBM CPF	IBM, SSP, OS/400, IBM CPF
Protocols	BSC	Twinax	SNA	SNA
Applications Supported	Vendor did not specify	Access to host-resident programs	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	Twinax	Twinax	Twinax
Transmission Mode	Synchronous	Vendor did not specify	Synchronous	Synchronous
Transmission Speed (bps)	19.2K	1M	19.2K, 1M	19.2K, 1M
Communications Features	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	895	495 software, 675 hardware	1,295 software, 395 Hardware	1,295 software, 295 Hardware
Host Software/Hardware (\$)	Vendor did not specify	Included in price	Included in price	Included in price
Date of First Delivery	Vendor did not specify	1989	1987	1987
Number Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	1 year	1 year	1 year	1 year
Distribution	OEMs, VARs	OEMs, VARs	OEMs, VARs	OEMs, VARs
<b>Comments</b>	—	—	—	—

Vendor	IDEAssociates, Inc.	IDEAssociates, Inc.	IDEAssociates, Inc.	IDEAssociates, Inc.
Product	IDEAcomm 5250/Remote MC Version	IDEAcomm 5250/Remote PC Version	IDEAcomm 5250/Remote Share MC Version	IDEAcomm 5250/Remote Share PC Version
<b>Specifications</b>				
Product Function	Remote terminal emulation	Remote terminal emulation	Remote terminal emulation	Remote terminal emulation
Users Supported	Single user	Single user	Multuser; 4	Multuser; 4
Components	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software
Copy Protected	No	No	No	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Minimum Memory Required (bytes)	256K	128K	256K	128K
Terminals/Controllers Emulated	IBM, 5250 Series, IBM 3180	IBM, 5250 Series, IBM 3180	IBM, 5250 Series, IBM 3180	IBM, 5250 Series, IBM 3180
User Interface	On-line help, pop-up windows, diagnostics	On-line help, pop-up windows, diagnostics	On-line help, on-line tutor., pop-up windows, diagnostics	On-line help, on-line tutor., pop-up windows, diagnostics
Programmability API Compatibility	Yes IBM API	Yes IBM API	Yes IBM API	Yes IBM API
Microcomputer Security	Interface to host software	Interface to host software	Interface to host software	Interface to host software
Number of Concurrent Sessions	9	9	9	9
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII	ASCII	ASCII	ASCII
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, System/36/38, AS/400	IBM, System/36/38, AS/400	IBM, System/36/38, AS/400	IBM, System/36/38, AS/400
Software Environment	IBM, SSP, OS/400, IBM CPF	IBM, SSP, OS/400, IBM CPF	IBM, SSP, OS/400, IBM CPF	IBM, SSP, OS/400, IBM CPF
Protocols	SNA, SDLC	SNA, SDLC	SNA, SDLC	SNA, SDLC
Applications Supported	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Communications Characteristics</b>				
Physical Connection	Twinax	Twinax	RS-232-C	RS-232-C
Transmission Mode	Synchronous	Synchronous	Asynchronous, synchronous	Asynchronous, synchronous
Transmission Speed (bps)	19.2K	19.2K	19.2K	19.2K
Communications Features	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	395 software, 395 Hardware	395 software, 295 Hardware	495 software, 395 Hardware	495 software, 295 Hardware
Host Software/Hardware (\$)	Included in price	Included in price	Included in price	Included in price
Date of First Delivery	1985	1985	1987	1987
Number Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	1 year	1 year	1 year	1 year
Distribution	OEMs, VARs	OEMs, VARs	OEMs, VARs	OEMs, VARs
<b>Comments</b>	—	—	—	—

Vendor	IDEAssociates, Inc.	IDEAssociates, Inc.	IDEAssociates, Inc.	IDEAssociates, Inc.
Product	IDEAcomm 5251/Plus MC Version	IDEAcomm 5251/Plus PC Version	IDEAcomm 5251/Remote Gateway Plus MC Version	IDEAcomm 5251/Remote Gateway Plus PC Version
<b>Specifications</b>				
Product Function	Local terminal emulation	Local terminal emulation	Network gateway	Network gateway
Users Supported	Single user	Single user	Multuser; 210	Multuser; 210
Components	Microcomputer hardware & software, host software	Microcomputer hardware & software, host software	Vendor did not specify	Vendor did not specify
Copy Protected	No	No	No	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Vendor did not specify	Vendor did not specify	Ethernet, IBM Token-Ring, any NetBios compatible LAN	Ethernet, IBM Token-Ring, any NetBios compatible LAN
Minimum Memory Required (bytes)	256K	128K	256K	128K
Terminals/Controllers Emulated	IBM, 5250 Series, IBM 3180, 3196	IBM, 5250 Series, IBM 3180, 3196	IBM, 5250 Series	IBM, 5250 Series
User Interface	Install program, on-line help, pop-up windows, diagnostics	Install program, on-line help, pop-up windows, diagnostics	Install program, diagnostics	Install program, diagnostics
Programmability	Yes	Yes	Yes	Yes
API Compatibility	IBM API	IBM API	IBM API	IBM API
Microcomputer Security	Interface to host software	Interface to host software	Password protection, interface to host software	Password protection, interface to host software
Number of Concurrent Sessions	7	7	70 maximum per LAN	70 maximum per LAN
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Vendor did not specify	Vendor did not specify
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, System/36/38, AS/400	IBM, System/36/38, AS/400	IBM, System/36/38, AS/400	IBM, System/36/38, AS/400
Software Environment	IBM, SSP, OS/400, IBM CPF	IBM, SSP, OS/400, IBM CPF	IBM, SSP, OS/400, IBM CPF	IBM, SSP, OS/400, IBM CPF
Protocols	Twinax	Twinax	Vendor did not specify	Vendor did not specify
Applications Supported	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	Twinax	Twinax	Twinax	Twinax
Transmission Mode	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Transmission Speed (bps)	1M	1M	1M	1M
Communications Features	Vendor did not specify	Vendor did not specify	Auto answer	Auto answer
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	150 software, 675 hardware	150 software, 645 hardware	1,295 software, 675 Hardware	1,295 software, 645 Hardware
Host Software/Hardware (\$)	Software included in price	Software included in price	Included in price	Included in price
Date of First Delivery	1984	1984	1987	1987
Number Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	1 year	1 year	1 year	1 year
Distribution	OEMs, VARs	OEMs, VARs	OEMs, VARs	OEMs, VARs
<b>Comments</b>	—	—	—	—

Vendor	IDEAssociates, Inc.	IDEAssociates, Inc.	Information Technologies, Inc.	Information Technologies, Inc.
Product	IDEAcomm Mac Mac II Version	IDEAcomm Mac Mac SE Version	LinkUp 3270 Coax UniSession	LinkUp 3270 Coax WorkStation
<b>Specifications</b>				
Product Function	Local/remote terminal emulation	Local/remote terminal emulation	Local terminal emulation	Local terminal emulation
Users Supported	Single user	Single user	Single user	Single user
Components	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer software	Microcomputer hardware & software
Copy Protected Microcomputers Supported	Vendor did not specify Macintosh	Vendor did not specify Macintosh	Yes IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	Yes IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	Macintosh Finder, Apple Macintosh Multifinder	Macintosh Finder, Apple Macintosh Multifinder	MS-/PC-D-JS	MS-/PC-DOS
Local Area Network Support	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Minimum Memory Required (bytes)	2M to 4M	1M	36K	165K
Terminals/Controllers Emulated	Vendor did not specify	Vendor did not specify	IBM, 327X/317X CUT	IBM, 327X/317X DFT, 327X/317X CUT
User Interface	On-line help, mouse, on-line tutor., graphic icons, pop-up windows, diags., menus	On-line help, mouse, on-line tutor., graphic icons, pop-up windows, diags., windows	Install program, on-line help, mouse, diagnostics	Install program, on-line help, mouse, pop-up windows, diagnostics
Programmability API Compatibility	Vendor did not specify HyperCard	Vendor did not specify HyperCard	Yes IBM API	Yes IBM API
Microcomputer Security	Vendor did not specify	Vendor did not specify	Password protection	Password protection
Number of Concurrent Sessions	4	4	1	5
DOS Access During Session	Vendor did not specify	Vendor did not specify	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII	ASCII	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	System/36/38, AS/400	System/36/38, AS/400	IBM, 43XX/30XX, System/36/38	IBM, 43XX/30XX, System/36/38, AS/400
Software Environment	Vendor did not specify	Vendor did not specify	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP, OS/400	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP, OS/400
Protocols	Vendor did not specify	Vendor did not specify	BSC, SNA, SDLC, non-SNA (channel)	BSC, SNA, SDLC, non-SNA (channel)
Applications Supported	Vendor did not specify	Vendor did not specify	Access to host-resident programs	Access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	Twinax	Twinax	Coax	Coax
Transmission Mode	Synchronous	Synchronous	Vendor did not specify	Vendor did not specify
Transmission Speed (bps)	1M	1M	N/A	Vendor did not specify
Communications Features	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	1195	995	149 software only	650
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	February 1989	February 1989	December 1983	May 1985
Number Installed to Date	Vendor did not specify	Vendor did not specify	75,000	75,000
Warranty	1 year	1 year	1 year	1 year
Distribution	Direct, dist., dlrs, retail, OEMs, VARs	Direct, dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs
<b>Comments</b>	Full Macintosh interface with pull down and pop-up menus	Full Macintosh interface with pull down and pop-up menus	—	—

Vendor	Information Technologies, Inc.	Information Technologies, Inc.	Information Technologies, Inc.	Information Technologies, Inc.
Product	LinkUp 3270 Coax WorkStation Plus	LinkUp 3270 Remote WorkStation	LinkUp 3270 Remote/10 Gatestation	LinkUp 3270 SDLC Workstation
<b>Specifications</b>				
Product Function	Network gateway	Remote terminal emulation	Network gateway	Remote terminal emulation
Users Supported	Multuser; 5	Single user	Multuser; 10	Single user
Components	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software
Copy Protected	Yes	Yes	Yes	Yes
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	ARCnet, Ethernet, IBM Token-Ring, STARLAN	Vendor did not specify	ARCnet, Ethernet, IBM Token-Ring, STARLAN	Vendor did not specify
Minimum Memory Required (bytes)	230K gateway; 90K nodes	165K	230K gateway; 90K nodes	165K
Terminals/Controllers Emulated	IBM, 327X/317X DFT, 327X/317X CUT, 5250 Series	IBM 3278/79	3278/79	IBM 3278/79
User Interface	Install program	On-line help, mouse, graphic icons, pop-up windows, diagnostics	On-line help, mouse, diagnostics	Mouse, diagnostics
Programmability	Yes	Yes	Yes	Yes
API Compatibility	IBM API	IBM API	IBM API	Vendor did not specify
Microcomputer Security	Password protection	Password protection	Password protection	Password protection
Number of Concurrent Sessions	5	32	32	5
DOS Access During Session	Yes	Yes	Yes	Vendor did not specify
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX, System/36/38, AS/400	IBM, 43XX/30XX, System/36/38, AS/400	IBM, 43XX/30XX, System/36/38, AS/400	IBM, 43XX/30XX, System/36/38, AS/400
Software Environment	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP, OS/400	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP, OS/400	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP, OS/400	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP, OS/400
Protocols	BSC, SNA, SDLC, non-SNA (channel)	BSC, SNA, SDLC	BSC, SNA, SDLC	BSC, SNA, SDLC
Applications Supported	Access to host-resident programs	Access to host-resident programs	Vendor did not specify	Access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	Coax	RS-232-C	RS-232-C	RS-232-C
Transmission Mode	Vendor did not specify	Synchronous	Synchronous	Synchronous
Transmission Speed (bps)	N/A	300, 600, 1200, 2400, 4800, 9600	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K	Vendor did not specify
Communications Features	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	895	795	1,545	Vendor did not specify
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	May 1988	May 1986	March 1986	May 1986
Number Installed to Date	2,000	10,000	Vendor did not specify	10,000
Warranty	1 year	1 year	1 year	1 year
Distribution	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs
Comments	—	—	—	—

Vendor	Information Technologies, Inc.	Information Technologies, Inc.	Information Technologies, Inc.	Information Technologies, Inc.
Product	LinkUp 3270 SDLC WorkStation	LinkUp 3299 Coax Gatestation	LinkUp 3780 Remote/32 Gatestation	LinkUp 3780 RJE Workstation
<b>Specifications</b>				
Product Function	Remote terminal emulation	Network gateway	Network gateway	Remote terminal emulation
Users Supported	Single user	Multuser; 40	Multuser; 32	Single user
Components	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software
Copy Protected	Yes	Yes	Vendor did not specify	Yes
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Vendor did not specify	ARCnet, Ethernet, IBM Token-Ring, STARLAN	ARCnet, Ethernet, IBM Token-Ring, STARLAN	Vendor did not specify
Minimum Memory Required (bytes)	165K	230K gateway; 90K nodes	230K gateway; 90K nodes	150K
Terminals/Controllers Emulated	IBM 3278/79	IBM, 327X/317X DFT, 327X/317X CUT	IBM 3278/79	IBM, 2780/3780
User Interface	On-line help, mouse, graphic icons, pop-up windows, diagnostics	On-line help, mouse, diagnostics	On-line help, diagnostics	Diagnostics
Programmability	Yes	Yes	Yes	Vendor did not specify
API Compatibility	IBM API	IBM API	IBM API	Proprietary
Microcomputer Security	Password protection	Password protection	Password protection	Password protection
Number of Concurrent Sessions	5	40	32	Vendor did not specify
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	No
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	Binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX, System/36/38	IBM, 43XX/30XX, System/36/38, AS/400	IBM, 43XX/30XX, System/36/38, AS/400	IBM, 43XX/30XX, System/36/38, AS/400
Software Environment	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP, OS/400	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP, OS/400	IBM, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP, OS/400	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP, OS/400
Protocols	BSC, SNA, SDLC	BSC, SNA, SDLC, non-SNA (channel attach)	SNA	Vendor did not specify
Applications Supported	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	Coax	RS-232-C	RS-232-C
Transmission Mode	Synchronous	Vendor did not specify	Synchronous	Synchronous
Transmission Speed (bps)	300, 600, 1200, 2400, 4800, 9600	N/A	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K	9600
Communications Features	Vendor did not specify	Vendor did not specify	Vendor did not specify	Auto dial/redial, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Software/Hardware (\$)	595	2,995	2,995	795
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	May 1986	May 1988	May 1986	May 1984
Number Installed to Date	10,000	1,000	Vendor did not specify	Vendor did not specify
Warranty	1 year	1 year	Vendor did not specify	1 year
Distribution	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs
Comments	—	—	—	—

Vendor	Information Technologies, Inc.	Innovative Electronics, Inc.	International Business Machines Corp. (IBM)	International Business Machines Corp. (IBM)
Product	LinkUp M/Remote Platform	Netmaster System	3270 Workstation Program	AS/400 PC Support
<b>Specifications</b>				
Product Function	Remote terminal emulation	Remote terminal emulation, host app. spfc. link	Local terminal emulation	Local terminal emulation
Users Supported	Single user	100	Single user	Single user
Components	Vendor did not specify	Microcomputer hardware & software	Microcomputer software	Microcomputer software, host software
Copy Protected	Yes	Yes	No	No
Microcomputers Supported	IBM, PS/2 MCA	IBM, PC/XT/AT & compatibles	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS, UNIX	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Vendor did not specify	STARLAN	IBM Token-Ring, IBM PC Network	IBM Token-Ring
Minimum Memory Required (bytes)	35K	Vendor did not specify	384K to 640K	512K
Terminals/Controllers Emulated	DEC, VT52/100, VT200 Series, VT300 Series Honeywell Bull; Unisys	IBM, 327X/317X DFT, 327X/317X CUT	IBM, 327X/317X DFT, 327X/317X CUT	5250 Series
User Interface	Vendor did not specify	Vendor did not specify	Install program, mouse, on-line tutor., pop-up windows	Install program, on-line help
Programmability	Vendor did not specify	Yes	Yes	Yes
API Compatibility	Software determined	Proprietary	IBM API, IBM HLLAPI	IBM LU 6.2, proprietary
Microcomputer Security	N/A	Password protection	Interface to host software	Transmission encryption, password protection, interface to host software
Number of Concurrent Sessions	N/A	Multiple	6 PC, 4 host	5
DOS Access During Session	Vendor did not specify	Yes	Yes	Yes
File Transfer	Not applicable	Yes	Yes	Yes
File Formats	Not applicable	ASCII	ASCII, binary	ASCII, binary
File Conversion	Not applicable	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX, System/36/38, AS/400	IBM, 43XX/30XX, System/36/38; UNIX-based systems	IBM, 43XX/30XX	Vendor did not specify
Software Environment	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP, OS/400	IBM, CICS; UNIX System 5	IBM, MVS, VM, TSO, CMS, CICS	IBM, OS/400
Protocols	BSC, SNA, HDLC, SDLC	BSC, SNA	SNA	SNA, SDLC, T1P1
Applications Supported	Access to host-resident programs	Vendor did not specify	Host virtual disk, ECF	Host virtual disk, shared folders
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	RS-232-C	Coax, token-ring, PC Net	Twinax, RS-232-C, token-ring
Transmission Mode	Synchronous	Synchronous	Asynchronous	Synchronous
Transmission Speed (bps)	300, 600, 1200, 2400, 4800, 9600	9600	Vendor did not specify	19.2K, 4M Lan
Communications Features	N/A	Auto dial/redial, unattended execution	Vendor did not specify	Auto dial/redial
<b>Pricing and Availability</b>				
Microcomputer Sftware/Hdwre (\$)	400 hardware	Vendor did not specify	495	Contact vendor
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	N/A	Contact vendor
Date of First Delivery	July 1989	December 1984	December 1987	Vendor did not specify
Number Installed to Date	500	Vendor did not specify	Vendor did not specify	Did not specify
Warranty	90 days	1 year	90 days	Did not specify
Distribution	Dist., dlrs, retail, OEMs, VARs	Direct	Direct, dist., dlrs, retail	Direct, dist., dlrs, retail, VARs
Comments	—	—	Product #75X1088	Product # 9406 for high end; product # 9404 for low end version

Vendor	International Business Machines Corp. (IBM)	International Business Machines Corp. (IBM)	International Business Machines Corp. (IBM)	International Business Machines Corp. (IBM)
<b>Product</b>	<b>Enhanced 5250 Display Station Emulation Adapt. Kit</b>	<b>Enhanced 5250 Emulation Program</b>	<b>FTTERM PC/Host File Transfer Program</b>	<b>IBM Enhanced 5250 Emulation Convenience Kit</b>
<b>Specifications</b>				
Product Function	Local terminal emulation	Local/remote terminal emulation	Local/remote terminal emulation	Local terminal emulation
Users Supported	Single user	Single user	Single user	Single user
Components	Microcomputer hardware & software	Microcomputer software	Microcomputer software	Microcomputer hardware & software
Copy Protected Microcomputers Supported	No, not applicable IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	Vendor did not specify PC/XT/AT & compatibles, PS/2 non-MCA	No IBM Roim CBXs	Vendor did not specify IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Did not specify	IBM Token-Ring	Vendor did not specify	Did not specify
Minimum Memory Required (bytes)	256K	256K	256K	256K
Terminals/Controllers Emulated	5250 Series	5250 Series	TTY, IBM, 327X/317X CUT, DEC, VT52/100, VT200 Series	5250 Series
User Interface	Install program, diagnostics	Install program, diagnostics	On-line help, pop-up windows	Install program, diagnostics
Programmability API Compatibility	Yes IBM API, IBM LU 6.2	Yes IBM API, proprietary	Vendor did not specify IBM API, HLLAPI	Yes IBM API, IBM LU 6.2, proprietary
Microcomputer Security	Interface to host software	Interface to host software	Protocol converter and host password security	Interface to host software
Number of Concurrent Sessions	2 PU's; 5 LU's; on AS/400	2	1 host and 1 DOS	2
DOS Access During Session	Yes	Yes	Yes	Vendor did not specify
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	System/36/38	System/36/38, AS/400	IBM, 43XX/30XX; DECVAX, any ASCII host supporting DEC VT 100/220, IBM 3101	System/36/38, AS/400
Software Environment	OS/400, IBM CPF, SCP	OS/400, System/36 SCP, System/38 CPF	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, IBM VSE	OS/400, System/36 SCP, System/38 CPF
Protocols	Twinax	T1P1 (Twinax)	SNA	T1P1 (Twinax)
Applications Supported	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs	IBM 3270 file transfer, host programs (IND\$FILE)	Host virtual disk, access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	Twinax, twisted pair, ECL	Twinax	RS-422 via 370B	Twinax, twisted pair, ECL
Transmission Mode	Synchronous	Synchronous	Asynchronous	Synchronous
Transmission Speed (bps)	1M	1M	300 to 19.2K	1M
Communications Features	Unattended execution, direct connection	Unattended execution	Dial directory, auto dial/redial, auto answer, macros, unattended execution	Unattended execution
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	595 ( card, diagnostics, manual )	160	145 (quantity)/108 (add. licenses)	845
Host Software/Hardware (\$)	Na	Vendor did not specify	N/A	Na
Date of First Delivery	April 1985	April 1985	July/1 1988	April 1985
Number Installed to Date	Did not specify	Did not specify	Vendor did not specify	Did not specify
Warranty	1 year	Did not specify	90 days, media and program	1 year
Distribution	Direct, dist., dlrs, retail, VARs	Direct, dist., dlrs, retail, VARs	Direct, dist., dlrs, retail, VARs	Direct, dist., dlrs, retail, VARs
<b>Comments</b>	Product # 2911; part of convenience kit # 2910	Product # 2912; part of convenience kit # 2910	Product #75X3-286; supports all IBM 3270 protocol converters	Product # 2910

Vendor	International Business Machines Corp. (IBM)	International Business Machines Corp. (IBM)	International Business Machines Corp. (IBM)	International Business Machines Corp. (IBM)
<b>Product</b>	<b>IBM PC 3270 Emulation Program Entry Level</b>	<b>IBM PC 3270 Emulation Program</b>	<b>System 36/38 Workstation Emulation Adapter</b>	<b>System/36 PC Support/36</b>
<b>Specifications</b>				
Product Function	Local terminal emulation	Local/remote terminal emulation, network gateway	Local terminal emulation	Local/remote terminal emulation
Users Supported	Single user	Single user, multiuser; 32 (gateway)	Single user	Single user
Components	Microcomputer software	Microcomputer software	Microcomputer hardware	Microcomputer software, host software
Copy Protected Microcomputers Supported	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	Not applicable PS/2 MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA, PC portable
Operating Systems Supported	M3-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Vendor did not specify	IBM Token-Ring, IBM PC Network	Did not specify	IBM Token-Ring
Minimum Memory Required (bytes)	128K	256K	384K	512K
Terminals/Controllers Emulated	IBM, 327X/317X CUT	IBM, 327X/317X DFT, 3X74 SDLC, token-ring, PC Network	5250 Series	5250 Series
User Interface	Install program	Install program, diagnostics	Install program, diagnostics	Install program, on-line help, pop-up windows
Programmability API Compatibility	Yes IBM HLLAPI	Yes IBM API, SRPI (IBM ECF)	Yes IBM API, IBM LU 6.2, proprietary	Yes IBM LU 6.2, proprietary
Microcomputer Security	Interface to host software	Interface to host software	Interface to host software	Transmission encryption, password protection, interface to host software
Number of Concurrent Sessions	1 PC, 1 host	1PC, 2 host	4PU's, 5LU's with AS/400	5
DOS Access During Session	Yes	Yes	Vendor did not specify	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM, 43XX/30XX	System/36/38	System/36/38
Software Environment	IBM, MVS, VM, TSO, CMS, CICS	IBM, MVS, VM, TSO, CMS, CICS	IBM, OS/400, System/36 SCP, System/38 CPF	System 36 SSP
Protocols	BSC, SNA, SDLC, 3X74 controller dep., SLHA	BSC, SNA, SDLC	T1P1 ( Twinax )	SNA, SDLC, T1P1
Applications Supported	Host virtual disk, access to host-resident programs, ECF	Host virtual disk, IBM ECF	Host virtual disk, access to host-resident programs	Host virtual disk, shared folders
<b>Communications Characteristics</b>				
Physical Connection	Coax	Coax, SDLC, token-ring, PC Network	Twinax, Twisted pair, ECL	Twinax, RS-232-C, token-ring
Transmission Mode	Vendor did not specify	Synchronous	Synchronous	Synchronous
Transmission Speed (bps)	Coax	2400 to 19.2K	1M	19.2K, 4M Lan
Communications Features	Vendor did not specify	Auto answer	Unattended execution	Auto dial/redial
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	325	495	620	Contact vendor
Host Software/Hardware (\$)	N/A	N/A	Na	Contact vendor
Date of First Delivery	September 1987	January 1987	December 1987	Vendor did not specify
Number Installed to Date	Vendor did not specify	Vendor did not specify	Did not specify	Did not specify
Warranty	90 days	90 days	1 year	Did not specify
Distribution	Direct, dist., dlrs, retail	Direct, dist., dlrs, retail	Direct, dist., dlrs, retail, VARs	Direct, dist., dlrs, retail, VARs
<b>Comments</b>	Product #75X1085	Product #59X9969; BSC support if linked to a 3X74 using BSC	Product # 69X6-279 convenience kit hardware and software # 69X6-287	Product # 5727-WS1

Vendor	JDS MicroProcessing	JDS MicroProcessing	KEA Systems, Ltd.	KEA Systems, Ltd.
Product	HYDRA II	HYDRA SNA	ZSTEM 220	ZSTEM 240
<b>Specifications</b>				
Product Function	Local/remote terminal emulation, standalone protocol converter, host app. spfc. link	Local/remote terminal emulation, standalone protocol converter, host app. spfc. link	Local terminal emulation	Local/remote terminal emulation
Users Supported	Multuser; up to 64	Multuser; 64	Single user	Single user
Components	Standalone hardware	Standalone hardware	Microcomputer software	Microcomputer software
Copy Protected Microcomputers Supported	Yes Macintosh, IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	Yes Macintosh, IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	Vendor did not specify	Vendor did not specify	MS-/PC-DOS	MS-/PC-DOS, UNIX
Local Area Network Support	Vendor did not specify	Vendor did not specify	Ethernet	Ethernet
Minimum Memory Required (bytes)	Vendor did not specify	Vendor did not specify	200K	240K
Terminals/Controllers Emulated	IBM, 327X/317X DFT	IBM, 327X/317X DFT	TTY, DEC, VT52/100, VT200 Series, VT300 Series	TTY, DEC, VT52/100, VT200 Series, VT300 Series
User Interface	Diagnostics	Diagnostics	Install program, on-line help, mouse	Install program, on-line help, mouse
Programmability API Compatibility	Yes Vendor did not specify	Yes Vendor did not specify	Yes Vendor did not specify	Yes Vendor did not specify
Microcomputer Security	Password protection, call back security, positive log off security	Call back security	Password protection	Password protection
Number of Concurrent Sessions	1 per port	1 per port	4	8
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII	ASCII, binary	ASCII, binary
File Conversion	Yes	Vendor did not specify	No	No
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM, 43XX/30XX, 9370	DEC/VAX, DECsystem UNIX-based systems	DEC/VAX, DECsystem; HP UNIX-based systems
Software Environment	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	VAX/VMS; UNIX System 5	VAX/VMS; DG OAS; UNIX System 5
Protocols	Mainframe channel	SNA, mainframe 360 channel	TCP/IP, LAT, CTERM	TCP/IP, LAT, CTERM
Applications Supported	Vendor did not specify	Vendor did not specify	None	None
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C, twisted pair	RS-232-C, twisted pair	Coax, RS-232-C	Coax, RS-232-C
Transmission Mode	Asynchronous	Asynchronous	Asynchronous	Asynchronous
Transmission Speed (bps)	Up to 38.4K bps	Up to 38.4K bps	300, 600, 1200, 2400, 4800, 9600, 19.2K, 38.4K bps, 57.6K bps	300, 600, 1200, 2400, 4800, 9600, 19.2K, 38.4K bps, 57.6K bps
Communications Features	Dial directory	Dial directory	Dial directory, auto dial/redial, auto answer, macros, unattended execution	Dial directory, auto dial/redial, auto answer, macros, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	Vendor did not specify	Vendor did not specify	150	295
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	March 1983	June 1988	November 1986	November 1987
Number Installed to Date	1,500 units	50 units	21,000	18,500
Warranty	90 days	90 days	30 days	30 days
Distribution	Dist., dlrs, retail	Direct, dist., dlrs, retail	Direct, dist., dlrs, retail, mail, OEMs, VARs	Direct, dist., dlrs, retail, mail, OEMs, VARs
<b>Comments</b>	Demonstrations available through distributors/dealers	Demonstrations available through distributors/dealers	VT220 layout keyboard for the PC is available	Available to military and many civil agencies on SMSCRC; VT240 keyboard for the PC is available

Vendor	KMW Systems Corp.	KMW Systems Corp.	KMW Systems Corp.	Management Science America
Product	TwinAccessTwinax Series II	TwinAccessTwinax Series III	TwinAxxess for the Mac II	ExpertLink
<b>Specifications</b>				
Product Function	Local/remote terminal emulation, standalone protocol converter	Local/remote terminal emulation, standalone protocol converter	Local terminal emulation, network gateway	Local terminal emulation, host app. spfc. link
Users Supported	Multiuser; up to 7	Single user	Multiuser; up to 7	Single user
Components	Microcomputer hardware & software, host software	Microcomputer hardware & software, host software	Microcomputer hardware & software, host software	Microcomputer software, host software
Copy Protected	Yes	Yes	No	No
Microcomputers Supported	Macintosh, IBM, PC/XT/AT & compatibles, PS/2 non-MCA	Macintosh, IBM, PC/XT/AT & compatibles, PS/2 non-MCA	Macintosh	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	Macintosh Finder, MS-/PC-DOS	Macintosh Finder, MS-/PC-DOS	Macintosh Finder	MS-/PC-DOS
Local Area Network Support	AppleTalk	AppleTalk	AppleTalk	IBM Token-Ring
Minimum Memory Required (bytes)	1M, 640K for PCs	1M for Macs, 640K for PCs	1M	256K
Terminals/Controllers Emulated	TTY, IBM, 5250 Series, DEC, VT52/100, VT200 Series	TTY, IBM, 5250 Series, DEC, VT52/100, VT200 Series	IBM, 5250 Series	IBM, 327X/317X DFT, 327X/317X CUT
User Interface	Install program, mouse, diagnostics	Install program, mouse, diagnostics	Install program, mouse, graphic icons, pop-up windows, diagnostics	Install program, on-line help
Programmability	No	No	Yes	Yes
API Compatibility	IBM API	IBM API	Vendor did not specify	IBM API, DCA IRMA API
Microcomputer Security	Password protection	Password protection	Password protection	Password protection, interface to host software
Number of Concurrent Sessions	Up to 7	1	Up to 7	1
DOS Access During Session	Yes	Yes	Not applicable	No
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII	ASCII	Vendor did not specify	ASCII
File Conversion	Yes	Yes	Vendor did not specify	Yes
<b>Host Interface</b>				
Systems Supported	IBM, System/36/38, AS/400	IBM, System/36/38, AS/400	IBM, System/36/38, AS/400	IBM, 43XX/30XX
Software Environment	IBM, DOS, OS/400	IBM, DOS, OS/400	IBM, OS/400	IBM, DOS, OS/VS, MVS, VM, CICS
Protocols	Twinax	Twinax	Twinax	BSC
Applications Supported	All IBM midrange applications	All IBM midrange applications	All IBM midrange applications	MSA host applications
<b>Communications Characteristics</b>				
Physical Connection	Twinax, RS-232-C, parallel	Twinax, RS-232-C, parallel	Twinax	Coax, modem
Transmission Mode	Asynchronous	Asynchronous	Synchronous	Asynchronous, synchronous
Transmission Speed (bps)	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K	Twinax speeds	9600, 2.4M
Communications Features	Dial directory	Dial directory	Vendor did not specify	Vendor did not specify
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	150 software	No charge for software with purchase of unit	1,095 hardware	Vendor did not specify
Host Software/Hardware (\$)	400 to 950 host software	400 to 950 host software	400 to 950 software	Vendor did not specify
Date of First Delivery	March 1985	September 1986	November 1989	Vendor did not specify
Number Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	90 days	90 days	1 year	Vendor did not specify
Distribution	Direct, dist., dirs, retail, OEMs, VARs	Direct, dist., dirs, retail, OEMs, VARs	Direct, dist., dirs, retail, OEMs, VARs	Direct
<b>Comments</b>	—	—	—	—

Vendor	McCormack & Dodge	Micro Decisionware, Inc.	Micro Tempus, Inc.	Micro Tempus, Inc.
Product	PC Link	PC/SQL-link	Tempus-Link	Tempus-Share
<b>Specifications</b>				
Product Function	Local/remote terminal emulation, network gateway, host app. spfc. link	Non-host app. spfc. link	Host app. spfc. link	Host app. spfc. link, mainframe server
Users Supported	Single user	Single user	Multuser; unlimited	Multuser; unlimited
Components	Microcomputer software, host software	Microcomputer software, host software	Microcomputer software, host software	Host software
Copy Protected	Yes	No	Yes	Yes
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	OS/2, MS-/PC-DOS	OS/2, MS-/PC-DOS
Local Area Network Support	Ethernet, IBM Token-Ring, NET BIOS	Ethernet, IBM Token-Ring	Ethernet, IBM Token-Ring	Ethernet, IBM Token-Ring
Minimum Memory Required (bytes)	256K	320K	Vendor did not specify	Vendor did not specify
Terminals/Controllers Emulated	IBM, 327X/317X DFT, 327X/317X CUT, DEC, VT200 Series	TTY, IBM, 327X/317X DFT, 327X/317X CUT, DEC, VT52/100; Honeywell Bull	TTY, IBM, 327X/317X DFT, 327X/317X CUT, 5250 Series, DEC, VT52/100; Honeywell Bull	TTY, IBM, 327X/317X DFT, 327X/317X CUT, 5250 Series, DEC, VT52/100; Honeywell Bull
User Interface	Install program, on-line help, pop-up windows	Install program, on-line help, pop-up windows	On-line help, mouse, pop-up windows	On-line help, mouse, pop-up windows
Programmability API Compatibility	Yes IBM API, DCA IRMA API, Novell (CXI)	Vendor did not specify IBM API, DCA IRMA API, IBM LU 6.2, Novell/LXI API	Yes Vendor did not specify	Yes Vendor did not specify
Microcomputer Security	Interface to host software	File encryption, interface to host software	Password protection, interface to host software	Password protection, interface to host software
Number of Concurrent Sessions	Vendor did not specify	Vendor did not specify	Vendor did not specify	Unlimited
DOS Access During Session	Yes	Vendor did not specify	Yes	Yes
File Transfer	Yes	No	Yes	Yes
File Formats	ASCII	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX; DECVAX	IBM, 43XX/30XX; Honeywell Bull, Tandem	IBM, 43XX/30XX	IBM, 43XX/30XX
Software Environment	CICS; VAX/VMS	IBM, MVS, VM, TSO, CMS, CICS; Honeywell GCOS	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	IBM, MVS, TSO, MVS/VTAM
Protocols	BSC, SNA	BSC, SNA	BSC, SNA, HDLC, SDLC	BSC, SNA, HDLC, SDLC
Applications Supported	Access to host-resident programs	Access to host-resident programs	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	Coax, RS-232-C	Coax, RS-232-C	Vendor did not specify	Vendor did not specify
Transmission Mode	Asynchronous, synchronous	Asynchronous, synchronous	Asynchronous, synchronous	Asynchronous, synchronous
Transmission Speed (bps)	19.2K	Vendor did not specify	Vendor did not specify	Vendor did not specify
Communications Features	Macros, unattended execution	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	1,100-8,000	300 to 600	Free	Free
Host Software/Hardware (\$)	35,000	Software 5,000 to 45,000	Based on processor group	Based on processor group
Date of First Delivery	1983	June 1985	September 1982	August 1987
Number Installed to Date	10,000	120	Not available	Not available
Warranty	1 year	Varies with purchase plan	Renewable	Renewable
Distribution	Direct	Direct, OEMs	Direct, dist., dlrs, retail, OEMs	Direct, dist., dlrs, retail, OEMs
<b>Comments</b>	Maintenance contract available	—	—	—

Vendor	Micro Tempus, Inc.	Microcom Software Div.	MicroGate Corp.	MicroGate Corp.
Product	Tempus-Transfer	Relay Gold 4.0	MicroGate 3270/API	MicroGate 3270/BSC
<b>Specifications</b>				
Product Function	Host app. spfc. link	Local/remote terminal, net gateway, standalone protocol converter, host application link	Remote terminal emulation, host app. spfc. link	Remote terminal emulation
Users Supported	Multuser; unlimited	Single user, multiuser; up to 250	Single user	Single user
Components	Microcomputer software, host software	Microcomputer software, host software	Microcomputer software	Microcomputer software
Copy Protected	Yes	No	No	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	Macintosh, IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA
Operating Systems Supported	OS/2, MS-/PC-DOS	Macintosh Finder, MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Ethernet, IBM Token-Ring	Ethernet, IBM Token-Ring, STARLAN, Ungermann Bass and NetBios-compatible	Vendor did not specify	Vendor did not specify
Minimum Memory Required (bytes)	Vendor did not specify	192K or 128K with EMS	512K	512K
Terminals/Controllers Emulated	TTY, IBM, 327X/317X CUT, 5250 Series, VT52/100, VT200 Series	TTY, IBM, 327X/317X DFT, 327X/317X CUT, DEC, VT52/100, VT200 Series	IBM, 327X/317X CUT	IBM, 327X/317X CUT
User Interface	On-line help, mouse, pop-up windows, diagnostics	Install program, on-line help, on-line tutor., pop-up windows, diagnostics	Vendor did not specify	On-line help, diagnostics
Programmability	Yes	Yes	Yes	No
API Compatibility	Vendor did not specify	Proprietary	IBM API	Vendor did not specify
Microcomputer Security	Password protection, interface to host software	Transmission/file encryption, interface to host software	Interface to host software	Interface to host software
Number of Concurrent Sessions	Vendor did not specify	15	5	5
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX
Software Environment	IBM, MVS, TSO, MVS/VTAM	IBM, MVS, VM, TSO, CMS, IMS, CICS	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP
Protocols	BSC, SNA, HDLC, SDLC	BSC, SNA, SDLC	SNA, SDLC	BSC
Applications Supported	Host virtual disk, access to host-resident programs, any mainframe application	Access to host-resident programs	Access to host-resident programs	Vendor did not specify
<b>Communications Characteristics</b>				
Physical Connection	Vendor did not specify	Coax, RS-232-C, LAN gateways	RS-232-C	RS-232-C
Transmission Mode	Asynchronous, synchronous	Asynchronous	Synchronous	Synchronous
Transmission Speed (bps)	Vendor did not specify	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K, supports speeds up to 56.4K bps	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K
Communications Features	Vendor did not specify	Dial directory, auto dial/redial, auto answer, macros, unattended execution	Auto dial/redial, auto answer	Auto dial/redial, auto answer
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	Free	299	900	300
Host Software/Hardware (\$)	Based on processor group	6,500-14,500	Vendor did not specify	Vendor did not specify
Date of First Delivery	January 1989	1983	1988	1985
Number Installed to Date	Not available	100,000	Vendor did not specify	Vendor did not specify
Warranty	1 year, renewable	90 days	30 days	30 days
Distribution	Direct, dist., dlrs, retail, OEMs	Direct, dist., dlrs, retail, mail, OEMs, VARs	Direct, dist., dlrs, retail, OEMs, VARs	Direct, dist., dlrs, retail, OEMs, VARs
Comments	—	—	—	—

Vendor	MicroGate Corp.	MicroGate Corp.	MicroGate Corp.	MicroGate Corp.
Product	MicroGate 3270/SNA	MicroGate 3780	MicroGate 3780/API	MicroGate 6530
<b>Specifications</b>				
Product Function	Remote terminal emulation	Remote terminal emulation	Remote terminal emulation, host app. spfc. link	Remote terminal emulation, host app. spfc. link
Users Supported	Single user	Single user	Single user	Single user
Components	Microcomputer software	Microcomputer software	Microcomputer software	Microcomputer hardware & software, host software
Copy Protected Microcomputers Supported	No IBM, PC/XT/AT & compatibles, PS/2 MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Minimum Memory Required (bytes)	512K	512K	512K	512K
Terminals/Crrit: "ers Emulated	IBM, 327X/317X CUT	IBM, 2780/3780	IBM, 2780/3780	Tandem 6530
User Interface	On-line help, diagnostics	On-line help, diagnostics	Vendor did not specify	Vendor did not specify
Programmability API Compatibility	Yes IBM API	Yes Proprietary	Yes Proprietary	Yes Proprietary
Microcomputer Security	Interface to host software	Interface to host software	Interface to host software	Interface to host software
Number of Concurrent Sessions	5	2	Vendor did not specify	1
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Vendor did not specify
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX	Tandem
Software Environment	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	Tandem Guardian, Pathway
Protocols	SNA, SDLC	BSC	BSC	Async
Applications Supported	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	Vendor did not specify	RS-232-C	RS-232-C
Transmission Mode	Synchronous	Synchronous	Synchronous	Asynchronous
Transmission Speed (bps)	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K	300, 600, 1200, 2400, 4800, 9600, 14.4K	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K
Communications Features	Vendor did not specify	Auto dial/redial, auto answer, unattended execution	Auto dial/redial, auto answer, unattended execution	Auto dial/redial, auto answer, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	300	300	900	150/225
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	1986	1983	1983	Vendor did not specify
Number Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	30 days	30 days	30 days	30 days
Distribution	Direct, dist., dlrs, retail, OEMs, VARs	Direct, dist., dlrs, retail, OEMs, VARs	Direct, dist., dlrs, retail, OEMs, VARs	Direct
Comments	—	Supports unattended sessions, background file tranfer	—	—

Vendor	MicroGate Corp.	MicroGate Corp.	MicroGate Corp.	MicroGate Corp.
Product	SLAM/208	SLAM/32	SyncLink 2400	SyncLink 2400/2
<b>Specifications</b>				
Product Function	Local/remote terminal emulation	Remote terminal emulation, network gateway	Remote terminal emulation	Remote terminal emulation
Users Supported	Vendor did not specify	Vendor did not specify	Single user	Single user
Components	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware	Microcomputer hardware
Copy Protected	No	No	Vendor did not specify	Vendor did not specify
Microcomputers Supported	IBM, PS/2 MCA	IBM, PS/2 MCA	IBM, PC/XT/AT & compatibles	IBM, PS/2 MCA
Operating Systems Supported	OS/2, MS-/PC-DOS	OS/2, MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Vendor did not specify	IBM Token-Ring	Vendor did not specify	Vendor did not specify
Minimum Memory Required (bytes)	Vendor did not specify	Vendor did not specify	512K	512K
Terminals/Controllers Emulated	IBM, 327X/317X DFT, 327X/317X CUT	IBM, 327X/317X DFT, 327X/317X CUT	IBM, 327X/317X DFT, 327X/317X CUT, 2780/3780	IBM, 327X/317X DFT, 327X/317X CUT, 2780/3780
User Interface	Install program, on-line help, mouse, on-line tutor, graphic icons, windows, diagnostics	Install program, on-line help/ tutor, mouse, graphic icons, pop-up windows, diagnostics	On-line help, diagnostics	On-line help, diagnostics
Programmability	Yes	Yes	Yes	Yes
API Compatibility	IBM API, IBM LU 6.2	IBM API, IBM LU 6.2	IBM API	IBM API
Microcomputer Security	Interface to host software	Interface to host software	Interface to host software	Interface to host software
Number of Concurrent Sessions	8	8	5	5
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX
Software Environment	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP
Protocols	SNA, HDLC, SDLC	SNA, HDLC, SDLC	BSC, SNA, HDLC, SDLC	BSC, SNA, HDLC, SDLC
Applications Supported	Vendor did not specify	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	Twisted pair	Twisted pair	Twisted pair	Twisted pair
Transmission Mode	Synchronous	Synchronous	Synchronous	Synchronous
Transmission Speed (bps)	2400, 4800	300, 600, 1200, 2400, 4800, 9600, 12000 bps	Vendor did not specify	2400
Communications Features	Dial directory, auto dial/redial, auto answer, unattended execution	Dial directory, auto dial/redial, auto answer, unattended execution	Auto dial/redial, auto answer, unattended execution	Auto dial/redial, auto answer, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Software/Hardware (\$)	1,295 hardware	1,595 hardware	795 hardware	845 hardware
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	Vendor did not specify	September 1989	1988	1987
Number Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	1 year	1 year	1 year	1 year
Distribution	Direct, dist., dlrs, retail, OEMs, VARs	Direct, dist., dlrs, retail, OEMs, VARs	Direct, dist., dlrs, retail, OEMs, VARs	Direct, dist., dlrs, retail, OEMs, VARs
Comments	Combines a SDLC adapter, a Bell 208-compatible modem, and a Bell 201-compatible modem	Combines an SDLC adapter and a CCITT V.32 modem on a half-size board	Combines a sync adapter and Bell 201-compatible modem on one board	Combines a sync adapter and Bell 201-compatible modem on one board

Vendor	MicroGate Corp.	MicroGate Corp.	MicroGate Corp.	MicroGate Corp.
Product	SyncLink 2422	SyncLink 4822	SyncLink 4824	SyncLink 4824/2
<b>Specifications</b>				
Product Function	Remote terminal emulation	Remote terminal emulation	Remote terminal emulation	Remote terminal emulation
Users Supported	Single user	Single user	Single user	Single user
Components	Microcomputer hardware	Microcomputer hardware	Microcomputer hardware	Microcomputer hardware
Copy Protected Microcomputers Supported	Vendor did not specify IBM, PC/XT/AT & compatibles	Vendor did not specify IBM, PC/XT/AT & compatibles	Vendor did not specify IBM, PC/XT/AT & compatibles	Vendor did not specify IBM, PS/2 MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Minimum Memory Required (bytes)	512K	512K	512K	512K
Terminals/Controllers Emulated	IBM, 327X/317X DFT, 327X/317X CUT, 2780/3780	IBM, 327X/317X DFT, 327X/317X CUT, 2780/3780	IBM, 327X/317X DFT, 327X/317X CUT, 2780/3780	IBM, 327X/317X DFT, 327X/317X CUT, 2780/3780
User Interface	On-line help, diagnostics	On-line help, diagnostics	On-line help, diagnostics	On-line help, diagnostics
Programmability API Compatibility	Vendor did not specify IBM API	Vendor did not specify IBM API	Yes IBM API	Yes IBM API
Microcomputer Security	Interface to host software	Interface to host software	Interface to host software	Interface to host software
Number of Concurrent Sessions	5	5	5	5
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX
Software Environment	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP
Protocols	BSC, SNA, HDLC, SDLC	BSC, SNA, HDLC, SDLC	BSC, SNA, HDLC, SDLC	BSC, SNA, HDLC, SDLC
Applications Supported	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	Twisted pair	Twisted pair	Twisted pair	Twisted pair
Transmission Mode	Asynchronous, synchronous	Synchronous	Synchronous	Synchronous
Transmission Speed (bps)	300, 600, 1200, 2400	300, 600, 1200, 2400, 4800	2400, 4800	300, 600, 1200, 2400, 4800
Communications Features	Auto dial/redial, auto answer, unattended execution	Auto dial/redial, auto answer, unattended execution	Auto dial/redial, auto answer, unattended execution	Auto dial/redial, auto answer, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	925 hardware	1,175 hardware	1,040 hardware	1,085 hardware
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	1988	1988	1988	1987
Number Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	1 year	1 year	1 year	1 year
Distribution	Direct, dist., dlrs, retail, OEMs, VARs	Direct, dist., dlrs, retail, OEMs, VARs	Direct, dist., dlrs, retail, OEMs, VARs	Direct, dist., dlrs, retail, OEMs, VARs
Comments	Combines a sync adapter, Bell 201-compatible modem, and CCITT V.22 bis modem on one board	Combines a sync adapter, Bell 208-compatible modem, Bell 201-compatible modem, and CCITT V.22 bis modem	Combines a sync adapter, Bell 208-compatible modem, and Bell 201-compatible modem on one board	Combines a sync adapter, Bell 201-compatible modem, and Bell 208-compatible modem on one board

Vendor	MicroGate Corp.	MicroPlot Systems, Inc.	Modems Plus, Inc.	Multi-Tech Systems
<b>Product</b>	<b>SyncLink Communications Card</b>	<b>PC-PLOT</b>	<b>Micro SNAP</b>	<b>MultiCom 3270</b>
<b>Specifications</b>				
Product Function	Local/remote terminal emulation	Local/remote terminal emulation	Local/remote terminal emulation, network gateway, standalone protocol converter, host app. spfc. link	Local terminal emulation
Users Supported	Single user	Single user	Single user	Vendor did not specify
Components	Microcomputer hardware & software	Microcomputer software	Microcomputer hardware & software, standalone hwre.	Microcomputer hardware & software
Copy Protected	Vendor did not specify	No	Yes	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Vendor did not specify	Ethernet	Ethernet	Vendor did not specify
Minimum Memory Required (bytes)	512K	256K	75K	256K
Terminals/Controllers Emulated	IBM, 327X/317X DFT, 327X/317X CUT, 2780/3780	TTY, DEC, VT52/100, VT200 Series, VT300 Series, Tektronix 4010/4014/4027/4105	TTY, IBM, 327X/317X DFT, 2780/3780, DEC, VT52/100	IBM, 327X/317X DFT, 327X/317X CUT
User Interface	On-line help, diagnostics	Install program, on-line help, mouse, pop-up windows	Install program	On-line help, pop-up windows
Programmability	Yes	Vendor did not specify	Yes	No
API Compatibility	IBM API	Proprietary	IBM API	IBM API
Microcomputer Security	Interface to host software	Vendor did not specify	Password protection, interface to host software	Password protection
Number of Concurrent Sessions	5	Vendor did not specify	5	5
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Vendor did not specify	Yes	No
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM, 43XX/30XX, System/36/38; Data General DECVAX; HP; UNIX-based systems	IBM, 43XX/30XX; Unisys	Vendor did not specify
Software Environment	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM, DOS, OS/VS, VM, TSO VAX/VMS; UNIX System 5 Berkeley 4.X	IBM, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM, MVS, VM, TSO, CMS, CICS
Protocols	BSC, SNA, HDLC, SDLC	TCP/IP	BSC, SNA, SDLC	BSC, SNA, SDLC
Applications Supported	Access to host-resident programs	None	Access to host-resident programs	Vendor did not specify
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	RS-232-C	RS-232-C	Coax
Transmission Mode	Synchronous	Asynchronous	Asynchronous, synchronous	Synchronous
Transmission Speed (bps)	300, 600, 1200, 2400, 4800	300, 600, 1200, 2400, 4800, 9600, 19.2K	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K	2.4M
Communications Features	Auto dial/redial, auto answer, unattended execution	Dial directory, auto dial/redial, auto answer, macros, script file	Auto answer, unattended execution	Vendor did not specify
<b>Pricing and Availability</b>				
Microcomputer Sftware/Hdwre (\$)	245-295 hardware	195	995 hardware	150-250/399-499
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	1983	March 1986	June 1985	March 1987
Number Installed to Date	Vendor did not specify	11,000	5,000	Vendor did not specify
Warranty	1 year	Vendor did not specify	90 days	Two years
Distribution	Direct, dist., dlrs, retail, OEMs, VARs	Direct, dist., dlrs, retail, mail	Direct, dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, VARs
<b>Comments</b>	—	—	—	Supports both CUT and DFT applications

Vendor	Multi Soft, Inc.	National Semiconductor	Network Research Corp.	Network Software Associates, Inc.
Product	INFRONT	MainLink II	Fusion Network Software	AdaptAsync
<b>Specifications</b>				
Product Function	Host app. spfc. link	Local terminal emulation	Local/remote terminal emulation, host app. spfc. link	Vendor did not specify
Users Supported	Single user	Single user	Multiuser	Multiuser; 32
Components	Microcomputer software	Microcomputer hardware & software	Microcomputer hardware & software, host software	Microcomputer hardware & software
Copy Protected	No	No	No	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	OS/2, MS-/PC-DOS	OS/2, MS-/PC-DOS	MS-/PC-DOS, Xenix	MS-/PC-DOS
Local Area Network Support	Ethernet, IBM Token-Ring	Vendor did not specify	Ethernet	IBM Token-Ring
Minimum Memory Required (bytes)	640K	85K	256K	Vendor did not specify
Terminals/Controllers Emulated	Vendor did not specify	IBM, 327X/317X DFT, 327X/317X CUT	DEC, VT52/100, VT200 Series; HP	Vendor did not specify
User Interface	On-line help, on-line tutor., graphic icons, pop-up windows	Install program, on-line help, diagnostics	Install program, on-line help	Vendor did not specify
Programmability	Yes	No	Yes	Yes
API Compatibility	IBM API, DCA IRMA API, IBM LU 6.2	Proprietary	Vendor did not specify	Vendor did not specify
Microcomputer Security	Interface to host software	Password protection	Password protection	Password protection, interface to host software, serial # check, SMDR Up to 128
Number of Concurrent Sessions	1	5	Vendor did not specify	
DOS Access During Session	Yes	No	No	Yes
File Transfer	Yes	Yes	Yes	Vendor did not specify
File Formats	ASCII	ASCII, binary	ASCII, binary	Vendor did not specify
File Conversion	No	Yes	Yes	Vendor did not specify
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX; DEC/VAX	IBM, 43XX/30XX, AS/400	DEC/VAX; HP	IBM, 43XX/30XX
Software Environment	IBM, DOS, MVS, VM, TSO, CMS, CICS; VAX/VMS, MVS-TDMS/DC	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	VAX/VMS; UNIX System 5 Berkeley 4.X	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, OS/400
Protocols	SNA, SDLC	SNA, SDLC	TCP/IP, XNS, NFS	SNA, SDLC
Applications Supported	Access to host-resident programs	None	Access to host-resident programs	Host virtual disk, access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	N/A	Coax, RS-232-C	Coax, Cheapernet	RS-232-C, token ring
Transmission Mode	Vendor did not specify	Vendor did not specify	Asynchronous, synchronous	Asynchronous, synchronous
Transmission Speed (bps)	Vendor did not specify	2.3587 MHz	Depends on network	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K, 2.4M, 4M bps
Communications Features	Vendor did not specify	Vendor did not specify	Unattended execution	Auto dial/redial, auto answer, macros, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	Vendor did not specify	225-345/395	300-500	795/1,295
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	750-15,000	Vendor did not specify
Date of First Delivery	October 1987	Vendor did not specify	January 1983	January 1988
Number Installed to Date	Vendor did not specify	25,000	10,000	Not available
Warranty	Vendor did not specify	1 year	90 days	90 days, 1 year
Distribution	Direct, dist., dirs, retail, mail, VARs	Direct, dist., dirs, retail, OEMs, VARs	Direct, dist., dirs, retail, OEMs, VARs	Direct, OEMs
Comments				Used in conjunction with other AdaptSNA software for providing SNA comm. over asynchronous lines

Vendor	Network Software Associates, Inc.			
Product	AdaptSNA 3270	AdaptSNA APPC	AdaptSNA APPC+3270	AdaptSNA LAN Gateway
<b>Specifications</b>				
Product Function	Local/remote terminal emulation	Host app. spfc. link	Local/remote terminal emulation, host app. spfc. link	Network gateway
Users Supported	Single user	Single user	Single user	Multuser; 128
Components	Microcomputer software	Microcomputer software	Microcomputer software	Microcomputer software
Copy Protected Microcomputers Supported	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA, laptops	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA, laptops	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA, laptops	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	OS/2, MS-/PC-DOS	OS/2, MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	ARCnet, Ethernet, IBM Token-Ring, STARLAN, NetBios-compatible	ARCnet, Ethernet, IBM Token-Ring, NetBios-compatible	ARCnet, Ethernet, IBM Token-Ring, NetBios-compatible	ARCnet, Ethernet, IBM Token-Ring, NetBios-compatible
Minimum Memory Required (bytes)	210K	155K	230K	Vendor did not specify
Terminals/Controllers Emulated	IBM, 327X/317X DFT	Vendor did not specify	IBM, 327X/317X DFT	IBM, 327X/317X DFT, IBM 3770
User Interface	On-line help, on-line tutor., diagnostics	Vendor did not specify	On-line help, on-line tutor., diagnostics	On-line help, on-line tutor., diagnostics
Programmability API Compatibility	Yes IBM API, proprietary	Yes IBM LU 6.2	Yes IBM LU 6.2	Yes IBM API, proprietary
Microcomputer Security	Vendor did not specify	Vendor did not specify	Vendor did not specify	Password protection, interface to host software, SMDR 128 per gateway
Number of Concurrent Sessions	4	1	3	128 per gateway
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Vendor did not specify	Yes
File Formats	ASCII, binary	ASCII, binary	Vendor did not specify	ASCII, binary
File Conversion	Yes	Yes	Vendor did not specify	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX, AS/400	IBM, 43XX/30XX, System/36/38, AS/400 DECVAX, IBM APPC systems	IBM, 43XX/30XX, System/36/38, AS/400	IBM, 43XX/30XX
Software Environment	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP, OS/400	IBM, DOS, OS/VS, MVS, VM, IMS, CICS, OS/400	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, OS/400	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, OS/400
Protocols	SNA, SDLC	SNA, SDLC	SNA, SDLC, APPL/LU6.2	SNA, SDLC
Applications Supported	Access to host-resident programs	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	Coax, RS-232-C, token ring	Coax, RS-232-C, token ring	Coax, RS-232-C	RS-232-C, token ring
Transmission Mode	Asynchronous, synchronous	Asynchronous, synchronous	Asynchronous, synchronous	Synchronous
Transmission Speed (bps)	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K, 2.4M, 4M bps	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K, 2.4M, 4M bps	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K, 2.4M, 4M bps	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K, 2.4M, 4M bps
Communications Features	Auto dial/redial, auto answer, macros, unattended execution			
<b>Pricing and Availability</b>				
Microcomputer Software/Hardware (\$)	245	285	495	995-5,995
Host Software/Hardware (\$)	Vendor did not specify			
Date of First Delivery	1983	October 1985	June 1989	December 1988
Number Installed to Date	Not available	Not available	Not available	Not available
Warranty	90 days	90 days	90 days	90 days
Distribution	Direct, OEMs	Direct, OEMs	Direct, OEMs	Direct, OEMs
Comments	—	—	—	—

Vendor	Network Software Associates, Inc.	Network Software Associates, Inc.	Novell, Inc., Communications Products Division	Novell, Inc., Communications Products Division
Product	AdaptSNA LU0	AdaptSNA RJE	NetLine 5250	NetWare 3270 CUT Workstation
<b>Specifications</b>				
Product Function	Vendor did not specify	Local/remote terminal emulation, host app. spfc. link	Vendor did not specify	Local terminal emulation
Users Supported	Single user	Single user	Single user, multiuser	Single user
Components	Microcomputer software	Microcomputer software	Microcomputer software, host software	Microcomputer software
Copy Protected Microcomputers Supported	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA, laptops	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA, laptops	No IBM, PC/XT/AT & compatibles, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	OS/2, MS-/PC-DOS	OS/2, MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	ARCnet, Ethernet, IBM Token-Ring, NetBios-compatible	ARCnet, Ethernet, IBM Token-Ring, NetBios-compatible	NetBIOS-compatible	ARCnet, Ethernet, IBM Token-Ring, STARLAN
Minimum Memory Required (bytes)	180K	200K	70K	95K
Terminals/Controllers Emulated	Vendor did not specify	IBM 3770	IBM, 5250 Series	IBM, 327X/317X CUT
User Interface	Vendor did not specify	On-line help, on-line tutor., diagnostics	Windows	Install program
Programmability API Compatibility	Yes LU0	Yes IBM API, proprietary	No IBM API	Vendor did not specify IBM API, DCA IRMA API, proprietary
Microcomputer Security	Vendor did not specify	Vendor did not specify	Vendor did not specify	Interface to host software
Number of Concurrent Sessions	16	5	Vendor did not specify	1
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, System/36/38, AS/400	IBM, 43XX/30XX
Software Environment	IBM, DOS, OS/VS, MVS, VM	IBM, DOS, OS/VS, MVS, VM	IBM, SSP, OS/400, IBM CPF	IBM, DOS, MVS, VM, TSO, CMS, IMS, CICS
Protocols	SNA, SDLC	SNA, SDLC, HASP	Vendor did not specify	SNA, non-SNA
Applications Supported	Host virtual disk, access to host-resident programs	Host virtual disk	Vendor did not specify	Access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	Coax, RS-232-C	Coax, RS-232-C, token ring	Hardware dependent	Coax
Transmission Mode	Asynchronous, synchronous	Asynchronous, synchronous	Vendor did not specify	Vendor did not specify
Transmission Speed (bps)	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K, 2.4M, 4M bps	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K, 2.4M, 4M bps	Depends on configuration	Vendor did not specify
Communications Features	Auto dial/redial, auto answer, macros, unattended execution	Auto dial/redial, auto answer, macros, unattended execution	Vendor did not specify	Vendor did not specify
<b>Pricing and Availability</b>				
Microcomputer Software/Hardware (\$)	585	785	150 software	350 software
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	August 1987	1984	March 1986	January 1987
Number Installed to Date	No available	Not available	Vendor did not specify	Vendor did not specify
Warranty	90 days	90 days	1 year	Vendor did not specify
Distribution	Direct, OEMs	Direct, OEMs	Direct, dist., dirs, retail	Dist., dirs, retail, OEMs, VARs
Comments	—	—	—	—

Vendor	Novell, Inc., Communications Products Division	Novell, Inc., Communications Products Division	Novell, Inc., Communications Products Division	Novell, Inc., Communications Products Division
Product	NetWare 3270 LAN Workstation	NetWare 3270 Multi Workstation	NetWare 3270 Multi Workstation	NetWare 3270 Send-Receive
<b>Specifications</b>				
Product Function	Local/remote terminal emulation	Local/remote terminal emulation	Local/remote terminal emulation	File transfer package
Users Supported	Multiuser; 96	Single user	Single user	Vendor did not specify
Components	Microcomputer software	Microcomputer software	Microcomputer software	Microcomputer software
Copy Protected Microcomputers Supported	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	ARCnet, Ethernet, IBM Token-Ring, STARLAN, NetBIOS-compatible, NetWare	Vendor did not specify	ARCnet, Ethernet, IBM Token-Ring, STARLAN	Vendor did not specify
Minimum Memory Required (bytes)	106K	145K	160K to 270K	Vendor did not specify
Terminals/Controllers Emulated	IBM, 327X/317X DFT	IBM, 327X/317X DFT	IBM, 327X/317X DFT	Vendor did not specify
User Interface	Install program	Install program	Install program	Vendor did not specify
Programmability API Compatibility	Vendor did not specify IBM API, DCA IRMA API, IBM LU 6.2, proprietary	Vendor did not specify IBM API, DCA IRMA API, proprietary	Vendor did not specify IBM API, DCA IRMA API, proprietary	Vendor did not specify Vendor did not specify
Microcomputer Security	Interface to host software	Interface to host software	Interface to host software	Vendor did not specify
Number of Concurrent Sessions	5 per user	5	5	Vendor did not specify
DOS Access During Session	Yes	Yes	Yes	Vendor did not specify
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX
Software Environment	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	IBM, DOS, MVS, VM, TSO, CMS, IMS, CICS	IBM, DOS, MVS, VM, TSO, CMS, IMS, CICS	IBM, TSO, CMS, CICS
Protocols	Novell SPX	SNA, SDLC, token-ring, non-SNA	BSC, SNA, SDLC, non-SNA	SNA
Applications Supported	Vendor did not specify	Access to host-resident programs	Access to host-resident programs	IBM IND\$FILE file transfer
<b>Communications Characteristics</b>				
Physical Connection	LAN transport layer to gateway	Coax, token-ring	Coax, RS-232-C	Vendor did not specify
Transmission Mode	Vendor did not specify	Vendor did not specify	Synchronous	Vendor did not specify
Transmission Speed (bps)	Vendor did not specify	64K to 16M	600 to 19.2K	Vendor did not specify
Communications Features	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	995 software (licensed up to 96 workstations)	395 to 545	475 software	100 software
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	December 1988	December 1988	January 1987	October 1986
Number Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	1 year	1 year	1 year	1 year
Distribution	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs
Comments	—	—	—	—

Vendor	Novell, Inc., Communications Products Division	Novell, Inc., Communications Products Division	Novell, Inc., Communications Products Division	Novell, Inc., Communications Products Division
Product	NetWare 5250 Gateway	NetWare 5250 LAN Workstation	NetWare 5250 SDLC Workstation	NetWare 5250 Twinax Workstation
<b>Specifications</b>				
Product Function	Network gateway	Remote terminal emulation	Remote terminal emulation	Local terminal emulation
Users Supported	Multuser; 9	Multuser; 9	Single user	Multuser; 7
Components	Microcomputer hardware & software	Microcomputer software	Microcomputer hardware & software	Microcomputer hardware & software
Copy Protected Microcomputers Supported	No IBM, PC/XT/AT & compatibles, PS/2 non-MCA			
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	NetBIOS-compatible	NetBIOS-compatible	Vendor did not specify	Vendor did not specify
Minimum Memory Required (bytes)	150K	200K	220K	64K
Terminals/Controllers Emulated	IBM, 5250 Series	IBM, 5250 Series	IBM, 5250 Series	IBM, 5250 Series
User Interface	On-line help, pop-up windows	On-line help	On-line help	On-line help
Programmability API Compatibility	Vendor did not specify IBM API	No IBM API	No IBM API	No IBM API
Microcomputer Security	Keyboard lock feature	Keyboard lock feature	Keyboard lock feature	Keyboard lock feature
Number of Concurrent Sessions	9	9	9	7
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII	ASCII	ASCII	ASCII
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, System/36/38	IBM, System/36/38	IBM, System/36/38	IBM, System/36/38, AS/400
Software Environment	IBM CPF	IBM CPF	IBM CPF	IBM, DOS, OS/400, IBM CPF
Protocols	SNA	SNA	SDLC	Twinax
Applications Supported	Host virtual disk, access to host-resident programs			
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	Any LAN media	Twinax, RS-232-C, twisted pair	Twinax
Transmission Mode	Asynchronous	Synchronous	Synchronous	Synchronous
Transmission Speed (bps)	9600	LAN speed	19.2K	1M
Communications Features	Vendor did not specify			
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	550 software, 395 hardware	200	250 software, 395 hardware	200 software, 545 hardware
Host Software/Hardware (\$)	Vendor did not specify			
Date of First Delivery	January 1987	May 1989	April 1989	January 1986
Number Installed to Date	Vendor did not specify			
Warranty	1 year	1 year	1 year	1 year
Distribution	Direct, dist., dlrs, retail			
<b>Comments</b>	—	—	—	—

Vendor	Novell, Inc., Communications Products Division	Novell, Inc., Communications Products Division	Novell, Inc., Communications Products Division	Novell, Inc., Communications Products Division
Product	NetWare SNA Gateway	NetWare SNA Gateway ELS	NetWare X.25 Extended Gateway	NetWare X.25 Gateway
<b>Specifications</b>				
Product Function	Network gateway	Network gateway	Local/remote terminal emulation, network gateway	Local/remote terminal emulation, network gateway
Users Supported	Multuser; 96 workstations	Multuser; 16	Multuser; 97	Multuser; 8
Components	Microcomputer software	Microcomputer software	Microcomputer software	Microcomputer software
Copy Protected Microcomputers Supported	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	ARCnet, Ethernet, IBM Token-Ring, STARLAN, NetBIOS-compatible, NetWare	ARCnet, Ethernet, IBM Token-Ring, NetBIOS-compatible, NetWare	ARCnet, Ethernet, IBM Token-Ring, STARLAN	ARCnet, Ethernet, IBM Token-Ring, STARLAN
Minimum Memory Required (bytes)	Vendor did not specify	232K (coax), 238K (remote)	256K	256K
Terminals/Controllers Emulated	IBM, 327X/317X DFT	IBM, 327X/317X DFT	TTY, third party emulation	TTY, third party emulation
User Interface	Install program, on-line help, diagnostics, windows	Install program, on-line help, diagnostics, windows	Vendor did not specify	Vendor did not specify
Programmability API Compatibility	Vendor did not specify IBM API, DCA IRMA API	No IBM API, DCA IRMA API, IBM LU 6.2, proprietary	Vendor did not specify Interrupt 14	Vendor did not specify Interrupt 14
Microcomputer Security	Interface to host software	Interface to host software	Vendor did not specify	Vendor did not specify
Number of Concurrent Sessions	128	16	8	8
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	Vendor did not specify	Vendor did not specify
File Conversion	Yes	Yes	No	No
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM, 43XX/30XX	Data General; Honeywell Bull; DEC VAX; HP, X.29 hosts	Data General; Honeywell Bull; DEC VAX; HP, X.29 hosts
Software Environment	IBM, DOS, MVS, VM, TSO, CMS, IMS, CICS	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	VAX/VMS; DG OAS; Honeywell GCOS	VAX/VMS; DG OAS; Honeywell GCOS
Protocols	SNA, SDLC, token-ring	SNA, SDLC	X.25	X.25
Applications Supported	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	Coax, RS-232-C, token-ring interface	Coax	RS-232-C	RS-232-C
Transmission Mode	Synchronous	Synchronous	Synchronous	Synchronous
Transmission Speed (bps)	2.4M (coax), 1200 to 64K (remote)	19.2K to 2.4M (coax), 1200 to 19.2K (remote)	Up to 64K	Up to 64K
Communications Features	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	2,995 software	595 software	1,150 software	550 software
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	December 1988	December 1988	June 1988	June 1988
Number Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	Vendor did not specify	Vendor did not specify	1 year	1 year
Distribution	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail
Comments	—	—	Requires Novell X.25 extended adapter for PC	Requires Novell X.25 adapter

**PC-to-Host  
Communications  
Products:  
Comparison Columns**

Vendor	Novell, Inc., Communications Products Division	Novell, Inc., Communications Products Division	Novell, Inc., Communications Products Division	Novell, Inc., Communications Products Division
<b>Product</b>	Novell Coax Adapter	Novell Coax Mux Adapter for PC	Novell Synchronous Adapter for PC	Novell Synchronous Adapter
<b>Specifications</b>				
Product Function	Network gateway	Network gateway	Network gateway	Remote terminal emulation, network gateway
Users Supported	Multuser; up to 5	Multuser; up to 40	Multuser	Single user, multiuser
Components	Microcomputer hardware	Microcomputer hardware	Microcomputer hardware	Microcomputer hardware
Copy Protected Microcomputers Supported	Vendor did not specify IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	Vendor did not specify IBM, PC/XT/AT & compatibles, PS/2 non-MCA	Not applicable IBM, PC/XT/AT & compatibles	Vendor did not specify IBM, PC/XT/AT & compatibles, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	ARCnet, Ethernet, IBM Token-Ring, STARLAN	ARCnet, Ethernet, IBM Token-Ring, STARLAN	ARCnet, Ethernet, IBM Token-Ring, STARLAN	ARCnet, Ethernet, IBM Token-Ring, STARLAN
Minimum Memory Required (bytes)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Terminals/Controllers Emulated	IBM, 327X/317X DFT, 327X/317X CUT	IBM, 327X/317X DFT	IBM, 327X/317X DFT	IBM, 327X/317X DFT
User Interface	Vendor did not specify	Vendor did not specify	Not applicable	Vendor did not specify
Programmability API Compatibility	Vendor did not specify Vendor did not specify	Vendor did not specify Vendor did not specify	Vendor did not specify Vendor did not specify	Vendor did not specify Vendor did not specify
Microcomputer Security	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Number of Concurrent Sessions	5	40	128	128
DOS Access During Session	Yes	Vendor did not specify	Vendor did not specify	Vendor did not specify
File Transfer	Vendor did not specify	Not applicable	Not applicable	Vendor did not specify
File Formats	Vendor did not specify	Not applicable	Not applicable	Vendor did not specify
File Conversion	Vendor did not specify	Not applicable	Not applicable	Vendor did not specify
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX
Software Environment	IBM, DOS, MVS, VM, TSO, CMS, IMS, CICS	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS
Protocols	SNA, non-SNA	SNA	SNA, SDLC	SNA, SDLC
Applications Supported	Vendor did not specify	None	Vendor did not specify	Vendor did not specify
<b>Communications Characteristics</b>				
Physical Connection	Coax	Coax	RS-232-C	RS-232-C
Transmission Mode	Vendor did not specify	Vendor did not specify	Vendor did not specify	Synchronous
Transmission Speed (bps)	2.35M	2.35M	2400 to 56K	1200 to 56K
Communications Features	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	545 software	1,100 software	1,000 software	395 software
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	June 1983	July 1987	1986	January 1985
Number Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	1 year	1 year	Vendor did not specify	Vendor did not specify
Distribution	Dist., dlrs, retail	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs	Dist., dlrs, retail, OEMs, VARs
<b>Comments</b>	Supports both single-user and gateway products in coax environment	Supports a 40-user coax gateway (connected to multiplexer port on a 3 x 74)	Board supports a high-speed remote SDLC gateway	Supports single user and gateway products in a 3270 remote SDLC (or BSC single-user) environment

Vendor	Novell, Inc., Communications Products Division	Novell, Inc., Communications Products Division	OBS Software	On-Line Software International, Inc.
Product	Novell Twinax Adapter	PCOX/Multi-M	EXCELLINK	RAMIS/PC
<b>Specifications</b>				
Product Function	Vendor did not specify	Local terminal emulation	Local/remote terminal emulation	Local/remote terminal emulation, network gateway, standalone protocol converter, host, application link
Users Supported	Single user	Single user	Multuser; unlimited	Single user, multiuser
Components	Microcomputer hardware	Microcomputer software	Microcomputer software, host software	Microcomputer software, host software
Copy Protected Microcomputers Supported	No IBM, PC/XT/AT & compatibles, PS/2 non-MCA	No Macintosh	No IBM, PC/XT/AT & compatibles, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	Macintosh Finder	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	NetBIOS-compatible	Vendor did not specify	Ethernet, IBM Token-Ring	IBM Token-Ring, Novell
Minimum Memory Required (bytes)	160K	Vendor did not specify	124K	640K
Terminals/Controllers Emulated	IBM, 5250 Series	IBM, 327X/317X DFT	TTY, IBM, 327X/317X DFT, 327X/317X CUT, 2780/3780	TTY, IBM, 327X/317X DFT, 327X/317X CUT, IBM 3101
User Interface	Vendor did not specify	Vendor did not specify	On-line help	Install program, on-line help, mouse, pop-up windows
Programmability API Compatibility	Vendor did not specify Vendor did not specify	No Vendor did not specify	Yes IBM API, DCA IRMA API, proprietary	Yes Proprietary
Microcomputer Security	Vendor did not specify	Interface to host software	Interface to host software	Interface to host software
Number of Concurrent Sessions	1	Vendor did not specify	1	4
DOS Access During Session	Yes	Vendor did not specify	No	Yes
File Transfer	Vendor did not specify	Yes	Yes	Yes
File Formats	Vendor did not specify	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Vendor did not specify	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, System/36/38	IBM, 43XX/30XX	IBM, 43XX/30XX, AS/400	IBM, 43XX/30XX
Software Environment	IBM, SSP, IBM CPF	IBM, MVS, VM, TSO, IMS, CICS	IBM, MVS, VM, TSO, CMS	IBM, TSO, CMS, CICS
Protocols	Twinax	SNA	BSC, SNA, HDLC, SDLC	BSC, SNA, SDLC
Applications Supported	Host virtual disk, access to host-resident programs	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	Twinax	Coax	Coax, RS-232-C	Coax, modem
Transmission Mode	Synchronous	Vendor did not specify	Asynchronous, synchronous	Asynchronous, synchronous
Transmission Speed (bps)	19.2K	Vendor did not specify	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K	300, 600, 1200, 2400, 4800, 9600
Communications Features	Vendor did not specify	Vendor did not specify	Macros, unattended execution	Macros, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	545	675 software	Vendor did not specify	595
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	19,000-126,000
Date of First Delivery	October 1986	October 1987	January 1986	January 1986
Number Installed to Date	Vendor did not specify	Vendor did not specify	Over 100	20,000 PC/1,440 IBM Host
Warranty	1 year	1 year	1 year	1 year
Distribution	Direct, dist., dlrs, retail	Dist., dlrs, retail	Direct	Direct, dist., dlrs, retail
Comments	—	—	—	Includes hot-line support

Vendor	Packet/PC Inc.	Packet/PC Inc.	Packet/PC Inc.	Packet/PC Inc.
<b>Product</b>	<b>COMMPress</b>	<b>EPD (Electronic Program Distribution)</b>	<b>Packet/3270 Mac</b>	<b>Packet/3270</b>
<b>Specifications</b>				
Product Function	Host app. spfc. link	Host app. spfc. link	Remote terminal emulation	Remote terminal emulation, network gateway
Users Supported	Vendor did not specify	Multuser	Single user	Single user, multiuser; 254 with LAN version
Components	Microcomputer software, host software	Microcomputer software, host software	Microcomputer software, host software, host hwre.	Microcomputer software, host software, host hwre.
Copy Protected	No	No	No	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	Macintosh	Macintosh, IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	Macintosh Finder	MS-/PC-DOS, OS2
Local Area Network Support	ARCnet, Ethernet, IBM Token-Ring, 3Com	ARCnet, IBM Token-Ring, 3Com and NetBios-compatible	Vendor did not specify	ARCnet, IBM Token-Ring, 3Com and NetBios-compatible
Minimum Memory Required (bytes)	256K	640K	384K	384K
Terminals/Controllers Emulated	Vendor did not specify	IBM, 327X/317X DFT	IBM, 327X/317X DFT	TTY, IBM, 327X/317X DFT
User Interface	Vendor did not specify	On-line help, diagnostics	On-line help, mouse, graphic icons, pop-up windows, diagnostics	On-line help, diagnostics
Programmability	No	Yes	No	Yes
API Compatibility	Vendor did not specify	IBM API, DCA IRMA API, proprietary	Vendor did not specify	IBM API, proprietary, IBM HLL API
Microcomputer Security	Vendor did not specify	Password protection, interface to host software	Password protection, interface to host software	Password protection, interface to host software
Number of Concurrent Sessions	N/A	2	2	2
DOS Access During Session	Vendor did not specify	No	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX, System/36/38, AS/400	IBM, 43XX/30XX, System/36/38, AS/400
Software Environment	IBM, TSO, CMS, CICS	IBM, MVS, CICS	IBM, DOS, MVS, VM, TSO, CMS, IMS, CICS, SSP, OS/400	IBM, DOS, MVS, VM, TSO, CMS, IMS, CICS, SSP, OS/400
Protocols	BSC, SNA, HDLC, SDLC	SNA, SDLC	SNA, SDLC	SNA, SDLC
Applications Supported	None	Access to host-resident programs	Vendor did not specify	Vendor did not specify
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	Coax, RS-232-C	RS-232-C	RS-232-C
Transmission Mode	Asynchronous, synchronous	Asynchronous, synchronous	Asynchronous	Asynchronous
Transmission Speed (bps)	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K, 2.4M	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K, 2.4M	300, 600, 1200, 2400, 4800, 9600	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K
Communications Features	Vendor did not specify	Auto dial/redial, auto answer, macros, unattended execution	Auto dial/redial, auto answer, macros, unattended execution	Auto dial/redial, auto answer, macros, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	Vendor did not specify	495-195	295-110	295-110
Host Software/Hardware (\$)	5,000	30,000 software	10,000-8,500/8,000-6,400	10,000-8,500/8,000-6,400
Date of First Delivery	January 1987	November 1989	October 1989	December 1985
Number Installed to Date	Vendor did not specify	2	Vendor did not specify	100,000
Warranty	1 year	1 year	1 year	1 year
Distribution	Direct, dist., dlrs, retail	Direct	Direct, dist., dlrs, retail	Direct, dist., dlrs, retail
<b>Comments</b>	—	—	Requires either host software or hardware, not both	Requires either host software or hardware, not both

Vendor	Packet/PC Inc.	Packet/PC Inc.	Pansophic Systems	Passport Communications, Inc.
Product	Packet/5250	PC/400	The Corporate Tie	Bisync Exchange
<b>Specifications</b>				
Product Function	Remote terminal emulation	Remote terminal emulation	Non-host app. spfc. link	Remote terminal emulation
Users Supported	Single user	Single user	Multuser; unlimited	Single user
Components	Microcomputer software, host hardware	Microcomputer software, host hardware	Microcomputer software, host software	Microcomputer hardware & software
Copy Protected	No	No	No	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	OS/2, MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Vendor did not specify	Vendor did not specify	Ethernet, IBM Token-Ring, STARLAN	Vendor did not specify
Minimum Memory Required (bytes)	512K	512K	256K	256K
Terminals/Controllers Emulated	IBM, 5250 Series	IBM, 5250 Series, APPC, LU6.2, 802.2	TTY, IBM, 327X/317X DFT, 327X/317X CUT, IBM 4702	IBM, 2780/3780
User Interface	On-line help, diagnostics	On-line help, diagnostics	Install program, pop-up windows, diagnostics	Install program
Programmability API Compatibility	Yes IBM API	Yes IBM LU 6.2	Yes IBM API, DCA IRMA API	No Proprietary
Microcomputer Security	Password protection	Password protection	Transmission encryption, password protection, interface to host software	Interface to host software
Number of Concurrent Sessions	7	Vendor did not specify	1	1
DOS Access During Session	Yes	Yes	Yes	No
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	No	Yes
<b>Host Interface</b>				
Systems Supported	IBM, System/36/38, AS/400	IBM, AS/400	IBM, 43XX/30XX	IBM, 43XX/30XX, System/36/38; Data General Honeywell BullVAX, DECsystem; HP
Software Environment	IBM, SSP, OS/400	IBM, OS/400	IBM, DOS, MVS, CICS, IBM VTAM (MVS)	Any BSC Fep
Protocols	SNA, SDLC	Token ring	BSC, SNA, SDLC	BSC
Applications Supported	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs, network spool file	None
<b>Communications Characteristics</b>				
Physical Connection	Vendor did not specify	RS-232-C	Coax, RS-232-C	RS-232-C
Transmission Mode	Asynchronous	Asynchronous	Asynchronous, synchronous	Synchronous
Transmission Speed (bps)	300, 600, 1200, 2400, 4800, 9600	300, 600, 1200, 2400, 4800, 9600	300, 1200, 2400	300, 1200, 2400, 4800, 9600, 19.2K
Communications Features	Auto dial/redial, auto answer, unattended execution	Auto dial/redial, auto answer, macros, unattended execution	Auto dial/redial, auto answer, unattended execution	Auto dial/redial, auto answer, macros, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	295-195	295-110	Vendor did not specify	795
Host Software/Hardware (\$)	8,000-6,400	8,000-6,400	Vendor did not specify	Vendor did not specify
Date of First Delivery	May 1989	November 1989	March 1987	June 1983
Number Installed to Date	250	Two	300	Over 2,000
Warranty	1 year	1 year	Vendor did not specify	90 days
Distribution	Direct, dist., dlrs, retail	Direct, dist., dlrs, retail	Direct	Direct, OEMs, VARs
<b>Comments</b>	—	Supports IBM's office and PC Support 400 over a public data network	—	Supports PC-to-PC Bisync 3780 communications

Vendor	Passport Communications, Inc.	Passport Communications, Inc.	Passport Communications, Inc.	Passport Communications, Inc.
Product	Bisync Exchange/II	Gateway Exchange	Gateway Exchange/II	Modem Exchange
<b>Specifications</b>				
Product Function	Remote terminal emulation	Remote terminal emulation	Remote terminal emulation	Remote terminal emulation
Users Supported	Single user	Multiuser	Multiuser	Single user
Components	Microcomputer hardware & software	Vendor did not specify	Microcomputer hardware & software	Microcomputer hardware & software
Copy Protected	No	No	No	No
Microcomputers Supported	IBM, PS/2 MCA	IBM, PC/XT/AT & compatibles, PS/2 non-MCA	IBM, PS/2 MCA	IBM, PC/XT/AT & compatibles, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Vendor did not specify	ARCnet, STARLAN, NetBios-compatible	ARCnet, STARLAN, NetBios-compatible	Vendor did not specify
Minimum Memory Required (bytes)	256K	128K at server, 256K at workstation	128K at server, 256K at workstation	256K
Terminals/Controllers Emulated	IBM, 2780/3780	IBM, 327X/317X DFT, RJE 3770	IBM, 327X/317X DFT, RJE 3777-1	IBM, 327X/317X DFT, IBM 3777-1
User Interface	Install program	Install program, diagnostics	Install program, diagnostics	Install program, diagnostics
Programmability	No	No	No	No
API Compatibility	Proprietary	Proprietary	Proprietary	Proprietary
Microcomputer Security	Interface to host software	Interface to host software	Interface to host software	Interface to host software
Number of Concurrent Sessions	1	64	64	8
DOS Access During Session	No	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX, System/36/38; Data General Honeywell Bull; DEC/VAX; HP Unisys	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX
Software Environment	Any BSC Fep	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP
Protocols	BSC	SNA, SDLC	SNA, SDLC	SNA, SDLC, RJE 3770
Applications Supported	None	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	RS-232-C	RS-232-C	RS-232-C
Transmission Mode	Synchronous	Synchronous	Synchronous	Synchronous
Transmission Speed (bps)	300, 1200, 2400, 4800, 9600, 19.2K	1200, 2400, 4800, 9600, 14.4K, 19.2K	1200, 2400, 4800, 9600, 14.4K, 19.2K	4800
Communications Features	Auto dial/redial, auto answer, macros, unattended execution	Auto dial/redial, auto answer, macros	Auto dial/redial, auto answer, macros	Dial directory, auto dial/redial, auto answer, macros, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	895	1,995	2,495	1,595
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	December 1987	July 1987	December 1987	December 1987
Number Installed to Date	Vendor did not specify	Over 300	Over 50	Over 100
Warranty	90 days	90 days	90 days	90 days
Distribution	Direct, OEMs, VARs	Direct, OEMs	Direct, OEMs, VARs	Direct, OEMs, VARs
<b>Comments</b>	Supports PC-to-PC Bisync 3780 connectivity	—	—	Product includes both 3270 and 3770 RJE emulation

Vendor	Passport Communications, Inc.	Passport Communications, Inc.	Passport Communications, Inc.	Passport Communications, Inc.
Product	Modem Exchange/II BSC 3780	Modem Exchange/II	SNA Exchange	SNA Exchange/II
<b>Specifications</b>				
Product Function	Remote terminal emulation	Remote terminal emulation	Remote terminal emulation, non-host app. spfc. link	Remote terminal emulation, non-host app. spfc. link
Users Supported	Single user	Single user	Single user	Single user
Components	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software
Copy Protected	No	No	No	No
Microcomputers Supported	IBM, PS/2 MCA	IBM, PS/2 MCA	IBM, PC/XT/AT & compatibles, PS/2 non-MCA	IBM, PS/2 MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Minimum Memory Required (bytes)	256K	256K	256K	256K
Terminals/Controllers Emulated	IBM, 2780/3780	IBM, 327X/317X DFT, IBM 3777-1	IBM, 327X/317X DFT, IBM 3777-1	IBM, 327X/317X DFT, IBM 3777-1
User Interface	Install program	Install program, diagnostics	Install program, diagnostics	Install program, diagnostics
Programmability	No	No	No	No
API Compatibility	Proprietary	Proprietary	Proprietary	Proprietary
Microcomputer Security	Interface to host software	Interface to host software	Interface to host software	Interface to host software
Number of Concurrent Sessions	1	8	8	8
DOS Access During Session	No	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX, System/36/38; Data General Honeywell Bull; DECVAX; HP Unisys	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX
Software Environment	Any SBC Fep	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP
Protocols	BSC	SNA, SDLC, RJE 3770	SNA, SDLC, RJE 3770	SNA, SDLC, RJE 3770
Applications Supported	None	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	RS-232-C	RS-232-C	RS-232-C
Transmission Mode	Synchronous	Synchronous	Synchronous	Synchronous
Transmission Speed (bps)	4800	4800	1200, 2400, 4800, 9600, 14.4K, 19.2K	1200, 2400, 4800, 9600, 14.4K, 19.2K
Communications Features	Auto dial/redial, auto answer, unattended execution	Dial directory, auto dial/redial, auto answer, macros, unattended execution	Auto dial/redial, auto answer, macros, unattended execution	Auto dial/redial, auto answer, macros, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	1,795	1,995	895/395	995
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	February 1988	December 1987	May 1984	August 1987
Number Installed to Date	Over 50	Over 100	Over 5,000	Unknown
Warranty	90 days	90 days	90 days	90 days
Distribution	Direct, OEMs, VARs	Direct, OEMs, VARs	Direct, OEMs, VARs	Direct, OEMs, VARs
<b>Comments</b>	Supports PC-to-PC Bisync 3780 connectivity	Product includes both 3270 and 3770 RJE emulation	This product provides both 3270 emulation and 3770 RJE emulation	Product includes both 3270 and 3770 RJE emulation

Vendor	Performance Software Inc.	Persoft, Inc.	Persoft, Inc.	Persoft, Inc.
Product	MasterLink	SmarTerm 240	SmartMove	SmartTerm 320
<b>Specifications</b>				
Product Function	Non-host app. spfc. link	Local terminal emulation	Local terminal emulation	Local terminal emulation
Users Supported	Multuser; unlimited	Single user, multuser; 5	Single user	Single user, multuser
Components	Microcomputer software, host software	Microcomputer software	Microcomputer software	Microcomputer software
Copy Protected Microcomputers Supported	No Macintosh, IBM, PC/XT/AT & compatibles, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	Macintosh Finder, MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	ARCnet, Ethernet, IBM Token-Ring, AppleTalk, STARLAN	Ethernet, IBM Token-Ring, STARLAN	Ethernet, IBM Token-Ring, STARLAN	Ethernet, IBM Token-Ring, STARLAN
Minimum Memory Required (bytes)	256K	400K	320K	256K
Terminals/Controllers Emulated	Vendor did not specify	TTY, DEC, VT52/100, VT200 Series, VT300 Series	TTY, DEC, VT52/100	TTY, DEC, VT52/100, VT200 Series, VT300 Series
User Interface	Install program, on-line help/tutor. mouse, graphic icons pop-up windows, diagnostics	Install program, on-line help, pop-up windows	On-line help, pop-up windows	Install program, on-line help, pop-up windows
Programmability API Compatibility	Yes IBM API, DCA IRMA API	Yes Vendor did not specify	Yes Vendor did not specify	Yes Vendor did not specify
Microcomputer Security	Password protection, interface to host software	Interface to host software	Vendor did not specify	Interface to host software
Number of Concurrent Sessions	Vendor did not specify	Four	One	Four
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX; Unisys	Vendor did not specify	Vendor did not specify	Vendor did not specify
Software Environment	IBM, DOS, OS/VS, MVS	Vendor did not specify	Vendor did not specify	Vendor did not specify
Protocols	BSC, SNA, SDLC, TCP/IP	Vendor did not specify	Vendor did not specify	Vendor did not specify
Applications Supported	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	Coax, RS-232-C	Twinax, coax, RS-232-C	Twinax, coax, RS-232-C	Twinax, coax, RS-232-C
Transmission Mode	Asynchronous, synchronous	Asynchronous	Asynchronous	Asynchronous
Transmission Speed (bps)	19.2K	300, 600, 1200, 2400, 4800, 9600, 19.2K	300, 600, 1200, 2400, 4800, 9600, 19.2K	300, 600, 1200, 2400, 4800, 9600, 19.2K
Communications Features	Dial directory, auto dial/redial, macros, unattended execution	Auto dial/redial, auto answer, macros, unattended execution	Auto dial/redial, auto answer, macros, unattended execution	Auto dial/redial, auto answer, macros
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	Contact vendor	345-1495	149	195-825
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	January 1985	January 1986	October 1987	September 1989
Number Installed to Date	500	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	1 year	30 days	30 days	30 days
Distribution	Direct	Direct, dist., dirs, retail, mail, OEMs, VARs	Direct, dist., dirs, retail, mail, OEMs, VARs	Direct, dist., dirs, retail, mail, OEMs, VARs
Comments	—	—	—	—

Vendor	Persoft, Inc.	Persoft, Inc.	POINT 4 Data Corp.	Rabbit Software Corp.
Product	SmartTerm 400	SmartTerm 470	PC Answer	RabbitGATE II BSC
<b>Specifications</b>				
Product Function	Local terminal emulation	Local terminal emulation	Local terminal emulation, host app. spfc. link	Remote terminal emulation, network gateway
Users Supported	Single user	Single user	Multuser; up to 128	Single user, multuser; 32
Components	Microcomputer software, host software	Microcomputer software, host software	Microcomputer software	Microcomputer hardware & software
Copy Protected	Yes	Yes	Yes	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles	IBM, PC/XT/AT & compatibles, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Vendor did not specify	Vendor did not specify	Vendor did not specify	ARCnet, Ethernet, IBM Token-Ring, STARLAN, NETBIOS or Novell IPX
Minimum Memory Required (bytes)	320K	384K	256K	Gateway 52K, workstation 126K
Terminals/Controllers Emulated	TTY; DG	TTY; DG	DEC, VT52/100, VT200 Series, VT300 Series	IBM, 327X/317X DFT
User Interface	Install program, on-line help	Install program, on-line help	Install program, on-line help, on-line tutor.	Install program, on-line help, pop-up windows, diags., line/gateway monitor
Programmability	Vendor did not specify	Vendor did not specify	Yes	Yes
API Compatibility	Vendor did not specify	Vendor did not specify	Proprietary	IBM API, proprietary
Microcomputer Security	Vendor did not specify	Vendor did not specify	Password protection, interface to host software	Vendor did not specify
Number of Concurrent Sessions	One	Vendor did not specify	Vendor did not specify	8 per workstation, 512 per LAN
DOS Access During Session	Yes	Yes	No	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII	ASCII, binary
File Conversion	No	No	Yes	Yes
<b>Host Interface</b>				
Systems Supported	Data General	Data General MV series	Point 4 Iris System	IBM, 43XX/30XX, System/36/38, AS/400
Software Environment	DG OAS, AOS/VS, RDCS	AOS/VS, RDCS	Iris	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS
Protocols	Vendor did not specify	Vendor did not specify	Vendor did not specify	BSC
Applications Supported	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	RS-232-C	RS-232-C	RS-232-C
Transmission Mode	Asynchronous	Asynchronous	Asynchronous	Synchronous
Transmission Speed (bps)	300, 1200, 2400, 4800, 9600, 19.2K	300, 600, 1200, 2400, 4800, 9600, 19.2K	300, 600, 1200, 2400, 4800	19.2K
Communications Features	Dial directory, macros, unattended execution	Dial directory, auto dial/redial, macros, unattended execution	Vendor did not specify	Macros
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	175	295	1,800 software	Contact vendor
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	January 1983	June 1989	June 1986	Vendor did not specify
Number Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	30 days	30 days	90 days	1 year
Distribution	Direct, dist., dlrs, retail	Direct, dist., dlrs, retail	Dist., dlrs, retail, VARs	Direct, dist., dlrs, retail, mail, OEMs, VARs
<b>Comments</b>	—	—	—	Toll free number 1 (800) RABBITC

Vendor	Rabbit Software Corp.	Rabbit Software Corp.	Rabbit Software Corp.	Rabbit Software Corp.
Product	RabbitGATE II DFT	RabbitGATE II DFT 3299	RabbitGATE II SNA	RabbitGATE Token-Ring
<b>Specifications</b>				
Product Function	Remote terminal emulation, network gateway	Remote terminal emulation, network gateway	Remote terminal emulation, network gateway	Remote terminal emulation
Users Supported	Single user, multiuser; 5	Single user, multiuser; 40	Single user, multiuser; 64	Single user, multiuser; 128
Components	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer software
Copy Protected	No	No	No	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	ARCnet, Ethernet, IBM Token-Ring, STARLAN, NETBIOS or Novell IPX	ARCnet, Ethernet, IBM Token-Ring, STARLAN, NETBIOS or Novell IPX	ARCnet, Ethernet, IBM Token-Ring, STARLAN, NETBIOS or Novell IPX	ARCnet, Ethernet, IBM Token-Ring, STARLAN, NETBIOS or Novell IPX
Minimum Memory Required (bytes)	Gateway 94K, workstation 126K	126K	Gateway 52K, workstation 126K	256K
Terminals/Controllers Emulated	IBM, 327X/317X DFT	IBM, 327X/317X DFT	IBM, 327X/317X DFT	IBM, 327X/317X DFT
User Interface	Install program, on-line help, help, pop-up windows, diags., line/gateway monitor	Install program, on-line help, pop-up windows	Install program, on-line help, pop-up windows, diags., line/gateway monitor	Install program, on-line help/tutor., mouse, graphic icons, pop-up windows, diags.
Programmability API Compatibility	Yes IBM API, proprietary	Yes IBM API, proprietary	Yes IBM API, proprietary	Yes IBM API
Microcomputer Security	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Number of Concurrent Sessions	8 per workstation, 80 per LAN	8 per workstation, 640 per LAN	8 per workstation, 1,024 per LAN	8 per workstation; 2,048 per LAN
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX, System/36/38, AS/400	IBM, 43XX/30XX	IBM, 43XX/30XX, System/36/38, AS/400	IBM, 43XX/30XX, System/36/38, AS/400
Software Environment	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS
Protocols	SNA, DFT (SNA)	SNA, DFT-3299 (SNA)	SNA, SDLC	SNA, token ring (SNA)
Applications Supported	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	Coax	Coax	RS-232-C	Token ring
Transmission Mode	Vendor did not specify	Vendor did not specify	Synchronous	Vendor did not specify
Transmission Speed (bps)	2.4M	2.4M	64K	4M, 16M
Communications Features	Vendor did not specify	Macros	Macros	Macros
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Number Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	1 year	1 year	1 year	Vendor did not specify
Distribution	Direct, dist., dlrs, retail, OEMs, VARs	Direct, dist., dlrs, retail, OEMs, VARs	Direct, dist., dlrs, retail, OEMs, VARs	Direct, dist., dlrs, retail, OEMs, VARs
Comments	—	Toll free number 1 (800) RABBITC	Toll free number 1 (800) RABBITC	Toll free number 1 (800) RABBITC

Vendor	Rabbit Software Corp.	Rabbit Software Corp.	Rabbit Software Corp.	Rabbit Software Corp.
Product	RabbitPLUS 3270 BSC	RabbitPLUS 3270 SNA	RabbitPLUS APPC	RabbitPLUS RJE BSC
<b>Specifications</b>				
Product Function	Non-host app. spfc. link	Non-host app. spfc. link	Vendor did not specify	Non-host app. spfc. link
Users Supported	Multiuser; up to 32	Multiuser; up to 32	Multiuser; unlimited	Multiuser; unlimited
Components	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software
Copy Protected	No	No	No	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA, any 386	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA, any 386 based system	IBM, PS/2 MCA, PS/2 non-MCA, any 386	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA, any 386
Operating Systems Supported	UNIX, AIX	Vendor did not specify	UNIX, Xenix, AIX	UNIX, Xenix, AIX
Local Area Network Support	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Minimum Memory Required (bytes)	1.5M	1.5M	1.5M	1.5M
Terminals/Controllers Emulated	IBM, 327X/317X DFT	IBM, 327X/317X DFT	Vendor did not specify	IBM, 2780/3780
User Interface	On-line help, pop-up windows, diagnostics	Install program, on-line help, diagnostics	Diagnostics	On-line help, diagnostics
Programmability	Yes	Yes	Yes	No
API Compatibility	IBM API, proprietary	IBM API, proprietary	IBM LU 6.2	Vendor did not specify
Microcomputer Security	Transmission encryption, password protection, interface to host software	Transmission encryption, password protection, interface to host software	Interface to host software	Vendor did not specify
Number of Concurrent Sessions	Up to 32	Up to 32	32	1
DOS Access During Session	Vendor did not specify	No	Vendor did not specify	Vendor did not specify
File Transfer	Yes	Yes	Vendor did not specify	Yes
File Formats	ASCII, binary	ASCII, binary	Vendor did not specify	ASCII, binary
File Conversion	Yes	Vendor did not specify	Vendor did not specify	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM, 43XX/30XX, System/36/38, AS/400	IBM, 43XX/30XX, System/36/38, AS/400 UNIX-based systems, any machine supporting LU6.2	IBM, 43XX/30XX, any system supporting 2780/3780 protocols
Software Environment	IBM, DOS, MVS, VM, TSO, CMS, IMS, CICS	IBM, DOS, MVS, VM, TSO, CMS, IMS, CICS	CICS, any software supporting LU6.2	JES/2 power
Protocols	BSC	SNA, SDLC, QLLC (X.25)	SNA, SDLC, QLLC (X.25)	BSC
Applications Supported	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs	Vendor did not specify
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	RS-232-C	RS-232-C	RS-232-C
Transmission Mode	Synchronous	Synchronous	Synchronous	Synchronous
Transmission Speed (bps)	4800, 9600, 19.2K	4800, 9600, 19.2K	4800, 9600, 19.2K	9600
Communications Features	Auto answer, unattended execution	Vendor did not specify	Auto answer	Auto answer
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	1,795 to 2,995 software 200 hardware	1,795 to 2,995 software 200 hardware	3,195 software; 200 hardware	1,095 software; 200 hardware
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Number Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	1 year	Vendor did not specify	1 year	1 year
Distribution	Direct, dist., dirs, retail, OEMs, VARs	Direct, dist., dirs, retail, OEMs, VARs	Direct, dist., dirs, retail, OEMs, VARs	Direct, dist., dirs, retail, OEMs, VARs
<b>Comments</b>	UNIX access supported; toll free number 1 (800) RABBITC	UNIX access during session toll-free phone number 1 (800) RABBITC	UNIX access supported; toll free number 1 (800) RABBITC	—

**PC-to-Host  
Communications  
Products:  
Comparison Columns**

Vendor	Rabbit Software Corp.	Rabbit Software Corp.	Rabbit Software Corp.	Rabbit Software Corp.
Product	RabbitPLUS RJE SNA	RabbitSTATION DFT	RabbitSTATION Remote SNA/BSC	RabbitSTATION Token-Ring
<b>Specifications</b>				
Product Function	Vendor did not specify	Local/remote terminal emulation	Remote terminal emulation	Vendor did not specify
Users Supported	Multuser; unlimited	Single user	Single user	Single user
Components	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer hardware & software	Microcomputer software
Copy Protected	No	No	No	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA, any 386	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	UNIX, Xenix, AIX	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Minimum Memory Required (bytes)	1.5M	150K	82K	Vendor did not specify
Terminals/Controllers Emulated	3770	IBM, 327X/317X DFT	IBM, 327X/317X DFT	IBM, 327X/317X DFT
User Interface	On-line help, diagnostics	Install program, on-line help, graphic icons, pop-up windows, diagnostics	Install program, on-line help, graphic icons, pop-up windows, diagnostics	Install program, on-line help/tutor, mouse, graphic icons, pop-up windows, diagnostics
Programmability	Vendor did not specify	Yes	Yes	Yes
API Compatibility	Vendor did not specify	IBM API, proprietary	IBM API, proprietary	IBM API, proprietary
Microcomputer Security	Vendor did not specify	Interface to host software	Interface to host software	Vendor did not specify
Number of Concurrent Sessions	6	5 host, 1 DOS, 1 notepad	8 host, 1 DOS, 1 notepad	8
DOS Access During Session	Vendor did not specify	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Yes	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM, 43XX/30XX	IBM, 43XX/30XX, System/36/38, AS/400	IBM, 43XX/30XX, System/36/38, AS/400
Software Environment	JES and power	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, OS/400	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS
Protocols	SDLC, QLLC (SNA)	DFT (SNA)	BSC, SNA, SDLC	SNA, token ring (SNA)
Applications Supported	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	Coax	RS-232-C	Token ring
Transmission Mode	Synchronous	Vendor did not specify	Synchronous	Vendor did not specify
Transmission Speed (bps)	4800, 9600, 19.2K	Vendor did not specify	64K (SNA/SDLC), 19.2K (BSC)	4M, 16M
Communications Features	Auto answer	Macros, unattended execution	Macros, unattended execution	Macros
<b>Pricing and Availability</b>				
Microcomputer Software/Hardware (\$)	1,095 software; 200 hardware	Contact vendor	Contact vendor	Contact vendor
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Number Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	1 year	1 year	1 year	Vendor did not specify
Distribution	Direct, dist., dlrs, retail, OEMs, VARs	Direct, dist., dlrs, retail, OEMs, VARs	Direct, dist., dlrs, retail, mail, OEMs, VARs	Direct, dist., dlrs, retail, OEMs, VARs
Comments	UNIX access supported; toll free number 1 (800) RABBITC	Toll free number 1 (800) RABBITC	Toll free number 1 (800) RABBITC	—

Vendor	The Santa Cruz Operation, Inc.	Simware Inc.	Simware Inc.	Softel Inc.
Product	SCO uniPATH SNA-3270	SimMac	SimPC Master/SimPC	PC 52
<b>Specifications</b>				
Product Function	Remote terminal emulation, network gateway	Local/remote terminal emulation, standalone protocol converter, host app. spfc. link	Local/remote terminal emulation, standalone protocol converter, host app. spfc. link	Remote terminal emulation
Users Supported	Single user, multiuser; 32	Single user	Vendor did not specify	Multiuser; dependent on hardware
Components	Microcomputer hardware & software	Microcomputer software	Microcomputer software	Microcomputer software
Copy Protected Microcomputers Supported	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No Macintosh	No IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	No IBM
Operating Systems Supported	UNIX, Xenix	Macintosh Finder	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Vendor did not specify	AppleTalk	ARCnet, Ethernet, IBM Token-Ring, NETBIOS compatible	X.25
Minimum Memory Required (bytes)	20K	585K	384K	128K
Terminals/Controllers Emulated	IBM, 327X/317X CUT	TTY, IBM, 327X/317X CUT	TTY, IBM, 327X/317X CUT, DEC, VT52/100, 50 different terminal emulators and user definables	DEC, VT52/100
User Interface	Install program, on-line help, pop-up windows, diagnostics	Mouse, graphic icons, pop-up windows, diagnostics	Install program, on-line help, mouse, pop-up windows, diagnostics	Vendor did not specify
Programmability API Compatibility	Yes Proprietary	Yes Vendor did not specify	Yes IBM API, proprietary	No Vendor did not specify
Microcomputer Security	Password protection	Password protection, interface to host software	Password protection, interface to host software	Provided by minicomputer
Number of Concurrent Sessions	32	12	12	Dependent on hardware
DOS Access During Session	Yes	Not applicable	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII
File Conversion	Yes	Yes	Yes	No
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM, 43XX/30XX, IBM 370 class	IBM, 43XX/30XX, IBM 370 class mainframes	UNIX-based systems
Software Environment	IBM, DOS, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP, OS/400	IBM, MVS, VM, TSO, CMS, CICS	IBM, MVS, VM, TSO, CMS, CICS	UNIX System 5
Protocols	SNA, SDLC	BSC, SNA, SDLC, asynchronous	BSC, SNA, SDLC, TCP/IP, asynchronous or X.25	X.25
Applications Supported	IND\$FILE	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	Twinax, coax, RS-232-C, asynchronous	Coax, RS-232-C, async	RS-232-C, TILL X.25 board
Transmission Mode	Synchronous	Asynchronous	Asynchronous	Asynchronous
Transmission Speed (bps)	2400, 4800, 9600, 14.4K, 19.2K	300, 600, 1200, 2400, 4800, 9600	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K	Up to 56K
Communications Features	Dial directory, auto dial/redial, auto answer, macros, unattended execution	Dial directory, auto dial/redial, auto answer, macros, unattended execution	Dial directory, auto dial/redial, auto answer, macros, unattended execution	Remote command execution
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	995 to 2,295 software, 495 hardware	Contact vendor	Contact vendor	149
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	N/A
Date of First Delivery	November 1986	January 1988	July 1984	September 1985
Number Installed to Date	2,500	15,000	400,000	Over 15,000
Warranty	30 days	1 year	1 year	1 year
Distribution	Direct, dist., dirs, retail, OEMs, VARs	Direct, dist., dirs, retail	Direct, dist., dirs, retail	OEMs
Comments	—	—	—	DOS-to-Unix terminal emulator

Vendor	Softel Inc.	Software Clearing House, Inc.	Software Corp. of America	Software Synergy, Inc.
Product	PC52 VI	Microlink	Gateway PC	Respond/Async
<b>Specifications</b>				
Product Function	Remote terminal emulation	Local/remote terminal emulation	Local/remote terminal emulation, non-host app. spfc. link	Remote terminal emulation
Users Supported	Multuser	Multuser; unlimited	Single user	Single user
Components	Microcomputer software	Microcomputer software, host software	Microcomputer software, host software	Microcomputer software
Copy Protected Microcomputers Supported	No IBM PC/XT/AT & compatibles	No IBM, PC/XT/AT & compatibles	No IBM, PC/XT/AT & compatibles, PS/2 non-MCA	No IBM, PC/XT/AT & compatibles
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	OS/2, MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	STARLAN	None	Ethernet, IBM Token-Ring, STARLAN, IBM compatibles	Vendor did not specify
Minimum Memory Required (bytes)	128K	512K	18K	256K
Terminals/Controllers Emulated	VT52/100	NCR	TTY, IBM, 327X/317X DFT, 327X/317X CUT, DEC, VT52/100, VT200 Series, Tymnet 78, 3101 block and char, X.25	TTY, DEC, VT52/100; HP, IBM 3101
User Interface	Vendor did not specify	Install program, on-line help, graphic icons, diagnostics	Install program, on-line help, pop-up windows, diagnostics	On-line help, on-line tutor.
Programmability API Compatibility	No Vendor did not specify	Yes Vendor did not specify	Yes IBM API	Yes Vendor did not specify
Microcomputer Security	Vendor did not specify	Password protection, interface to host software	File encryption, interface to host software	Vendor did not specify
Number of Concurrent Sessions	Limited only by UNIX	Unlimited	Vendor did not specify	1
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII	ASCII	ASCII, binary	ASCII, binary
File Conversion	Vendor did not specify	Vendor did not specify	Yes	Yes
<b>Host Interface</b>				
Systems Supported	AT&T 3B2 & 386	NCR ITX VRX	IBM, 43XX/30XX	Vendor did not specify
Software Environment	UNIX System 5	NCR ITX VRX	IBM, VM, CICS	Vendor did not specify
Protocols	Vendor did not specify	Vendor did not specify	SNA, SDLC	Vendor did not specify
Applications Supported	Access to host-resident programs	Vendor did not specify	Access to host-resident programs	None
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	RS-232-C	Coax	RS-232-C
Transmission Mode	Asynchronous	Asynchronous	Asynchronous, synchronous	Asynchronous
Transmission Speed (bps)	Up to 56K	19.2K	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K	300, 1200, 2400, 4800, 9600
Communications Features	Vendor did not specify	Dial directory, auto dial/redial, macros, unattended execution	Dial directory, auto dial/redial, macros, unattended execution	Dial directory, auto dial/redial, auto answer, macros, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	99	1,600-6,400	350 per PC for software	129
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	9,000 for host software	Vendor did not specify
Date of First Delivery	December 1985	January 1983	May 1985	November 1985
Number Installed to Date	13,000	422	Over 100,000	3,000
Warranty	Vendor did not specify	30 days	30 days	90 days
Distribution	OEMs	Direct	Direct, dist., dlrs, retail, OEMs, VARs	Direct, mail, OEMs
Comments	—	—	Volume and LAN discounts available	—

Vendor	Sterling Software, Systems Software Division	Sterling Software, Systems Software Division	Structured Software Solutions Inc.	Synex Systems Corp.
Product	PC-Tracs 3770	PC-Tracs 3780	Facet/PC	PK Harmony
<b>Specifications</b>				
Product Function	Remote terminal emulation	Remote terminal emulation	Local/remote terminal emulation	Local/remote terminal emulation
Users Supported	Single user	Single user	Vendor did not specify	Single user, multiuser; Up to 15
Components	Microcomputer software	Microcomputer software	Microcomputer software, host software	Microcomputer software, host software
Copy Protected	No	No	Yes	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS, UNIX, Xenix, Pick O/S
Local Area Network Support	Vendor did not specify	Vendor did not specify	Vendor did not specify	Ethernet, IBM Token-Ring, STARLAN, Novell
Minimum Memory Required (bytes)	200K plus DOS requirement	200K plus DOS requirement	250K	384K
Terminals/Controllers Emulated	IBM 377X	IBM 3780	DEC, VT200 Series	TTY, DEC, VT52/100, VT200 Series, VT300 Series, Wyse 50, Adds Viewpoint
User Interface	On-line help	Diagnostics	Pop-up windows	Install program, on-line help
Programmability API Compatibility	Yes Proprietary	Vendor did not specify Vendor did not specify	Yes Vendor did not specify	Yes Proprietary
Microcomputer Security	Interface to host software	Interface to host software	Password protection, interface to host software	Password protection
Number of Concurrent Sessions	5	1	10	2
DOS Access During Session	Yes	Yes	No	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	Yes	Yes	Vendor did not specify	Yes
<b>Host Interface</b>				
Systems Supported	IBM, 43XX/30XX	IBM, 43XX/30XX	UNIX-based systems	IBM, System/36/38 Honeywell Bull; UNIX-based systems
Software Environment	IBM, DOS, OS/VS, MVS, VM	IBM, DOS, OS/VS, MVS, VM	UNIX System 5	Pick O/S
Protocols	SNA, SDLC	BSC	TCP/IP	SNA, TCP/IP
Applications Supported	Access to host-resident programs	Access to host-resident programs	All Unix applications	Vendor did not specify
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C, twisted pair	RS-232-C, twisted pair	RS-232-C	RS-232-C
Transmission Mode	Synchronous	Synchronous	Asynchronous	Asynchronous
Transmission Speed (bps)	2400, 4800, 9600	2400, 4800, 9600	300, 600, 1200, 2400, 4800, 9600, 19.2K	300, 600, 1200, 2400, 4800, 9600
Communications Features	Dial directory, auto dial/redial, auto answer, unattended execution	Dial directory, auto dial/redial, auto answer, unattended execution	Vendor did not specify	Dial directory, auto dial/redial, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	1,000	1,000	150	595
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	895	Vendor did not specify
Date of First Delivery	June 1986	February 1983	January 1986	Vendor did not specify
Number Installed to Date	1,100	1,425	1,000	10,000
Warranty	90 days	90 days	90 days	30 days
Distribution	Direct, VARs	Direct, VARs	Direct, dist., dlrs, retail, OEMs, VARs	Direct, dist., dlrs, retail, mail, VARs
Comments	—	—	—	—

Vendor	Synex Systems Corp.	Tangram Systems Corp.	Tymnet/McDonnell Douglas	Universal Data Systems
Product	PK Term	Arbiter	EZTym	Sync-Up BSC Software
<b>Specifications</b>				
Product Function	Remote terminal emulation, network gateway	Local/remote terminal emulation, host app. spfc. link	Remote terminal emulation	Remote terminal emulation
Users Supported	Single user, multiuser unlimited	Multiuser	Single user	Single user
Components	Microcomputer hardware & software	Microcomputer software, host software	Microcomputer software	Microcomputer software
Copy Protected	No	No	No	Yes
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	ARCnet, Ethernet, IBM Token-Ring, STARLAN, any NetWare or NetBios compatible	Ethernet, IBM Token-Ring	Vendor did not specify	Vendor did not specify
Minimum Memory Required (bytes)	640K	640K	Vendor did not specify	Vendor did not specify
Terminals/Controllers Emulated	IBM, 5250 Series	IBM, 327X/317X CUT, DEC, VT52/100	TTY, IBM, 327X/317X CUT, DEC, VT52/100, VT200 Series	IBM, 2780/3780
User Interface	Install program, diagnostics	Install program, on-line help	Install program, on-line help, on-line tutor.	Install program, on-line help
Programmability API Compatibility	Yes IBM API, IBM LU 6.2, proprietary	Yes DCA IRMA API, IBM LU 6.2	Yes IBM API	Yes Vendor did not specify
Microcomputer Security	Password protection	Interface to host software	Vendor did not specify	Vendor did not specify
Number of Concurrent Sessions	254 per gateway, 9 per workstation	1	15	Vendor did not specify
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII	Binary
File Conversion	Yes	Yes	No	Vendor did not specify
<b>Host Interface</b>				
Systems Supported	IBM, System/36/38, AS/400	IBM, 43XX/30XX	IBM, 43XX/30XX, System/36/38, AS/400; Data General; DECVAX; HP; Unisys	Vendor did not specify
Software Environment	IBM, SSP, OS/400, IBM CPF	IBM, MVS, VM	IBM, OS/VS, MVS, VM, TSO, CMS, IMS, CICS, SSP, OS/400; VAX/VMS	Vendor did not specify
Protocols	SNA, HDLC, SDLC	BSC, SNA, SDLC	BSC, HDLC, SDLC	BSC
Applications Supported	Host virtual disk, access to host-resident programs	Host virtual disk, access to host-resident programs, file transfer	Vendor did not specify	Vendor did not specify
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C	Coax, RS-232-C	RS-232-C	Vendor did not specify
Transmission Mode	Synchronous	Synchronous	Asynchronous	Synchronous
Transmission Speed (bps)	Up to 128 kbps	Depends on connection	300, 1200, 2400, 9600	Vendor did not specify
Communications Features	Dial directory, auto dial/redial, auto answer, unattended execution	Unattended execution	Dial directory	Dial directory, auto dial/redial, auto answer
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	2,050/1,145	Vendor did not specify	Vendor did not specify	325
Host Software/Hardware (\$)	Vendor did not specify	30,000 to 60,000 software	Vendor did not specify	Vendor did not specify
Date of First Delivery	November 1987	September 1986	May 1987	January 1985
Number Installed to Date	1,000	250	100,000	10,000
Warranty	90 days, 1 year	Vendor did not specify	90 days	1 year
Distribution	Dist., dlrs, retail, OEMs, VARs	Direct, dist., dlrs, retail, OEMs	Direct	Direct, dist., dlrs, retail, OEMs
Comments	—	—	—	—

Vendor	Universal Data Systems	Universal Data Systems	Walker Richer & Quinn, Inc.	Walker Richer & Quinn, Inc.
Product	Sync-Up SNA 3270 Software	Sync-Up SNA 5251 Software	Reflection 1 PLUS	Reflection 2 PLUS
<b>Specifications</b>				
Product Function	Remote terminal emulation	Remote terminal emulation	Local terminal emulation	Local terminal emulation
Users Supported	Single user	Single user	Single user	Single user, multiuser
Components	Microcomputer software	Microcomputer software	Microcomputer software, host software	Microcomputer software, host software
Copy Protected	Yes	Yes	No	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA
Operating Systems Supported	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Local Area Network Support	Vendor did not specify	Vendor did not specify	ARCnet, Ethernet, IBM Token-Ring, STARLAN	ARCnet, Ethernet, IBM Token-Ring, STARLAN
Minimum Memory Required (bytes)	Vendor did not specify	Vendor did not specify	150K	140K
Terminals/Controllers Emulated	IBM, 327X/317X DFT, 327X/317X CUT	IBM, 5250 Series	DEC, VT52/100, VT200 Series; HP	DEC, VT52/100, VT200 Series, VT300 Series, VT320, VT220, Tektronix 4014
User Interface	Install program, on-line help	Install program, on-line help	Install program, on-line help, diagnostics	Install program, on-line help
Programmability	Yes	Vendor did not specify	Yes	Yes
API Compatibility	Vendor did not specify	Vendor did not specify	Proprietary	Proprietary
Microcomputer Security	Vendor did not specify	Vendor did not specify	File encryption	File encryption, password protection
Number of Concurrent Sessions	Vendor did not specify	Vendor did not specify	Up to 8	Up to 8
DOS Access During Session	Yes	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes	Yes
File Formats	Binary	Binary	ASCII, binary	ASCII, binary
File Conversion	Vendor did not specify	Vendor did not specify	No	No
<b>Host Interface</b>				
Systems Supported	Vendor did not specify	Vendor did not specify	DECVAX; HP; UNIX-based systems	DECVAX; UNIX-based systems, UNIX, Ultrix
Software Environment	Vendor did not specify	Vendor did not specify	VAX/VMS; UNIX System 5 Berkeley 4.X, HP MPE, HP MPE-XL, SUN OS, HP-UX, Ultrix	VAX/VMS; UNIX System 5, UNIX, Ultrix, Xenix, SUN OS, HP-UX
Protocols	SNA, SDLC	SNA, SDLC	TCP/IP, DEC LAT	TCP/IP, LAT
Applications Supported	Vendor did not specify	Vendor did not specify	Access to host-resident programs	Access to host-resident programs
<b>Communications Characteristics</b>				
Physical Connection	Vendor did not specify	Vendor did not specify	Coax, RS-232-C	Coax, RS-232-C
Transmission Mode	Synchronous	Synchronous	Asynchronous	Asynchronous
Transmission Speed (bps)	Vendor did not specify	Vendor did not specify	300, 1200, 2400, 4800, 9600, 19.2K, 38.4K, 57.6K	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K, 38.4K
Communications Features	Dial directory, auto dial/redial, auto answer	Dial directory, auto dial/redial, auto answer	Macros, unattended execution	Macros, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Sftwre/Hdwre (\$)	525	525	349	249 (sgl. copy list), 199 Reflection 2 (non-PLUS)
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Software included with micro
Date of First Delivery	March 1985	January 1986	Vendor did not specify	March 1986
Number Installed to Date	10,000	5,000	250,000	153,000
Warranty	1 year	1 year	Vendor did not specify	90 days
Distribution	Direct, dist., dlrs, retail, OEMs	Direct, dist., dlrs, retail, OEMs	Direct, dist., dlrs, retail, OEMs, VARs	Direct, dist., dlrs, retail, OEMs, VARs
<b>Comments</b>	—	—	—	Related software packages available for further PC-to-VAX connectivity

Vendor	Walker Richer & Quinn, Inc.	Walker Richer & Quinn, Inc.	Walker Richer & Quinn, Inc.	Walker Richer & Quinn, Inc.
Product	Reflection 3 Macintosh	Reflection 4 PLUS	Reflection 7 PLUS	Reflection 1 Macintosh
<b>Specifications</b>				
Product Function	Local terminal emulation	Local terminal emulation	Local terminal emulation	Local terminal emulation
Users Supported	Single user, multiuser	Single user, multiuser	Single user, multiuser	Single user, multiuser
Components	Microcomputer software	Microcomputer software, host software	Microcomputer software, host software	Microcomputer software, host software
Copy Protected	No	No	No	No
Microcomputers Supported	Macintosh	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	Macintosh
Operating Systems Supported	Macintosh Finder	MS-/PC-DOS	MS-/PC-DOS	Macintosh Finder
Local Area Network Support	AppleTalk	Ethernet, IBM Token-Ring, STARLAN	ARCnet, Ethernet, IBM Token-Ring, STARLAN	AppleTalk
Minimum Memory Required (bytes)	350K	240K	289K	320K
Terminals/Controllers Emulated	TTY; HP	DEC, VT52/100, VT200 Series, VT300 Series, Tektronix 4014	DEC, VT52/100, VT200 Series, VT300 Series; HP	TTY; HP
User Interface	On-line help, mouse, graphic icons, pop-up windows, diagnostics	Install program, on-line help, mouse	Install program, on-line help, mouse, diagnostics	On-line help, mouse, graphic icons, pop-up windows, diagnostics
Programmability API Compatibility	Yes Vendor did not specify	Yes DCA IRMA API, proprietary	Yes Proprietary	Yes Vendor did not specify
Microcomputer Security	Vendor did not specify	File encryption, password protection	File encryption, password protection	Vendor did not specify
Number of Concurrent Sessions	1	Up to 8	Up to 8	1
DOS Access During Session	No	Yes	Yes	Not applicable
File Transfer	Yes	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Conversion	No	No	No	No
<b>Host Interface</b>				
Systems Supported	DEC/VAX; HP; UNIX-based systems	DEC/VAX; UNIX-based systems	DEC/VAX; HP; UNIX-based systems	DEC/VAX; HP; UNIX-based systems
Software Environment	UNIX System 5; Berkeley 4.X, HP MPE, HP MPE-XL, Ultrix, SUN OS, HP-UX, Xenix	IBM, DOS; VAX/VMS; UNIX System 5; Berkeley 4.X, UNIX, Ultrix	VAX/VMS; UNIX System 5 Berkeley 4.X, HP MPE, HP MPE-XL, HP-UX	VAX/VMS; UNIX System 5 Berkeley 4.X, HP MPE, HP MPE-XL, Ultrix, SUN OS, HP-UX, Xenix
Protocols	Vendor did not specify	TCP/IP	DEC LAT	Vendor did not specify
Applications Supported	Access to host-resident programs	Access to host-resident programs	Access to host-resident programs	Vendor did not specify
<b>Communications Characteristics</b>				
Physical Connection	RS-232-C, AppleTalk	Coax, RS-232-C	Coax, RS-232-C	RS-232-C, AppleTalk
Transmission Mode	Asynchronous	Asynchronous	Asynchronous	Asynchronous
Transmission Speed (bps)	300, 600, 1200, 2400, 4800, 9600, 19.2K, 38.4K, 57.6K	300, 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K, 38.4K	300, 600, 1200, 2400, 4800, 9600, 19.2K, 38.4K, 57.6K	300, 600, 1200, 2400, 4800, 9600, 19.2K, 38.4K, 57.6K
Communications Features	Macros, unattended execution	Macros, unattended execution	Macros, unattended execution	Macros, unattended execution
<b>Pricing and Availability</b>				
Microcomputer Software/Hardware (\$)	399	349	449	299, quality discounts available
Host Software/Hardware (\$)	Vendor did not specify	Software included with micro	Vendor did not specify	Vendor did not specify
Date of First Delivery	Vendor did not specify	May 1988	Vendor did not specify	Vendor did not specify
Number Installed to Date	25,000	153,000	25,000	250,000
Warranty	90 days	90 days	90 days, 1 year	90 days
Distribution	Direct, dist., dlrs, retail, OEMs, VARs	Direct, dist., dlrs, retail, OEMs, VARs	Direct, dist., dlrs, retail	Direct, dist., dlrs, retail, OEMs, VARs
<b>Comments</b>	—	Related software packages available for further PC-to-VAX connectivity	Volume discounts available	Volume discounts available

Vendor	Wall Data Inc.	Waterloo Microsystems Inc.	Waterloo Microsystems Inc.
<b>Product</b>	<b>Rumba</b>	<b>Asynchronous Gateway/X.25 Server</b>	<b>Micropulse</b>
<b>Specifications</b>			
Product Function	Local/remote terminal emulation	Local terminal emulation, network gateway	Host app. spfc. link
Users Supported	Single user	Multuser; 32	Multuser
Components	Microcomputer software	Microcomputer software	Microcomputer software, host software
Copy Protected	Yes	No	No
Microcomputers Supported	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, PS/2 MCA, PS/2 non-MCA	IBM, PC/XT/AT & compatibles, B25-B28 BTOS
Operating Systems Supported	Microsoft Windows	MS-/PC-DOS, Waterloo PORT	MS-/PC-DOS, BTOS
Local Area Network Support	NetBIOS	ARCnet, IBM Token-Ring	Vendor did not specify
Minimum Memory Required (bytes)	640K	384K	Vendor did not specify
Terminals/Controllers Emulated	IBM, 327X/317X DFT	TTY	Vendor did not specify
User Interface	Install program, on-line help, mouse, graphic icons, pop-up windows	Mouse	Install program, on-line help, mouse
Programmability	No	Yes	Yes
API Compatibility	Vendor did not specify	Proprietary	Vendor did not specify
Microcomputer Security	Interface to host software	Password protection	Password protection, interface to host software
Number of Concurrent Sessions	Unlimited	Up to 32	Vendor did not specify
DOS Access During Session	Yes	Yes	Yes
File Transfer	Yes	Yes	Yes
File Formats	ASCII, binary	ASCII	ASCII, binary
File Conversion	Vendor did not specify	Yes	Yes
<b>Host Interface</b>			
Systems Supported	IBM, 43XX/30XX	Any asynchronous host	Unisys
Software Environment	IBM, MVS, VM, TSO, CMS, IMS, CICS	Any asynchronous	Unisys MCP
Protocols	SNA, SDLC	Async, X.25	Unisys Poll Select
Applications Supported	Access to host-resident programs	None	Vendor did not specify
<b>Communications Characteristics</b>			
Physical Connection	Coax, RS-232-C	RS-232-C	RS-232-C
Transmission Mode	Asynchronous, synchronous	Asynchronous	Asynchronous, synchronous
Transmission Speed (bps)	1200, 2400, 4800, 9600	9600	19.2K
Communications Features	Macros, unattended execution	Dial directory, auto dial/redial	Auto dial/redial, auto answer, macros, unattended execution
<b>Pricing and Availability</b>			
Microcomputer Sftwre/Hdwre (\$)	595 software	Vendor did not specify	Vendor did not specify
Host Software/Hardware (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	October 1981	August 1987	1984
Number Installed to Date	Vendor did not specify	Async/200, X.25 server/20	Over 80
Warranty	90 days	Vendor did not specify	30 days
Distribution	Direct, OEMs	Dist., dlrs, retail, VARs	Direct
<b>Comments</b>	—	Asynchronous gateway and X.25 server provide WAN connections between Waterloo PORT and LANs	—



# Local Area Networks: Market Overview

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## Synopsis

### Editor's Note

This report focuses on the LAN and LAN internetworking markets. For information on LAN technology, see Report 520-201. For detailed specifications of over 1,000 products from more than 200 LAN vendors in comparison column format, see Report 520-301.

### Market Highlights

The terminology of LANs has escalated from connectivity to interconnectivity, from networking to internetworking, and from operability to interoperability. All kinds of diverse equipment and software are talking to each other, and all kinds of vendors are working together to accommodate interconnected, global communications. From its simple beginnings as a departmental network, the LAN has graduated to a position of prominence in communications, cutting across office, campus, city, and country boundaries.

Sales of LAN products—hardware, software, and cabling—amounted to more than \$5 billion in 1989, and

the forecast for the next few years is encouraging for those in this market. Anticipated sales for the mid-90s can more than double the 1989 figure. Users are not only increasing the number of nodes in their LANs, they are paying less per node as costs to implement the technology continue to decrease.

Integrating the components in networks and the networks with other networks remains the greatest of challenges. Vendors have made peace with the existence of communications equipment from competitors and are actively promoting compatibility. "Vendor friendliness" can characterize the market's approach to the '90s. Vendors that formerly would not mention competitors' names are now boasting of their alliances and interoperability with the products of those very same competitors.

—By *Barbara Callahan*  
Associate Editor

# Analysis

In an era of retrenchment, streamlining, and restructuring, companies participating in or entering the LAN and LAN internetworking markets can draw comfort from the healthy prognosis for the industry. Connecting networks has become the goal of the '90s, and this intricate task creates opportunities for companies involved in producing connectivity hardware, software, and media, and even more opportunities for the companies that can tie them all together.

Since there is still room for many in the LAN and internetworking fields, the industry has not experienced the shakeout that often occurs when a technology achieves maturity. Although LANs have been around for awhile, growth and development factors have not diminished. Having noted this situation, many data communications companies have turned to LAN products to revitalize flat sales. To illustrate the high level of activity in the market, Table 1 presents an overview of the internetworking products announced by 108 companies during 1990.

Established vendors continue to innovate and refine products. Names like Novell, Banyan, 3COM, and Ungermann-Bass are still synonymous with LANs. The leader in token-ring technology, IBM, is far from complacent, having released a spate of LAN products in 1990. At the same time, new names are entering the field along with names associated with other communications devices—names like Microcom, General DataComm, and Hayes.

Many vendors have set their sights on overseas markets to continue growth and expand opportunities. Proteon, a LAN leader, has set up a sales office in Sydney, Australia, to handle sales that have increased more than 100 percent in the past two years in Australia and New Zealand. Codenoll Technology has signed a distribution agreement with Soliton of Japan to take advantage of the opportunities in the rapidly growing Japanese networking market.

## Issues and Trends

### New Markets for Old Pros

During 1990, attendees at trade shows featuring local area network products might have wondered if they had strayed into the wrong halls. Many of the names emblazoned over booths were old pros in the data communications field, but newcomers to the local area networking market. Having ascertained that the LAN market can still accommodate many participants, vendors formerly associated with products such as modems, multiplexers, and switches are entering the field. Some modem manufacturers, perhaps anticipating declining sales from the rapid digitalization that is occurring throughout the world, have set their sights on LANs to revitalize business.

Hayes, a name almost certain to be followed in a word-association test by "modem," has established "Hayes for LANs," a family of products that includes EtherMate 8, EtherMate 8UTP, and EtherMate Trio16. EtherMate 8UTP is an 8-bit half-card adapter that connects to thick or unshielded twisted-pair Ethernet environments through DB 15 AUI and RJ-45 connectors. EtherMate 8UTP is designed for IBM XT/AT, PS/2 (Models 25 and 30), EISA, and IBM-compatible computers. EtherMate 8 is an 8-bit half-card that connects to thick or thin Ethernet cables, designed for IBM XT/AT, PS/2 (Models 25 and 30), EISA, and IBM-compatible computers. EtherMate Trio 16 is a 16-bit, 3/4-length adapter servicing all media—thick, thin, and unshielded twisted-pair Ethernet cables on a single board. It is also designed for the computers supported by EtherMate 8 and EtherMate 8UTP.

Another vendor whose name is practically synonymous with modems, Microcom, has shifted direction slightly and moved into the LAN market. Microcom, which pioneered error correction and data compression in modems, still attracts customers for its modems and is enjoying a healthy business. A Microcom spokesperson commented, "Our customers won't let us get away from modems." The Microcom LAN Bridge (MLB) puts Microcom into the internetworking arena. MLB includes a family of high-performance, MAC-layer, remote LAN bridges. In May, Microcom added to the MLB line with Release 2.0 of the Microcom LAN

Bridge family with network management capabilities, the MLB/6500 with support for X.25 links, and the MLB/5500 for ISDN connections.

Another leading modem vendor, General DataComm, has introduced a LAN offering to complement existing products. The MEGA\*BRIDGE, a system for integrating multiple local area networks and remote local area networks at high speeds into a single communications network, complements MEGAMUX TMS, General DataComm's T1 networking multiplexer, and GEN\*NET, its line of statistical multiplexers.

In another word-association test, the name Telco would be followed by T1. Telco is still in the T1 network business but has entered the LAN market with FASTLANE, a 4:1 LAN/WAN compression bridge. With this product, Telco has not abandoned T1, but it enables customers to incorporate LAN access into their T1 networks. Len Eisenstein, vice president of sales and marketing, commented, "We have always been firmly rooted in the customer premises side of T1. As new office equipment plugs into the T1 network, we have adapted accordingly. This LAN/WAN compression bridge, a natural extension of our product line, is our response to customers who want to bridge LANs across a campus or across the country over T1 lines."

Bytex of Southborough, MA, a supplier of fault-tolerant electronic matrix switching systems, is now expanding its business focus by including LAN solutions. Jeffrey S. Goodman, president of Bytex, explained the company's decision. "Our entire business is focused around increasing our customers' network availability and reliability, as well as providing increased capabilities to control and manage their networks. Therefore, the decision to work with our customers to develop and deliver products that give them greater control of their LANs was an easy one for us to make and has initiated a series of investments." To further its entry into the LAN market, Bytex acquired Vance Systems Corp. of Chantilly, VA, a company that develops and markets the ATS LAN 1000 protocol analyzer. This product was also marketed under an OEM agreement with Atlantic Research as the Interview 1000 Series. The acquisition gives Bytex exclusive development, manufacturing, and distribution rights to all Vance Systems' products.

### Global Activity

During 1990, many LAN vendors, noting worldwide opportunities for their products, extended their operations to countries outside the United States. Wayne Fitzsimmons, vice president of international operations for *Banyan Systems* of Westboro, MA, outlined Banyan's international channel distribution strategy at Networks '90 in Birmingham, England. Fitzsimmons stressed the importance of partnerships with international distributors and the value of products that facilitate multilingual networking. At the same time, he announced a comarketing agreement with Apricot Computer Plc. Fitzsimmons stated that "Banyan is operating today in over 35 countries and has an installed base of nearly half a million users." Internationally, Banyan distributes principally through "country partners," regional distributors that support and sell Banyan products through a second tier of local resellers. The country partners act as Banyan's marketing representatives in their own regions, but they also participate in the development of products designed to meet the specific needs of their markets.

An outgrowth of these relationships has been the introduction of multilingual VINES, which is being prepared for delivery in French and German. Other languages, including two-byte versions of VINES, are also planned. Fitzsimmons indicated that "28 percent of Banyan's revenue comes from international operations today. Our goal is to increase that to 35 percent by 1991."

*Advanced Computer Communications (ACC)* of Santa Barbara, CA, has established a branch office near London to support its growing base of customers and resellers in Europe. ACC's European Support Center is staffed with technical personnel experienced in computer network planning, product design, and sales. In addition, the center maintains a stock of ACC's internetworking bridges, routers, and network management systems for demonstrations or for replacements of systems on warranty or under service contract.

*Codenoll Technology* of Yonkers, NY, signed a distribution agreement with Soliton systems of Japan under which Soliton sells Codenoll LAN systems in Japan. A leading supplier of Ethernet LAN systems, Codenoll has recently introduced network systems based on FDDI technology. Michael Coden, president of Codenoll, said, "Soliton is a proven performer in the rapidly growing Japanese

networking market, and we anticipate significant revenue from this new arrangement. Codenoll has also entered into distribution and OEM agreements with Bull of France, Robert Bosch of Germany, and Eurolan of Italy.

*DAVID Systems* of Sunnyvale, CA, has advanced its European distribution plan by signing an agreement with Trend Communications A/S of Denmark that covers the DAVID 10BASE-T Ethernet family of products. Henry R. Nothhaft, president and CEO of DAVID Systems, commented, "The signing of Trend, a significant, respected player in the data market in Denmark and Europe, is a welcome addition to our distribution network for Europe, which currently includes the United Kingdom, France, Germany, Switzerland, and Italy."

*Newport Systems* of Newport Beach, CA, a supplier of WAN and LAN connectivity products, announced a nonexclusive distribution agreement with Suntze Communications Engineering PTE LTD of Singapore for its complete line of communications products. The agreement calls for Suntze to distribute Newport Systems' LAN<sup>2</sup>LAN family of multilink router-level bridges and other products in Singapore, Malaysia, and Indonesia.

*Proteon* of Westborough, MA, has set up a sales office in Sydney, Australia, to provide sales and marketing support for Proteon's distributors and VARs in Australia and New Zealand. According to Daniel Berger, director of Proteon's Asia/Pacific Operations, Proteon's business has grown by more than 100 percent during 1989 and 1990 in Australia and New Zealand, which are two of Proteon's fastest-growing markets worldwide.

*Thomas-Conrad* of Austin, TX, has signed a distribution agreement with Ingram Micro D, Inc. to distribute its products internationally. Ingram Micro D serves as a wholesale distributor to over 40,000 reseller customers in the U.S., Canada, and Europe. It operates two international subsidiaries: Ingram Micro D Ltd. of Canada and Ingram Software of Belgium.

### Cooperative Ventures

LAN vendors have acknowledged the virtues of cooperation. By combining expertise and resources, they bypass the rigors and expense of individual research and development efforts. This cooperation has enhanced vendors' opportunities

because the LAN market is sufficiently vast to accommodate and reward many participants. An overview of cooperative ventures inaugurated in 1990 follows.

*Advanced Computer Communications (ACC) and Digital Equipment Corp.* In April 1990, Advanced Computer Communications (ACC) of Santa Barbara, CA, and Digital Equipment Corp. of Maynard, MA, announced a Basic Ordering Agreement under which Digital can purchase ACC data communications products and services, including the ACS Series 4000 family of bridges, routers, and network management products. The contract provides Digital with a blanket purchasing agreement that allows the company to acquire ACC's data communications products for resale or internal use.

*AT&T and cisco Systems.* AT&T Computer Systems Division of Morristown, NJ, and cisco Systems of Menlo Park, CA, have entered into an OEM relationship in which cisco supplies AT&T with high-performance, multiprotocol network routers for LAN interconnect solutions for AT&T's customers.

*Banyan and cc:Mail.* Banyan Systems of Westboro, MA, and cc:Mail of Mountain View, CA, announced a VINES network-specific version of the cc:Mail E-mail package—cc:Mail for VINES.

*British Telecom and Advanced Computer Communications (ACC).* The agreement states that British Telecom resells and supports ACC's LAN bridge/routers, incorporating them into its T-NET IN2000 range. The bridge/router products covered in the agreement provide links between T-NET LANs across X.25 packet-switching networks and private circuits. ACC is located in Santa Barbara, CA.

*cisco and Cabletron.* Cabletron of Rochester, NH, and cisco have entered into an alliance to integrate cisco's internetworking routing technology into Cabletron's Multi-Media Access Center (MMAC) intelligent hub products. Cabletron and cisco are jointly working on developing a router module that plugs into the MMAC chassis, resulting in MMAC's first routing capability.

*Codenoll and LANEX.* Codenoll Technology of Yonkers, NY, and LANEX of Beltsville, MD, entered into a strategic alliance to develop additional technology and products for FDDI networks.

*Codenoll and NYNEX.* Codenoll Technology and NYNEX Science & Technology of New York, the research and development arm of NYNEX Corp., have signed a five-year agreement to cooperate in the development of high-speed fiber optic-based products and other local area network products and technology.

*Cryptall Communications and Telco Systems.* Cryptall of Cranston, RI, entered into an OEM agreement with Telco Systems of Norwood, MA, under which Cryptall supplies Telco with the 8023 LAN/WAN bridge for Ethernet to T3 and the 8025 bridge for token-ring to T3. The products are marketed to interexchange carriers, local exchange carriers, and large corporations.

*DAVID Systems and Syntrex.* DAVID Systems of Sunnyvale, CA, and Syntrex of Eatontown, NJ, signed a strategic partnership agreement that enables Syntrex to market DAVID's line of Ethernet connectivity products.

*Moses and DacEasy.* Moses Computers of Los Gatos, CA, and DacEasy of Dallas, TX, finalized an OEM agreement for bundling products in September. The agreement establishes plans for creating a commercially offered, bundled IBM-compatible LAN with accounting software targeted for the microcomputer market. The network bundle incorporates ChosenLAN from Moses for sub-assembly by DacEasy into an integrated offering for small business accounting applications.

*Proteon and Acer, Inc.* Since July 1990, Acer has been reselling Proteon's IBM-compatible token-ring networking solutions. The agreement called for Acer to incorporate Proteon's ProNET-4/16 network interface cards and the Series 70 Intelligent Wire Center into its Acer Token Ring Network 5290 Series. Proteon is located in Westborough, MA, and Acer's headquarters are in Taipei, Taiwan.

*Proteon and Codex.* Proteon has entered into a VAR agreement with Codex of Mansfield, MA, under which the Systems Division of Codex markets Proteon's line of token-ring networking and internetworking products. Codex is offering the products through custom bids as part of a complete networking solution. Codex is marketing Proteon's p4100+ bridging router and ProNET-4/16 token-ring products.

*Proteon and HP/PSI.* In August 1990, Proteon announced a marketing agreement with

Hewlett-Packard and Performance Systems International (PSI) for its p4100+ Multi-Protocol Bridging Router. PSI became a value-added reseller of the p4100+, and Hewlett-Packard references and recommends p4100+ to prospective Apollo Token Ring users and its installed base. The p4100+ combines an HP Apollo Token Ring interface with support for the DOMAIN operating system.

*Retix and SynOptics.* In August, Retix of Santa Monica, CA, announced an additional OEM product agreement with SynOptics of Mountain View, CA, in which the high-speed remote bridge technology jointly developed with SynOptics is integrated in the LattisNet System 3000 intelligent wiring concentrator.

*StrataCom and CrossComm.* The agreement between StrataCom of Campbell, CA, and CrossComm of Marlborough, MA, calls for CrossComm to build support for StrataCom's frame relay interface into its ILAN internetwork server product family. When CrossComm's frame relay development is completed, it will enable frame relay traffic to pass between the company's ILAN internetwork server and StrataCom's fast packet IPX networking system.

*3Com and SynOptics.* In August 1990, 3Com of Santa Clara, CA, and SynOptics of Mountain View, CA, announced a strategic alliance to enhance interoperability and to integrate network management of 3Com's Ethernet adapter and SynOptics' intelligent hub products. Under terms of the agreement, 3Com resells SynOptics' System 3000 Ethernet intelligent wiring hubs and integrates the System 3000 into its network management architecture. SynOptics, in turn, integrates 3Com-managed adapter cards into its network management systems and also offers 3Com adapters. The agreement also gives 3Com the option to build value-added modules, such as internetworking and communications server devices for 3Com's hub platform.

*Thomas-Conrad and Performance Technology.* In August 1990, Thomas-Conrad of Austin, TX, and Performance Technology of San Antonio, TX, announced a strategic partnership, which consists of technology transfers and an OEM relationship to market local area networking products. Initially, both companies are working toward integrating their product lines.

*Tricord and Valinor.* In June 1990, Tricord Systems of Minneapolis, MN, and Valinor Inc. of

Westford, MA, announced a joint reseller agreement in which Tricord supplies Valinor with the PowerFrame family of superservers for LANs and client/server computing.

*Ungermann-Bass (U-B) Agreements.*

Ungermann-Bass of Santa Clara, CA, has entered into agreements with Norton-Lambert of Santa Barbara, CA; GTE of Stamford, CT; LANSystems of New York, NY; and British Telecom.

The U-B Norton-Lambert agreement calls for U-B to resell Norton-Lambert's Close-Up software and to integrate it into U-B's customer support programs. In conjunction with the agreement, U-B introduced ReDI (Remote Diagnostics), a support program enhancement that exploits the remote link features of Close-Up software.

In June 1990, U-B and GTE Corp. signed a two-year, multimillion dollar agreement under which GTE Telephone Operations sells U-B's full line of Access/One intelligent wiring systems.

LANSystems and U-B announced a two-year, multimillion dollar VAR agreement in which LANSystems offers U-B's full Access/One product line as part of its own network integration solutions.

British Telecom and U-B entered into an agreement that includes plans for joint development of OSI products and inclusion of T-NET local area networks under British Telecom's CONCERT network management system.

*Vitalink and StrataCom.* Vitalink Communications of Fremont, CA, and StrataCom of Campbell, CA, have established a joint development program to address the need for multivendor network management of wide area networks. The program is a bilateral effort between the two companies within the context of Digital Equipment Corp.'s Enterprise Management Architecture (EMA) program.

*Wellfleet and Digital Equipment Corp.* In July 1990, Wellfleet of Bedford, MA, and Digital Equipment Corp. announced that the two companies had jointly defined the basis for an SNMP-based Access Module that enables the DECmcc Management Station to manage a network of Wellfleet Feeder Node, Link Node, and Concentrator Node multiprotocol router/bridges. At the same time, Wellfleet announced that it had joined Digital's DECmcc Strategic Vendor Program. Under this program, Wellfleet provides Digital with the

specifications for its SNMP Management Information Base (MIB), which Digital plans to incorporate into the DECmcc Management Station.

*Xyplex and Vitalink.* Xyplex of Boxborough, MA, and Vitalink of Fremont, CA, are developing complementary products to provide WAN-link interoperability using the Vitalink Communication Protocol (VCP), which Xyplex has licensed from Vitalink. The first product from the alliance, announced in June 1990, is the MAXserver 6510 remote bridge card. A reseller provision in the Xyplex/Vitalink agreement allows Xyplex to resell Vitalink's family of TransLAN bridges and TransPATH bridge/routers. The products retain the Vitalink label, but Xyplex provides installation and support.

*Unisys and Novell.* In June 1990, Unisys of Blue Bell, PA, and Novell of Provo, UT, announced two agreements that enable Unisys to provide local area networking services to customers using the NetWare operating system. The strategic agreements certify Unisys as an authorized "NetWare Support Organization," capable of providing on-site and technical support to NetWare end users, and establish Unisys as a "Novell Authorized Education Center," able to provide NetWare certification training to Unisys service technicians and engineers.

**IBM's LAN Product Blitz**

In September 1990, IBM released a flurry of products, many of which serve the LAN market.

*IBM 8230 Controlled Access Unit (CAU)* is a powered cable attachment that connects devices to IBM Token-Ring LANs.

*LAN Network Manager V1.0 and V1.1 and LAN Network Manager Entry* replace the previous IBM LAN Manager products. LAN Network Manager V1.0 offers OS/2 database support for LAN management data. LAN Network Manager V1.1 offers extended host control from NetView with 80 commands. LAN Network Manager Entry is similar to V1.1 but does not support a local operator interface.

*LAN Station Manager* is a licensed program for DOS and OS/2 workstations. It provides information about the adapter, the workstation, and user data to the IBM LAN Network Manager.

*Enhancements to IBM 8209 LAN Bridge* include an upgraded Ethernet feature and a new token-ring feature.

*Enhanced Ethernet Attachment Module* offers token-ring network management information across an Ethernet LAN segment.

*IBM LAN-to-LAN Wide Area Network Program* allows users to employ their existing SNA or X.25 network for IEEE 802.2 NetBIOS LAN traffic.

*IBM LAN Asynchronous Connection Server (LANACS)* provides LAN access to IBM and ASCII hosts using a variety of terminal emulation packages.

*Workstation Data Save Facility/VM* handles backup and archive services.

*SAA Delivery Manager* implements software distribution between host computers and programmable workstations.

**Table 1. Networking Product Announcements in 1990**

Company	Location	Product	Company	Location	Product
Advanced Micro Devices (AMD)	Sunnyvale, CA	Am79C98EVAL 10BASE-T transceiver development kit; Am7997 Transceiver	AT&T	Morristown, NJ	StarServer S, StarGROUP Server for IBM LAN Clients, FDDI-to-802.3/Ethernet bridge, StarWAN Multi-Bridge, StarWAN Brouter, Model 450, and StarLAN 100 Network Concentrator
Abletec	Fremont, CA	AFS/386, ALS-2 LANStation, AE-2000 Ethernet board			
Accton Technology	Fremont, CA	TransPair-T 10BASE-T Transceiver, EN5090 Ethernet chip, EtherPocket-10T adapter, EtherPocket-CX adapter, SlimStations diskless workstations	Banyan	Westborough, MA	VINES support for medialess PS/2 55 LS workstations, cc:Mail for VINES, VINES SMP, VINES SNMP Agent, VINES SNMP MIB, VINES 4.0 Application Toolkit, Advanced 3270/SNA and Advanced 3270/SNA Graphics options for VINES
Advanced Computer Communications (ACC)	Santa Barbara, CA	ACS Series 4000 bridge/router, ACS 4810 LAN monitor, ACS 4000TR token-ring option, ACS 2100 local bridge			
Alantec	Fremont, CA	T1IM T1 Interface Module; MLS 425, MultiLAN Manager, SNMP Agent Software	BICC Data Networks	Westborough, MA	ISOLAN EtherConnect System/4 Structured Wiring Hub 1201-3 STP System, 1182 STP Transceiver, 1205 Managed Bridge Line Card, 1201-4 Multiport Transceiver Line Card, ISOLAN Ethernet UTP Controller Card for IBM AT and compatibles, ISOVIEW Network Manager
Allen-Bradley	Cleveland, OH	LAN/1-TCP/IP GatewayControl-View Operator Interface Software			
Allied Telesis	Mountain View, CA	CentreCOM 270 and 470 transceivers, CentreCOM 810 Ethernet transceiver/concentrator, CentreCOM 3000 repeaters	Cabletron	Rochester, NH	MRX and MRXI 10BASE-T hubs, Token Ring STP/UTP MIM boards, Intelligent Repeater Bridging Module (IRBM), enhancements to Desktop Network Interface (DNI) PC cards
Alloy	Marlborough, MA	EarthStation III, 386/MultiNode Software, PC-Slave/286, Silvercard			
Andrew	Torrance, CA	Bridgeport/7606 Local Source Routing Token-Ring Bridge, Intelligent Media Management System	Canary Communications	San Jose, CA	UTPC-1100 Concentrator, UTP-1000 one AUI Port Transceiver, UTP-2000 two AUI Port Transceiver, UTP-4000 four AUI Port Transceiver
Artisoft	Tucson, AZ	Micro Channel versions of LANtastic AE-2 Ethernet, LANtastic 2 Mbps, and LANtastic Voice adapters			
AST Research	Irvine, CA	Zero-k version of SixPak 286			

**Table 1. Networking Product Announcements in 1990 (Continued)**

Company	Location	Product	Company	Location	Product
Chipcom	Southborough, MA	ONline System Concentrator, ONline Fault-Tolerant Networking System, ONline Fiber Module, Fault-Tolerant Fiber Transceiver	DAVID Systems	Sunnyvale, CA	DAVID Pair Scanner for troubleshooting 10BASE-T, BNC-MAU Interface Unit, Ether-T PC and Ether-T AT Adapters, 10BASE-T Adapter Kits
cisco Systems	Menlo Park, CA	CSC-R16 Interface Card, "Priority Output Queuing" software feature for router/bridges, Integrated Gateway Server (IGS), IGRP IS-IS routing protocol, STS-10x Terminal Server, Multipoint Ethernet Connector (MEC), NetCentral Station Software	Develcon Electronics	Willowdale, ON	Model INB-1000 Internetworking Bridge
CMC	Santa Barbara, CA	Release 3.0 for DRN-3200 Router	Digital Communications Associates (DCA)	Alpharetta, GA	CROSSTALK Communicator, IRMA Workstation for Windows, enhancements to IRMAX DFT and IRMAX Multisessions, DCA/Microsoft Select Communications Server Version 1.0, IRMA-trac Token-Ring Adapter/Convertible, 10NET Plus NetBIOS/RS232 Bridge, 10NET Plus RS232 Version 2.0, IRMALAN for NetWare Gateway Server Products, DCA/Microsoft Select Communications Workstation (Select CW), 10NET Plus LAN OS Version 4.20
Cnet Technology	San Jose, CA	CN800E and CN800E/2 Adapters, CN500E and CN600E Network Interface Cards			
Codenoll	Yonkers, NY	CodeNet-832X Adapter Cards			
Cogent Data Technologies	Friday Harbor, WA	E/MASTER Ethernet Adapter Cards, NetWare 386 Drivers for E/MASTER II			
Commtext	Crofton, MD	Primary Rate Channel Bank (PRCB) Gateway, Cx-Card, Voice Subsystem Option	Digital Equipment Corp.	Maynard, MA	Digital's Unshielded Twisted Pair 802.3/Ethernet Product Family, DEC EtherWORKS LC 802.3/Ethernet PC Controller, DEC EtherWORKS Turbo 802.3/Ethernet PC Controller, OPEN DECconnect Structured Cabling System, DECnet/IPX Portal, DSM DDP-DOS Software
Corvus	San Jose, CA	ReadyNet 1.2 LAN, ReadyRAM Plus Card			
CrossComm	Marlborough, MA	ExpertWatch Service for monitoring ILAN			
Cryptall	Smithfield, RI	Series 4000 LAN/WAN Bridges, Redundant Link for Series 3000 Remote Bridges	Digital Products	Watertown, MA	NetCommander Sub-LAN Version 5.0, MacShare
Cubix	Carson City, NV	ComBridge for Novell LANs	DNA Networks	Malvern, PA	DNA MicroNet LAN for IBM PCs, Groupware Utilities for DNA MegaNet and DNA MicroNet
D-Link Systems	Irvine, CA	D-Link Ethernet Pocket LAN Adapter			
Datapoint	San Antonio, TX	Datapoint 7850 Network Server	Eicon	Montreal, PQ	LAN Router/400
Datatec	Fairfield, NJ	Token Ring Multi-Station Access Unit (MAU) Model 8	Emerald Systems	San Diego, CA	EmSAVE and EmLIB software for NetWare 386 V.30 networks

**Table 1. Networking Product Announcements in 1990 (Continued)**

Company	Location	Product	Company	Location	Product
Everex	Fremont, CA	SpeedLink/TR Token-Ring Adapters, STEPserver 486/33 File Server, SpeedLink/TP Ethernet Adapter, new versions of SpeedLink/PC and SpeedLink/PC16 Adapters	Hughes Network Systems	Germantown, MD	HNS LAN Gateway, LINC/Term HUB Series of Integrated Terminal Server Modules, ProBridge Family of LAN Bridges, ProLINC Software, ProLINC support of Microsoft Window environment
Fairchild	Scottsdale, AZ	LBR8323 Ethernet to Broadband Bridge	IBM	Armonk, NY	3174, 3745, 3172 Controllers, 8230 Token-Ring Controlled Access Unit, 8209 LAN Bridge Token-Ring Module, LAN-LAN Wide Area Network Program, 8209 LAN Bridge Ethernet Module, LAN Asynchronous Connection Server (LANACS), LAN Network Manager, LAN Station Manager
Fibronics	Hyannis, MA	System Finex Translation Bridge, Programmable Forwarding control (PFC)			
Fresh Technology Group	Gilbert, AZ	Remote Console, FRESH Utilities, FRESH Secure It, MODEM Assist, LAN Assist Plus, Q Assist			
Gandalf	Wheeling, IL	10BASE-T Mini MAU Transceiver			
Gateway Communications	Irvine, CA	Data compression and high-speed file transfer software for G/Remote Bridge Family of IPX Routers, Com-System, G/EtherTwist MC Adapter, G/Ethernet 8 and G/Ethernet 16 Adapters, G/EtherTwist PC, G/EtherTwist PC-WS, G/EtherTwist AT, G/EtherTwist AT-WS Adapters	IMC Networks	Tustin, CA	PCnic TP Family Ethernet Products, EtherNic 8-bit Card, NetWare 386 Driver for 16-bit PCnic and PCnic II Ethernet Interface Cards
			Information Builders	New York, NY	PC/FOCUS LANpak Release 5.5 for VINES
			In-Net	San Diego, CA	Integrated Services Ring (ISR), FiberTalk 5000 802.5 Bridge
General DataComm	Middlebury, CT	MEGA*BRIDGE	Integrated Workstations	San Jose, CA	MultiServer
GVC Technologies	Sparta, NJ	286LANode and 386SX LANode Diskless LAN Workstations	Interlink	Fremont, CA	SNS/B320 Bridge, SNS/BR340 and SNS/BR380 Bridge/Routers, SNS/SNMPconnect
Harris Adacom	Dallas, TX	Token-ring products for its SuperNet Strategy Series, Strategy 9770 Intelligent Token-Ring Gateway	Invisible Software	Foster City, CA	Invisible NET Control Software
			Kalpana	Los Gatos, CA	EPS-700 Multiport EtherSwitch
Hayes Microcomputer Products	Atlanta, GA	Hayes for LANs global family of Ethernet LAN adapters	KMS Systems	Austin, TX	NetAccess
			LANCAST	Amherst, NH	Universal Twisted-Pair/Coax Translator
Hewlett-Packard	Cupertino, CA	HP 9000, HP 3000 Networking Products, NetWare support of HP NewWave software environment	LANsPLUS	Montreal, PQ	EtherRAM LAN Adapter

**Table 1. Networking Product Announcements in 1990 (Continued)**

Company	Location	Product	Company	Location	Product
Lantana	San Diego, CA	Cypress/1-16, Cypress/2-16, Cypress/3-16, Cypress/1-4, Cypress/3-4 Controllers	Network Interface	Lenexa, KS	STAR/LINK Repeater, NIC10330 and NIC10336 AUI/Thinnet Adapters, NIC 10350 and NIC10356 AUI/UTP Adapters, PcARC Series of 8-bit ARC-NET Adapters, PcARC-AT, 103xx Series Ethernet Interface Cards
Laser Communications	Lancaster, PA	LACE L00-29 4M bps Link			
MaCo Networks	North Augusta, SC	LANFrame 486, LANFrame4 Server, LANFramePSP, and LANCall			
Madge Networks	San Jose, CA	Menu-Driven Installation Program for Token-Ring Adapters, Smart Server Software for NetWare 386, Smart Server Software for OS/2 LAN Manager, Smart 16/4 EISA Token Ringnode, Smart-Boot Software	Network Resources	San Jose, CA	Mac1000 32-bit Ethernet Card
			Network Systems	Minneapolis, MN	FE648 FDDI-to-T3 router
			NetWorth	Irving, TX	EtherNext Hubs, EtherNext UTP Hubs
			Nevada Western	Sunnyvale, CA	OMNI Patch Panel, NEV*STAR II Active Hub
Meridian Data	Scotts Valley, CA	CD Net Software Version 3.0	Newport Systems	Newport Beach, CA	LAN <sup>2</sup> LAN/Compression Router, LAN <sup>2</sup> LAN 386 NLM
Microcom	Norwood, MA	Release 2.0 Microcom LAN Bridge Family, MLB/6500 for X.25 Links, and MLB/5500 for ISDN	North Hills Electronics	Glen Cove, NY	LAT3247 Power-MAU, 2/4-port Token Ring Compact MAUs
Microtest	Phoenix, AZ	LANPORT Print Server	Novell	Provo, UT	NetWare SNA Gateway with Token Ring support for AS/400, NetWare Twinax Gateway Support for AS/400, NetWare 386 Version 3.1, ELS NetWare Level I Version 2.12, NetWare support for IBM PS/2s, NetWare DOS Shell Version 3.01, NetWare Requester for OS/2 Version 1.2, NetWare 386 Services for SAA, Client/Server NLM Testing Program, NetWare Remote Management Facility Software, LANtern Services Manager, LANalyzer, NetWare Name Service
Morton Management	Silver Spring, MD	486/33MHz EISA GigaServer Network File Server			
Moses Computer	Los Gatos, CA	ChosenLAN Version 1.10			
Multi-Tech	Mounds View, MN	MutiCom-Async-Gateway, Multi-Com3270Gateway			
NCR	Dayton, OH	ONS Networking System, NCRNet Manager Release 3.0, NCR WaveLAN Wireless LAN, Bridgeport 7404 Bridge (manufactured by Andrew Corp.)			
Netwise	Boulder, CO	Netwise RPC Tool for NetWare 386 Version 3.0, RPC Tool for MS-Windows, RPC Tool for Macintosh, RPC Monitor, Mainframe RPC	Optical Data Systems	Richardson, TX	ODS a-e Series MAUs

**Table 1. Networking Product Announcements in 1990 (Continued)**

Company	Location	Product	Company	Location	Product
Persoft	Madison, WI	Intersect LAN Bridge Software	Standard Microsystems	Hauppauge, NY	ARCNET Drivers, Intelligent Hub
Photonics	Campbell, CA	Building-to-Building Photolink	Star Gate Technologies	Solon, OH	Four-channel Synchronous Board
Promptus	Portsmouth, RI	Promptus T-1 CommServer+	Tecmar	Solon, OH	ProLine LAN backup system, MicroRAM
Proteon	Westborough, MA	ProNET-4/16 Adapter, p4200 FDDI Router, Jitter-Buster technology	Telco Systems	Fremont, CA	FASTLANE 4:1 Compression Bridge
Puredata	Richmond Hill, ON	PD $\mu$ C8023 and PDI8023-T Ethernet Cards	Telematics	Fort Lauderdale, FL	Series 9000 Frame Relay Exchange
Racal InterLan	Boxborough, MA	MacConnect-10BT, INX5000 Integrated LAN System, TCP Server for NetWare, NP622S, NI5210-10BT, NI6510-10BT, NI5210-10BT PC/XT, LanGate/LAT, NVL16W-10BT, NVL16S-10BT	Texas Instruments	Dallas, TX	JitterBuster technology
			Thomas-Conrad	Austin, TX	16/4 Token-Ring Adapter for the AT, 16/4 Token-Ring Adapter for Micro Channel computers, Enhanced Token-Ring Multistation Access Unit for UTP Type 3
RAD Network Devices	Rochelle Park, NJ	RTB Remote Token-Ring Brouter	3Com	Santa Clara, CA	Maxess for Windows, 3+Open TCP NetBIOS, 3+Open XNS
Republic Technology	Austin, TX	RPM Family of Diskless Workstations	TOP Microsystems	Santa Clara, CA	ARCNET cards for Toshiba laptops
Retix	Santa Monica, CA	OSI LAN Transport for DOS, OSI LAN Transport for OS/2, Retix Adaptive Routing	Touch Communications	Campbell, CA	Worldtalk/400 Gateway for SMTP and UUCP
Samsung	San Jose, CA	386A3 File Server	Tricord	Plymouth, MN	PowerFrame Servers for LANs and Client/Server Computing
SBE	Concord, CA	Token-ring products for VME and Multi-bus Systems, X.25 and TCP/IP for CPS1000 Series of Communications Processors	TRW	Torrance, CA	PC2001 hardware/software package, NB2010 MAC layer bridge
Sitka	Alameda, CA	Addition of DOS-based Software to InBox Plus 3.0 software	Ungermann-Bass	Santa Clara, CA	16 products for Access/One, Net/One LAN Manager Release 2.0
			SL Waber	Mt. Laurel, NJ	EPC 200

# Local Area Networks: Technology Overview

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## Synopsis

### Editor's Note

For information on the local area network market, see Report 520-101; for comparison columns, see Report 520-301.

### Technology Highlights

1990 was not a year marked by earthshaking new developments in the local area network marketplace. Rather, trends already under way continued to gather momentum. One of the chief examples was the 10BASE-T segment. This subsection of the IEEE standard for Ethernet—802.3—which describes Ethernet transmission on unshielded twisted pair, attracted much attention from vendors, with seemingly everyone offering 10BASE-T products. Several vendors debuted new wireless LANs based on radio or laser links.

One of the few really new developments was the debut of “superservers” from companies such as NetFrame, Parallan, and Tricord. These multiprocessor machines are the first computers designed from the ground up as network servers and combine the sophisticated I/O capabilities of minicomputers with the ability to run industry-standard network operating systems.

The first section of this report, Technology Basics, defines a local area network and discusses transmission media, topologies, access methods, and standards.

The second section, Products, provides a general overview of the components that must be assembled to build a local area network. These components include hardware—workstations, interface cards, transceivers, servers, and repeaters—and software issues—applications, integrity of data, record and file locking, and file systems.

The final section, Selection Guidelines, addresses issues common to the implementation of any local area network. These issues include advantages and restrictions of local area network resource sharing, integration of functions, channel speed, simplicity and flexibility, security, alternatives to local area networks, and pricing considerations.

# Analysis

## Technology Basics

### What Is a Local Area Network?

In addition to the independent computer networking vendors, most major computer and data communications companies also are active in the LAN marketplace. They each have branded at least one of their offerings a local area network. Although in a broad, functional sense, most of them may be right, consensus holds that the term refers quite specifically to a certain class of products. For this report's purposes, we have selected the following definition:

A local area network is a system for the interconnection of two or more communicating devices that are:

*Intracompany, Privately Owned, User Administrated, and Not Subject to Regulation by the FCC:* This excludes from our definition traditional local connections over common carrier facilities, such as tie lines, and public local networks, such as Digital Termination Services and local cable television networks.

*Structured:* Local area networks are integrated into a discrete, physical entity, with devices interconnected by a continuous structural medium. In a local area network, many types of equipment and applications, such as data processing, word processing, electronic mail, video, and voice, can operate over a single cable plant.

*Limited in Geographical Scope, with Devices Physically Separated But Not Mobile:* Devices can be on different floors of a building, on the same industrial or university campus, or in several buildings in the same city. The maximum distance, depending on the technology, is about 50 miles. Our definition excludes co-located computer systems interconnected by a high-speed parallel bus, global

network systems designed primarily for use as long-haul networks, and mobile radio networks.

*Supportive of Full Connectivity:* Every user device on the network must be potentially capable of communicating with every other user device. This characteristic excludes traditional local environments that support only hardwired, point-to-point connections between a host computer and its attached terminals.

*High Speed:* Since LANs are not subject to the speed limitations imposed by traditional common carrier facilities, they usually support operations in the 1M-to-16M bps range. Minimum and maximum throughput generally ranges from 500K bps for low-speed LANs based on twisted-pair wiring up to over 1 billion bps for fiber optic LANs.

*Commercially Available:* Although in this report we examine future trends and some technologies under development, our primary concern is to provide information on the current commercial environment and its capabilities.

In local area networking, commercial availability is a matter of degree. Only the simplest LANs are true turnkey products. Most local area networks require a great deal of on-site engineering to ensure the efficient location of stations, ease of reconfiguration and expansion, accessibility for testing and repair, and compliance with building and fire codes. To ensure proper design and installation, users may have to contract with a number of secondary suppliers in addition to the primary vendor of LAN equipment. For example, although some LAN vendors provide complete configuration and installation services, others require the user to purchase and install all but the intelligent components of the network.

One final note regarding our definition of LANs. Although the purpose of any definition is to facilitate unambiguous communication, it cannot be cast in stone. For example, the average geographical scope is not the same for fiber optic LANs as it is for twisted-pair wire-based LANs. With the increasing use of repeaters and bridges within a single LAN installation, the general span length of the communications media constantly

expands. Within a highly integrated multilevel network, the delimitation between a local area network and a wide area network is blurring.

**LAN Technology**

Initially, it seems that a bewildering number of arcane technologies compete for attention in the LAN market, but the number of distinct techniques used in local area networking is actually quite small. Like most modern methods of data communications, local area networks employ a multilayered model. Only a few technologies, usually two or three, compete to solve the problems of each layer.

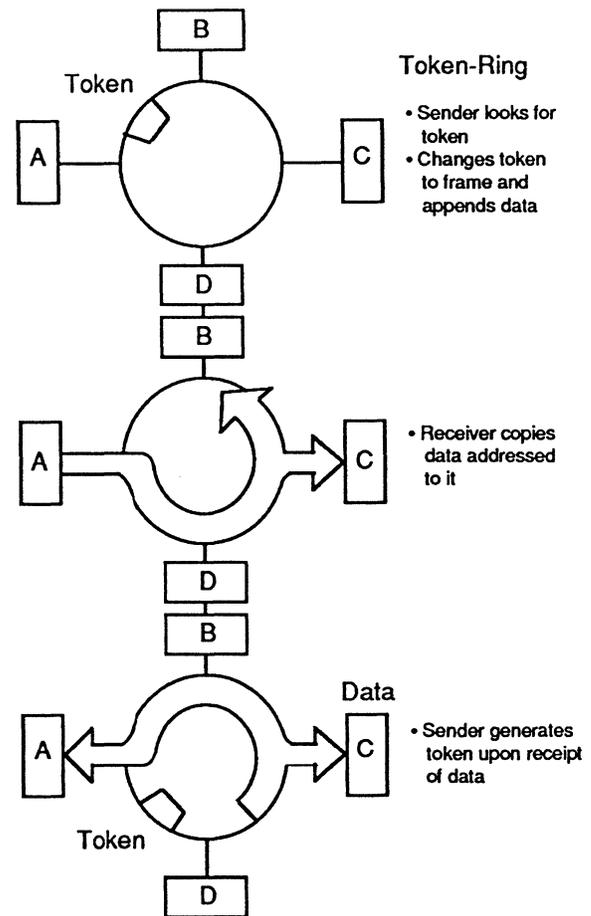
In today's market, however, a great deal of mixing and matching among techniques at different layers creates the illusion of a complex array of technologies. The reality is rather simple when taken a layer at a time. When choosing a local area network, users face the network's:

- physical medium and transmission technique;
- topology, the logical arrangement of its stations;
- access method, the way it arbitrates among its stations for use of the shared medium; and
- higher level services the LAN offers, such as protocol or file format conversion, data encryption, or network management.

Today's market offers three basic choices of media, three of topology, and two of access method. The issue of higher level services is somewhat more complex, since a vendor can offer such services on top of any practical combination of the other three factors. Presently, however, such services are only beginning to emerge as commercial offerings; they depend heavily on specific applications. Another issue is the increasingly important aspect of bridges and gateways to other networks.

This report discusses each of these issues separately, although we must state from the outset that one cannot mix and match LAN technologies at will. Some combinations are currently impractical, while others are simply impossible. Still, one should never underestimate the power of technology. Using a contention access method such as CSMA/CD over fiber optic media was once thought impossible, but LANs using such technol-

Figure 1.  
*Token-Ring Operation*



*IBM's Token-Ring Network conforms to the IEEE 802.5 standard for token-ring, baseband LANs. The operation of a single token-passing ring is illustrated here.*

ogy are now available. Ethernet over twisted-pair wire was once thought to be impractical, but today products based on the 10BASE-T subsection of the IEEE 802.3 standard are available from nearly every vendor of Ethernet solutions.

**Baseband vs Broadband**

Most networking schemes offered today are baseband networks. Baseband networks carry one signal at a time at rates from 1 to 16 million bits per second. Baseband signals are always digital, with the presence of a specified voltage representing the "on" condition and the absence of that voltage representing the "off" condition.

Baseband cable cannot extend beyond a few thousand feet without expensive digital repeaters, but it is easy to install and requires almost no maintenance. Baseband networks work well within a single building, though a single baseband network can span a small campus. With current technology, baseband networks can handle only data traffic.

Broadband networks were once used as the primary means of implementing metropolitan area network backbones that might connect several buildings on a campus and stretch for a few kilometers. Signals on a broadband network are analog; bits of information are represented by variations in the strength or frequency of a carrier signal. Broadband networks can carry many signals at a time, each signal occupying a different frequency band on the cable. Broadband networks can also carry voice and video traffic as well as data. While data rates practical on any one channel of a broadband network are somewhat lower than those available with baseband transmission, between 1 and 5 million bits per second, the availability of up to 20 or 30 such channels on a single cable greatly increases the amount of data that the medium can carry.

The attractiveness of broadband networks has faded as higher transmission speeds on baseband cable and fiber optic media have become widely available. Where a broadband network would have been installed as a backbone in the mid-eighties, a 16M bps token-ring on optical fiber is much more likely to be in evidence today, with a clear upgrade path available to 100M bps FDDI when it becomes available. The several clear disadvantages of broadband make it impractical when other means to achieve the same ends are available. A broadband data network requires a careful physical design process, and its components must be tuned carefully to handle specific ranges of frequencies. Broadband networking requires a staff of trained RF technicians, for both design and everyday maintenance.

### Transmission Media

Three media types are currently practical for local area networking: twisted pairs of copper wire, coaxial cable, and optical fiber. Each type serves some applications better than others, and each supports certain transmission techniques and has its own price/performance benefits.

*Twisted Copper Wire:* Twisted copper wire can also be called twisted-pair wire or common telephone wire. Ranging in price from \$0.05 to \$0.25 per foot, it is the least expensive medium available for LAN installations. It is also the easiest to install; a user can string it along a baseboard in minutes. Twisted-pair wire is also the most readily available of all LAN media, since it is in constant, high-volume production for voice telephone use. Twisted-pair wire is best for low-cost, short-distance local area networks, especially for small networks linking personal computers. It can effectively carry data at rates up to 10 million bits per second (bps) over distances up to several hundred feet without repeaters.

Standard twisted copper wire has, however, several significant disadvantages for data transmission. It is extremely susceptible to electrical interference (noise) from outside sources (e.g., typewriters and air conditioners). Such noise interferes minimally, if at all, with an analog voice signal, but causes two interrelated problems for data transmission. First, it limits the speeds at which data can travel, since a burst of noise that would garble only a few bits of low-speed data will destroy many bits of high-speed data. A "line hit" of a given duration garbles a number of bits that increases in proportion to the rate of transmission. Second, it limits the distance that a data signal can travel. A signal grows weaker, or "attenuates," as it travels farther from its source. Signals attenuate on all media, but twisted-pair wire's vulnerability to noise adds another factor. A length of twisted-pair wire acts as an antenna: The longer it gets, the more noise it gathers. After a given distance, the increased noise obliterates the attenuated signal.

Two techniques reduce vulnerability: shielding and repeating. Shielding makes the medium less vulnerable to electrical noise but adds significantly to the wire's cost. Active repeaters, devices that receive a signal and retransmit it to another length of wire or cable, increase the distance a signal can travel. Repeaters are expensive and add to the cost of running twisted-pair wire.

*Coaxial Cable:* Coaxial cable comes in several forms, each suited to a different kind of application. All forms of coaxial cable comprise a central conductor, the part of the cable carrying the signal, that is surrounded by a dielectric, or nonconducting, insulator; a solid or woven metal shielding

layer; and finally, a protective plastic outer coating. All these layers are concentric around a common axis, thus the term "coaxial." Coaxial cable is largely immune to electrical noise and can carry data at higher rates over longer distances than twisted copper wire.

*Optical Fiber:* Optical fiber is the newest medium in the commercial LAN market. There is no doubt that, in the long run, fiber optic technology has the greatest potential as a transmission medium. Many types of fiber optic cable are available (e.g., single mode, multimode), providing varying bandwidths and transmission speeds. Presently, fiber optic hardware, including optoelectronics and connectors, is the most expensive medium for LANs, but recent developments promise to change that quickly. Netronix introduced a Plastic Optical Fiber (POF) LAN in 1989. AT&T and a partnership of Codenoll Technology Corp. and General Motor's Packard Electric division both announced Plastic Optical Fiber products during the last quarter of 1990. Cheap and much easier to install and maintain than glass fiber optical media, POF promises to bring fiber, along with the high transmission speeds possible with it, to the desktop. Glass optical fiber cable was once extremely difficult to terminate, since each fiber had to be precisely aligned to ensure a continuous connection. Recent developments in the technology have made glass fiber media much easier to work with. Codenoll's plastic fiber media can be terminated in seconds with simple-to-use hand tools.

The principal advantages of fiber optics with present-day transmission technology are sturdiness and security. Optical fiber is immune to both physical and electrical influence from the environment. Copper corrodes; glass and plastic do not. Copper conducts electricity; glass and plastic do not. Fiber optic cable is difficult to tap surreptitiously; with current military technology, operators can isolate a break, or even significant movement, in a fiber optic cable to within a single inch over a mile or more of cable.

*Cabling Schemes:* When discussing transmission media for local area networking, it is important to touch on two major vendors' cabling schemes: the IBM Cabling System and AT&T's Premises Distribution System (PDS). The IBM Cabling System is

a star-wired system that can connect either computer devices or telephones to wall outlets; the wall outlets, in turn, connect to central wiring closets located on each floor of a building. Transmission media for the cabling system consists of Type 1, Type 2, Type 6, Type 8, and Type 9 data grade shielded twisted pair; Type 5 optical fiber; and Type 3 voice grade unshielded twisted pair.

AT&T's PDS is a distribution plan based on fiber optic and twisted-pair technology supporting voice, data, text, and video communications for various environments (multitenant and high-rise buildings, campuses). PDS subsystems comprise various parts of PDS including the fiber optic or twisted-pair media, cross-connect and interconnect hardware, connectors, plugs, jacks, and adapters.

The anticipated widespread acceptance of the IBM Cabling System and the AT&T PDS may signal a decline in the use of coaxial cable as the prime transmission medium for local area networks, a position that coax has held since the birth of the industry.

Table 1 compares the transmission media available for local area networking.

*Wireless LANs:* One of the most interesting new developments in LAN technology in recent years has been the wireless LAN. First introduced by small start-up companies such as O'Neill Communications and Arlan, wireless is now attracting the attention of several larger firms, most notably Motorola and NCR.

Most wireless LANs are based on low-power radio transmission, though there are also some line-of-sight systems based on laser or infrared transmission. Wireless LANs of all types are expected to find acceptance in businesses where frequent floor plan changes make LAN cabling impractical, and in more or less temporary installations, such as large construction sites. In many cases, wireless LANs will supplement traditional cabled LANs, providing quick connection to the main network wherever temporary workers or teams of specialists are deployed for a limited period.

### **Topology**

A network's topology is the physical and logical arrangement of its stations in relation to one another. For local area networking, we use the term "stations" rather than the more traditional

**Table 1. Comparison of Transmission Media**

	Twisted-Pair Wire	Baseband Coaxial Cable	Broadband Coaxial Cable	Fiber Optic Cable
Topologies supported	Ring, star, bus, tree	Bus, tree, ring	Bus, tree	Ring, star, tree
Maximum number of nodes per network	Generally, up to 1,024	Generally, up to 1,024	Up to about 25,000	Generally, up to 1,024
Type of signal	Single channel, unidirectional; analog or digital, depending on type of modulation used; half or full duplex	Single channel, bidirectional, digital, half duplex	Multichannel, unidirectional, RF analog, half-duplex (full duplex can be achieved by using two channels)	One single channel, unidirectional, or bidirectional simultaneously over a single wavelength half or full duplex, signal-encoded light-beam per fiber; single-encoded lightbeam per fiber; single fiber per cable
Maximum bandwidth	Generally, up to 16M bps (or higher)	Generally, up to 10M bps	Up to 400MHz (aggregate total)	Up to 200M bps in 10-kilometer range; up to 1G bps in experimental tests
Major advantages	<p>Low cost</p> <p>May be in existing plant; no rewiring needed; very easy to install; easy to support</p>	<p>Low maintenance cost</p> <p>Simple to install and tap</p>	<p>Supports voice, data, and video applications simultaneously</p> <p>Better immunity to noise and interference than baseband</p> <p>More flexible topology (branching tree)</p> <p>Rugged, durable equipment; needs no conduit</p> <p>Tolerates 100% bandwidth loading</p> <p>Uses off-the-shelf, industry-standard CATV components</p>	<p>Supports voice, data and video applications simultaneously</p> <p>Immunity to noise, cross talk, and electrical interference</p> <p>Very high bandwidth</p> <p>Highly secure</p> <p>Low signal loss</p> <p>Low weight/diameter; extremely flexible, pliable; can be installed in small spaces</p> <p>Durable under adverse temperature, chemical, and radiation conditions</p>
Major disadvantages	<p>Low immunity to noise and cross talk</p> <p>Lacks physical ruggedness; requires conduits, trenches, or ducts</p> <p>Speed and distance limitations</p> <p>Existing plant may be unsuited to data transmission (i.e., wire pairs may not be twisted; grade and quality may vary; accurate cable records may not be available)</p>	<p>Lower noise immunity than broadband (can be improved by the use of filters, special cable, and other means)</p> <p>Bandwidth can carry only about 40% load to remain stable</p> <p>Limited distance and topology</p> <p>Conduit required for hostile environments</p> <p>Not highly secure</p> <p>Rigid and bulky, difficult to install</p> <p>More expensive than twisted-pair</p>	<p>High maintenance cost</p> <p>More difficult to install and tap than baseband</p> <p>RF modems required at each user station; modems are expensive and limit the user device's transmission rate</p> <p>Rigid and bulky, difficult to install</p> <p>More expensive than twisted-pair</p>	<p>Higher cost, but declining</p> <p>Requires skilled installation and maintenance personnel</p> <p>Taps not perfected</p> <p>Currently limited to point-to-point connections</p>

“nodes.” A node in a traditional data communications network sits at the intersection of two or more transmission paths and switches traffic among those paths. On most local area networks, a station attaches to a single transmission trunk at one point, catching signals addressed to it and transmitting signals along the single path to other, similar stations.

There are three basic LAN topologies: linear bus, ring, and star. In a linear bus topology, stations are arranged along a single length of cable that can be extended at one of the ends. A tree is a complex linear bus in which the cable branches at either or both ends, but which offers only one transmission path between any two stations. All broadband networks and many baseband networks use a bus or tree topology.

In a ring topology, stations are arranged along the transmission path so that a signal passes through one station at a time before returning to its originating station; the stations form a closed circle. A loop network is a ring network in which one master station controls transmissions. A star network has a central node that connects to each station by a single, point-to-point link. Any communication between one station and another must pass through the central node.

In the United States, bus and tree topologies are presently the most common, due largely to the efforts of the Ethernet community to establish that particular bus architecture as a standard. In Europe, ring architectures are more common because much of the pioneering work in ring networking occurred at European universities. The introduction of the IBM Token-Ring Network has begun the proliferation of ring-type networks in the U.S.

In bus and ring networks, all transmissions are broadcast. Any signal transmitted on the network passes all the network's stations. The receiving intelligence in each station recognizes its address on a given signal and copies only such signals. In star networks, signals sent through the central node are circuit switched to the proper receiving station over a permanently or temporarily dedicated physical path.

Each topology has particular strengths and weaknesses. In choosing a topology, one must examine performance issues including delay, throughput, reliability, and robustness—the net-

work's capability to continue through, or to recover after, the failure of one or more of its stations. Users must also consider such physical constraints as circuit speed (or raw data rate), maximum operating distance, maximum number of stations, channel error rate, and overall system costs. Table 2 compares the three basic topologies, with graphic representations of a number of their variations.

### **Access Method**

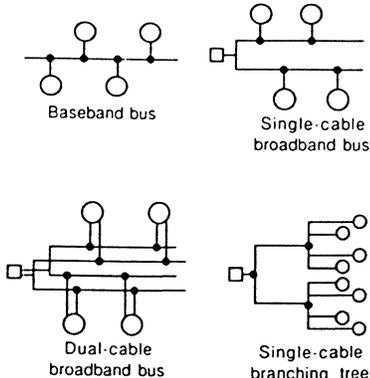
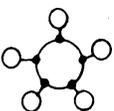
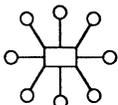
Using a network access method, the network distributes the right to transmit among its participating stations. The right to transmit is an issue only in broadcast topologies, where stations share a single, main data channel on which all stations receive and on which any station can transmit. The access method is the network's way of controlling traffic.

In general, access control can be centralized or distributed. Most conventional networks of computer terminals use central access control: A mainframe or its front-end processor polls the terminals in sequence for their transmissions. Most LANs use distributed access methods: Each station participates equally in controlling the network. There are two general classes of distributed access: random, or “contention,” and deterministic. With a random access method, any station can initiate a transmission at any time. With a deterministic access method, each station must wait its turn to transmit.

*Carrier Sense Multiple Access (CSMA):* The most common random access method on today's LAN market is carrier sense multiple access (CSMA). In a CSMA network, all stations can sense traffic on the network. When a station wishes to transmit, it “listens” on the main data channel for the sort of electrical activity it recognizes as traffic—it “senses carrier.” If the station senses traffic, it defers its transmission for a random interval and then resumes listening. When the station senses no traffic on the channel, it transmits.

One weakness in CSMA is that two stations may sense a clear channel at the same time and transmit simultaneously. A “collision” results—the signals from simultaneously transmitting stations interfere with one another. Many CSMA networks implement a mechanism for collision detection

**Table 2. Comparison of Basic Topologies**

Typical Schematics	Performance Considerations	Constraint Considerations
<p>Linear Bus Topology</p>  <p>Baseband bus</p> <p>Single-cable broadband bus</p> <p>Dual-cable broadband bus</p> <p>Single-cable branching tree</p>	<p>Delay—in token bus networks, waiting time is a fixed function dependent on number of nodes in network; in contention bus networks, delay is a variable dependent on current traffic; delay distortion ("jitter") is possible</p> <p>Throughput—in token bus networks, throughput decreases with each node added; in contention networks, throughput is best in light, bursty traffic conditions and decreases in high-volume steady-traffic environments</p> <p>Reliability—failure of one station will not affect the rest of the network; break in cable may affect only part of the network</p> <p>Robustness—relationship between stations is peer-to-peer; network is difficult to monitor; in contention networks, the difference between noise and collisions may be difficult to distinguish</p>	<p>Circuit speed—varies up to 50M bps</p> <p>Distance—generally unlimited by topology</p> <p>Maximum number of nodes—user stations may be added or deleted without reconfiguring the networks; in token bus networks, addition of each station directly affects performance</p> <p>Error rate—bit errors are lowest when fiber optic cable is transmission medium, low when coax cable is used, high with twisted-pair wire</p> <p>Cost—generally, lower cost per user station than star networks and higher than ring networks</p>
<p>Ring Topology</p> 	<p>Delay—waiting time is fixed function dependent on number of nodes in network</p> <p>Throughput—decreases with each added node</p> <p>Reliability—if one station fails, whole network fails unless bypass circuitry has been implemented in each interface or node; if loop is severed, the whole network fails, unless redundancy features have been implemented; potentially low reliability can be compensated for by high-quality engineering design</p> <p>Robustness—Nodes are easy to understand, construct, and maintain; may require custom-designed, device-dependent interface; communications control overhead is generally high; if network fails, recovery may be difficult, and may require complex logic and processing</p>	<p>Circuit speed—varies up to 80M bps</p> <p>Distance—limitations are imposed both on total distance and distance between nodes</p> <p>Maximum number of nodes—may be fixed parameter dependent on command station capacity; addition of each station directly affects performance</p> <p>Error rate—twisted-pair wire is vulnerable to transient errors; fiber optics has very low error rate</p> <p>Cost—generally, lower cost per station than other topologies</p>
<p>Star Topology</p> 	<p>Delay—in heavy traffic conditions, requests for service may be blocked at the switch in a PBX</p> <p>Throughput—dependent on internal bus capacity of central node</p> <p>Reliability—failure of one station does not affect the rest of the network; if central node fails, the whole network fails</p> <p>Robustness—Ready availability of network monitoring and control software; high overhead for communications control; corresponds well to applications in hierarchical (master/slave) networks</p>	<p>Circuit speed—varies considerably depending on medium, to a maximum of 10M bps</p> <p>Distance—limitations are imposed on distance between central node and any user station</p> <p>Maximum number of nodes—expansion limitations are dependent on capacity of central node; difficult to reconfigure</p> <p>Error rate—twisted pair wire is vulnerable to transient errors</p> <p>Cost—high initial cost, but low incremental costs thereafter</p>

**SCHEMATIC SYMBOLS**  
 — Transmission medium  
 ○ User station  
 • Connection device (network interface unit, RF modem, transceiver, etc.)  
 □ Command station (central host, PBX switch, etc.) or cable head-end

**Table 3. IEEE 802.3 Specifications**

	10BASE-5 (Standard Ethernet)	10BASE-2 ("cheapernet")	10BROAD-36 (Broadband Ethernet)	1BASE-5 (1M bps Starlan)	10BASE-T (10M bps Starlan)
<b>Bandwidth</b>	10M bps	10M bps	10M bps	1M bps	10M bps
<b>Media</b>	"Thick" Coaxial Cable	"Thin" Coaxial Cable	CATV Coaxial Cable	Twisted-Pair Wire	Twisted-Pair Wire
<b>Distance</b>	500 Meters	200 Meters	3.6 Kilometers	500 Meters	100 Meters
<b>Topology</b>	Bus	Bus	Bus	Star	Star

(CSMA/CD), which allows stations to recognize a collision, stop transmitting immediately, and resume transmission after a random wait (reducing the probability that any two stations will again transmit at the same time). Another mechanism implemented is collision avoidance (CSMA/CA). Using CSMA/CA, a transmitting station first "senses" whether the line is free. If other traffic is already on the line, the device waits until the line is free before transmitting. If it senses that the line is free, the device waits a predetermined period of time before reserving the line via a "handshake" process.

*Token Passing:* The most widely used deterministic access method is token passing. In a token-passing network, stations distribute the right to transmit on the channel by circulating a token, a special bit pattern that assigns the right to transmit to the station that receives it. A transmitting station waits until it receives the token from the previous station in the token-passing order. When the station receives the token, it transmits its data, then passes the token to the next station. Token passing is a form of distributed polling; each station on the network polls the next station in line for its transmission. Token-passing networks require a slightly greater effort to configure than do contention networks, because each station must have not only a logical address, but also a logical place in the token-passing sequence. CSMA, CSMA/CD, and CSMA/CA are most often found in bus and tree networks; token passing is most often seen in bus and ring networks.

A network's access method is the most important factor in determining its performance. Each access method functions differently under different kinds of traffic and on networks of different sizes.

CSMA networks perform better with sporadic, or "bursty," traffic patterns in which some stations transmit a great deal of data at a time or transmit very often, while others transmit a smaller amount of data less frequently. Performance on a CSMA network degrades as the likelihood of a collision increases. The probability of a collision increases with the number of stations likely to transmit and with the physical length of the network's main cable (since the time a signal takes to reach the station farthest from the transmitting station affects the likelihood of that station's sensing carrier in time to withhold its transmission). Another factor in CSMA networks is the length of the individual transmissions. A CSMA network operates more efficiently when stations transmit long individual messages rather than a large number of short messages.

Deterministic access methods perform better under uniform, heavy traffic than do CSMA networks. The number of participating stations is the most important factor affecting performance in token-passing networks, since the right to transmit must circulate through every other station before a given station may transmit again. Under any loading conditions, performance is more predictable for deterministic access methods than for random access methods.

#### High-Level Network Services

The design of most LANs is based on the reference model for OSI proposed by the ISO. All the characteristics we have discussed concern the two lowest levels of network services: those that can be classed as Layer 1 (Physical layer) or Layer 2 (Data Link layer) services in the OSI reference model. These layers pertain to the physical and electrical characteristics of the transmission medium and to link

access management (e.g., transmission setup, address recognition, message acknowledgment, and basic error checking).

A few vendors provide Layer 3 (Network layer) and Layer 4 (Transport layer) services. Layer 3 services involve network control, management, and maintenance. This type of control is generally software based and resident in a network processor, controller, or master unit. Layer 3 services include call establishment, maintenance, and disconnection; end-to-end traffic routing and flow control; management of buffering between end-user devices and the network; packet assembly/disassembly; end-to-end error checking and recovery procedures; network monitoring and diagnostic services; dynamic network reconfiguration; priority and security management; and status and statistics reporting.

Layer 4 functions pertain to "internetworking," the interconnection of one LAN to another or to a public or private long-haul network. Internetworking is generally performed through a software package called a gateway. Gateway functions include store-and-forward operations, protocol/code/interface conversion, and security procedures. Generally, the gateway resides on a single network node, and all traffic traveling between the two networks is funneled through a single port on the node.

TCP/IP is currently the de facto standard for internetworking in the United States. Originally developed for the U.S. military's Arpanet network, the Department of Defense requires TCP/IP for all government and military contracts. TCP/IP software is now used frequently in the private sector for communications between personal computers and other supporting processors linked to mainframes and departmental systems. Until other standards allowing companies to implement an ISO-standard network supplant it, TCP/IP will continue as the de facto standard for high-level applications.

The physical location of network services within a network varies greatly from one LAN product to another. The placement of network intelligence can generally be classified on one of four levels:

1. The end-user device performs all station functions and drives the communications medium; the network provides Layer 1 services only.
2. The end-user device connects to a separate network interface unit that provides Layer 1 and Layer 2 services and a small amount of buffering.
3. The network interface unit provides end-to-end Layer 3 reliability services, plus increased provision for buffering.
4. The network interface unit is a full-fledged micro- or minicomputer that provides all interconnection functions.

Whenever a function resides in the end-user device, it is considered to be outside the network. The user is usually responsible for developing and maintaining this software, though some LAN vendors have begun to provide high-level software for certain applications. Applications-related functions—program-to-program communications, distributed database management, file transfers, peripheral sharing, network management, and applications switching—often identified as the primary purpose for a LAN, are, in most cases, performed outside of the network.

Services at the Session (Layer 5), Presentation (Layer 6), and Application (Layer 7) layers depend heavily on the specific purpose of the individual network. Different types of services are best for different applications. Users can find such services in single-vendor, comprehensive LANs such as Digital Equipment Corporation's adaptation of Ethernet to its DECnet architecture.

### **Bridges, Routers, and Gateways**

As the number of separate, different types of LANs in an organization grows, interest in linking them increases. Bridges, routers, and gateways all perform this function, each at a different layer of the network and each in a different manner.

*Bridges:* A bridge connects two or more networks at the Media Access Control (MAC) portion of the Data Link layer, where differences in the high-level protocols (such as TCP/IP or OSI) used on the two networks to be linked are not a factor. A bridge will pass packets of any protocol, but the station receiving the packet must employ that protocol to read the packet. Bridges, therefore, generally connect networks with common architectures and protocols. Some bridges can translate packets from networks with differing MAC-layer characteristics, such as Ethernet and token-ring.

Bridges can improve the performance of a large network by splitting it into smaller segments, thus reducing traffic on each of the resulting subnets. Bridges can also connect networks using different types of transmission media, such as coax and twisted pair, or to connect a network to a backbone running between floors or buildings.

Remote bridges may link LANs in widely separated geographical locations over telecommunications lines. Most bridges today are referred to as learning bridges, because they keep tables of network addresses. Each time the bridge reads an address it has never seen before, it broadcasts the packet in question. When the receiver acknowledges, the bridge notes the location in its table, so that when it sees the address again it will know how to get to it.

*Routers:* Routers, which operate at the Network level of the OSI model, feature more sophisticated addressing software than bridges. Where bridges simply pass along everything that comes to them, routers can determine preferred paths to a final destination. Routers can be employed in complex internetworks and can be programmed to route packets according to various criteria. They can select the cheapest or fastest route, depending on the needs of the network and its users. This additional intelligence, however, makes them slower and more expensive than bridges. In addition, a particular router only works with one protocol. In internetworks with segments that operate under different protocols, a separate router is necessary for each one, but several router devices can reside in one chassis.

*Gateways:* Gateways operate at the OSI Transport layer or above and link LANs to networks which employ different protocols, such as TCP/IP, IBM SNA, DECnet, and X.25. Packets received by a gateway must be restructured into a format understandable by the destination network. This restructuring means delays in transmission.

### **LAN Standards**

The number of technologies available for local area networking, and the number of practical combinations of those technologies, creates both opportunity and confusion. The opportunity comes to the sophisticated purchaser who can pick and choose carefully among the range of available options to

create a specific solution for specific needs. The confusion comes from the lack of compatibility among different commercial solutions and the end-user equipment that eventually must communicate over the local area network. The local area network market has seen two major efforts to establish standards: one launched by industry organizations attempting to legislate standards in advance of the market, and one by individual vendors and groups of vendors attempting to establish de facto standards by making their interfaces widely available at low cost. Committee 802 of the Institute for Electrical and Electronics Engineers (IEEE) has led the legislative effort; the Ethernet vendors, spearheaded by Xerox Corp., led the initial market effort.

*IEEE Committee 802 Standards:* Late in 1982, Committee 802 published draft standards for two types of local area networks. The first, Standard 802.3, was published in 1983 and has been adopted by the International Organization for Standardization (ISO) as its 8802-3 standard. It describes a baseband, CSMA/CD network—similar to Ethernet—and includes several addenda adopted since its publication. 10BASE-2 deals with 10M bps baseband networks running on thin coaxial cable. 1BASE-5, similar to AT&T Starlan, is a 1M bps, twisted-pair configuration. 10BROAD-36 is a broadband 10M bps network running over thick coaxial cable. 10BASE-T is a 10M bps network operating on unshielded twisted-pair wire. It requires two separate twisted-pair lines—one for transmit and the other for receive. Table 3 summarizes the 802.3 specifications.

The second standard, Standard 802.4, describes a token-passing, baseband or broadband, bus network, similar to the Manufacturing Automation Protocol (MAP) standard.

IBM presented specifications for its Token-Ring Network to both IEEE Committee 802 and the engineering and trade press. The result is Standard 802.5 for token-ring, baseband local area networks, published in 1985. 802.5 panels are still at work on addenda on Early Token Release and Counter Rotating Rings. Early token release is a method of enhancing token-ring network performance, and counterrotating rings provide fault tolerance through redundant data paths.

Standard 802.1 describes network architecture concepts applicable to all networks. Subcommittees are still developing addenda on bridging and network management under this standard. The Committee has also released specifications for Logical Link Control, the protocol to be used with the two networks, in Standard 802.2. Other 802 committee work includes Standards 802.6 on Metropolitan Area Networks (MANs), 802.7 for broadband LANs, 802.8 on fiber optic media, 802.9 on LANs and Integrated Services Digital Network (ISDN), 802.10 on network security issues, and 802.11 on wireless LANs.

### LAN Applications

A local area network can support almost any application now served by conventional point-to-point communications. The implementation of a local area network can, however, be a radical and expensive step—and hard to justify if its sole purpose is simply to replace an existing cable plant for tried-and-true applications. A radical innovation must offer radical benefits. A local area network can simplify and streamline current procedures, of course; but in addition, it can offer benefits not available, or simply too expensive, with conventional local communications. These benefits vary for different applications in different environments. In the following, we list the best capabilities of LANs in several broad areas of application.

### General Business Data Processing

Simply running computer programs has never been the job of the corporate data processing department. Data processing must also manage the data that goes into a computer and the information that comes out, design and implement software for new applications, adapt current software to changing needs, maintain current programs and hardware, plan for the expansion of existing facilities and for the replacement of obsolete components, and ensure that such expansions and replacements remain compatible with current programs and procedures. The local area network offers DP managers a chance to restore order from the chaos that was slowly creeping in via cheap personal computers, compromising the DP manager's management and planning functions.

Using a LAN, the DP manager can centralize control of the company's newly distributed computing resources, ensuring, at minimum, that each

department's new computers are compatible with the network and, ideally, that they are compatible with every other department's machines. The DP manager can also ensure that all the company's decisions are based on the same data and not on each planner's custom-tailored collection of numbers. Used properly, a LAN can provide a common interface for a diversity of otherwise incompatible equipment, serving as the backbone of an orderly hierarchy of computing functions extending from the mainframe to the desktop.

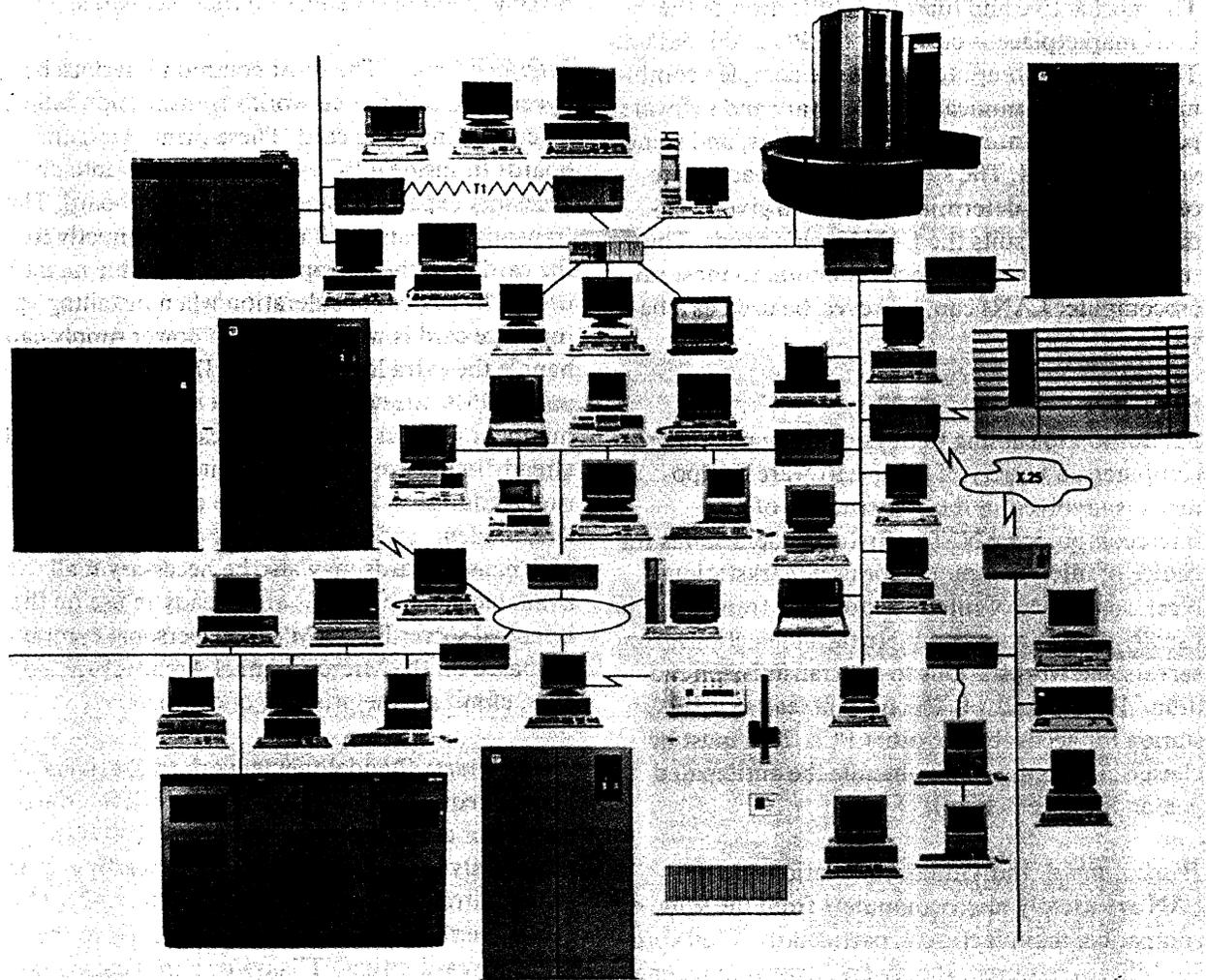
In the computer room, the local area network can relieve the mainframe of the job of arbitrating among users needing access to storage and communications facilities, releasing a greater percentage of its resources for actual computing. The LAN can also streamline users' access to remote communications facilities, eliminating redundant hardware and further easing the mainframe's burden. In large DP shops, it can provide a high-throughput path for computers sharing common databases.

### Office Automation

In a data processing shop, integrity and compatibility are big issues. The automated office requires timeliness and friendliness. In the office, the local area network can give users fast and efficient access to a common pool of information including customer lists, supplier lists, schedules, and document formats. In many cases, it allows a company to establish standard formats for files and documents for the first time and to guarantee a minimum of deviation from those standards. A LAN can allow an entire office to pool expensive resources such as printers and duplicators, streamlining the production and distribution of paper documents.

Ultimately, the office local area network can eliminate the need to circulate paper documents by distributing schedules and memorandums almost instantly to each worker's workstation. Workstations have yet to appear on every desk in the office, but in many companies they are now more common than typewriters. In the completely electronic office, a LAN can provide nearly instantaneous desk-to-desk communications, allowing the workstation to function as typewriter, copier, and telephone for internal use. The local area network also offers management a more direct way to monitor staff performance and to control the quality of information handling throughout the office.

*Figure 2.  
Multivendor Connectivity*



*This diagram illustrates the multilevel, multivendor nature of today's networking capabilities. All types of machines, from laptop PCs to ultrahigh-speed supercomputers, can be linked to provide true distributed processing.*

**Industrial and Laboratory Automation**

Efficient process control requires rapid feedback from monitoring devices to the central site. A good feedback loop requires very fast, very reliable, two-way communications. An automated factory or laboratory, with a proliferation of intelligent robots, sensors, and measuring instruments, is a natural environment for the local area network. In the factory, a LAN can simplify "retooling" by allowing the user to download new software to a number of programmable devices simultaneously from a central site. It can allow the near-instantaneous isolation of failures and bottlenecks in plant operation. By permitting feedback among a number of intelligent machines, a LAN enables managers to

automate the minute-by-minute decision-making process to a degree not possible with point-to-point communications through a central mainframe or minicomputer. A LAN also simplifies the gathering of performance information, allowing designers to optimize plant operations and to plan for future growth.

Eventually, laboratory and factory process control networks will hook up directly to the engineers' CAD/CAM workstations and to the data processing department's inventory and distribution records, realizing automation's potential for the entire operation over a single, integrated system.

## Products

### Local Area Networks for PCs

The most active and lucrative subsection of the LAN marketplace is currently the PC LAN market. Today's microcomputer LANs are complex combinations of communications hardware and software parts—some common between vendors, and some very specialized. The specialized approaches are, of course, what determine how well a given vendor's approach suits the LAN buyer's needs. The fundamental building blocks common to most microcomputer LANs can, however, be used as a basis for evaluation.

### Hardware

In addition to cabling to physically connect microcomputers, a variety of other hardware components is involved in the construction of a microcomputer LAN. The first consideration is the choice of microcomputers for user workstations. Next, some type of interface board or transceiver is usually necessary to complete the connections from servers and workstations to the transmission medium. Finally, most LANs have at least one server station for access by the other PCs. This must be chosen and configured to handle the anticipated demands of the network.

*Workstations:* Individual workstations on the LAN are usually microcomputers from the same or compatible manufacturers, particularly if full compatibility is required. If network software must be resident in each workstation PC, a minimum amount of memory may be a prerequisite. Standardization to a given release of the PC operating system is generally required as well. If the user stations are incompatible types, special provisions must be made for connecting them to a PC LAN. 3Com's Ethernet LANs are a good example. Using special interface cards, Apple Macintosh users can access the LAN, originally designed for the IBM PC and compatibles. Unrestricted file sharing, however, is still limited to compatible devices. Macintosh users can share files and programs (on any network server) with other Macintosh users and can receive electronic mail or straight ASCII files from any other station. Apple users cannot, however, share IBM binary files and programs, or vice versa. Their programs and file formats are entirely different, and the 3Com network, like any

other microcomputer LAN, cannot bridge that kind of compatibility gap. Usually, vendors of smaller LANs do not provide any provision for mixing incompatible PCs on their networks.

*Interface Cards:* The most common interface between a PC and the network's transmission cable is a network interface card. These printed circuit boards fit inside a PC cabinet, generally into an accessory expansion slot on the motherboard. The transmission cable will usually attach directly to the card, or a short drop to the main cable might be used. The major consideration when installing an interface card is whether the PC power supply can handle the extra load. With the IBM PC and compatible PCs, the card's interrupt address and the number of Direct Memory Access (DMA) channels already in use are also important. Conflicts between addresses of the interface card, disk controllers, modem cards, etc., must be resolved. Shuffling of expansion cards may also be necessary if all available DMA channels are already in use on the intended server PC. IBM's PS/2 personal computers based on the Micro Channel Architecture, however, eliminate the problem of conflicts.

*Transceivers:* Standalone network transceivers may be required in addition to network interface cards. For example, "thick" Ethernet LANs that use heavily shielded coaxial cable generally require a special transceiver to link a PC to the LAN. Thin cable interfaces are usually made directly to the interface card, using "T" and/or barrel coax connectors. Transceivers are also available to connect interface cards designed for one type of media to a different type. For example, a transceiver can convert the signal from a card intended for coaxial cable to one that can be transmitted over unshielded twisted pair.

*Servers:* The server station provides a central repository for programs, text, and data available to LAN users. The server is usually a suitably configured microcomputer. For use as a server, a PC must have a hard disk for storing shared information and loading appropriate server control software. The microcomputer must also have enough memory to handle the overhead of the network software. Some networking systems allow a hard disk-equipped PC to also be used as a workstation

while network functions are handled in the background. This will usually slow down overall network response to requests to the server, however, since the PC's I/O capability is limited to one request at a time. For this reason, most IBM PC-oriented LAN users find it practical to dedicate a PC to server use. With the wide availability of microcomputers based on 80286 or 80386 chips and with the next generation of networking software based on the Microsoft OS/2 LAN Manager, some hardware characteristics will change and some limitations eventually disappear.

Not all PC LANs require servers. For example, certain network operating systems provide a configuration that effectively distributes the accessible database throughout the workstations. Implemented at every node, the network software is actually an operating system that converts the LAN into a continuous, multiuser information processing system. In this instance a workstation may request to share information directly with other workstations. The requester must then decide how to store the information. Options are local storage or copying back to the source.

*Superservers:* A recent development in server technology is the so-called "superserver," which is based on multiple processors and has an I/O architecture similar to that of a minicomputer, with many ports for peripheral attachment. The multiple CPUs of such a machine, generally from two to eight Intel or Motorola processors, can divide tasks among themselves to speed network transactions. Newly formed companies such as NetFrame, Tri-cord, and Parallan offer the most technically interesting designs so far, while traditional computer manufacturers have been quick to adopt the "superserver" label for some of their especially high-performance machines. Compaq has brought out a dual-processor model of its SystemPro microcomputer.

*Device Sharing:* Not all servers provide only disk and file service. As discussed previously, a major feature of a PC LAN is provision for sharing expensive peripherals. While this capability may be an option, most LANs have some provision for parallel printer sharing, including print spooling routines. Some allow sharing of the server's serial ports, permitting the connection of modems and plotters. If the need is great enough, a dedicated

printer server may be justified. Networks needing connection to the outside world via dial-up communications can now purchase a modem server, which gives any network station access to a modem and communications software, as well as allowing the sharing of outside lines.

*Repeaters:* To overcome distance limitations of the basic network, vendors also may supply repeater or line driver devices that effectively boost the signal strength on the transmission medium, allowing the connection of two or more basic networks. The repeaters enable communications for stations beyond the limitations of a basic network. Repeaters do, however, have their own restrictions—signal propagation delays between extreme ends of a network will generally limit the number of repeaters that can practically be used together. With CSMA/CD networks, unusually long signal delays can subvert the collision detection mechanism, forcing careful adherence to the vendor's published distance limitations.

#### **Software**

Software considerations for PC LANs are very important and can be analyzed from two perspectives: network operating system software and applications software. All microcomputer LAN vendors provide some software to facilitate basic network management, file transfer, and connectivity functions. Network services such as electronic messaging, mail, remote access, and print spooling functions may also be available as either part of the basic network software or as add-on modules. The most important consideration in choosing network software is how it interacts with the microcomputer's operating system software and with the applications software to be networked.

*Applications:* Spreadsheets, word processing, graphics, and other miscellaneous business software packages are the most common applications run on microcomputer LANs. These are traditionally oriented toward the standalone user, and they require no special considerations to operate in a networked environment. Users must merely have some sort of agreement in place regarding access to the data files each creates and maintains. For example, a manager may elect to make some departmental information, such as employee work schedules, addresses, meeting schedules, open

memos, etc., available as public data. Other information such as spreadsheet-created budgets might necessarily be shared only with other managers, and a third type of information might be private and for the manager's review and edit only. The network software can easily handle these classifications.

Multiple access levels can be implemented by combinations of password security and the creation of public, shared, or private information volumes (storage areas). Public volumes are available for reading or copying only; private and shared volumes allow reviewing and editing by privileged users who know the password to access a volume. Initial setup of user volumes is done via administrative routines in the network system software. These provisions are usually implemented and maintained by a designated system administrator and can be changed as applicable.

*Integrity of Data:* Databases and accounting software present unique problems in a network environment, since access to data files must be controlled to ensure the integrity of the database. If one user of a networked accounting system attempts to generate monthly invoices and statements while another user is posting all applicable receivables, an unfortunate customer might be billed twice for the same purchase. While not a problem with the network per se, it is a typical consideration when migrating applications from stand-alone PCs to a PC LAN.

A more serious task is the implementation of database software on a LAN. Here, some provision must be made for file or record protection to avoid a situation in which two users are simultaneously updating data in the same record. When each record is stored, only the last "copy" of the record written to disk will be available for the next query. In this scenario of simultaneous attempts to update the same record, the last record written will have "old" data in the field that was just updated by the first user, and this old data will corrupt the record. Database users planning to migrate from single PCs to a LAN must keep this in mind when choosing their system, so that some data protection scheme is used. This situation can usually be addressed by updating to a "network" version of the software, by provisions in the LAN's system software, or by the LAN's server configuration itself. Network versions of applications software have

either file- or record-locking provisions to prevent users from simultaneously accessing the same record. They usually depend on some interaction with the LAN's operating system for this protection.

*Record and File Locking:* Most LAN vendors provide some file or record locking as part of their system software, and as long as users access the files in a way the network expects them to, these provisions will eliminate nearly all data corruption problems. Another type of corruption protection is provided by network servers that qualify as true file servers, as opposed to disk servers that merely respond to workstation requests for information copies. (Today, however, LAN server software has reached such a sophisticated level that users would have a hard time running across a plain disk server program.) File servers have the capability to intercept requests for access to a given file and interleave them as the file is available for edit. This protection may extend to the record level, allowing simultaneous updates of files from multiple workstations without exposure to corruption problems. Some file server programs, such as Novell's NetWare, not only provide concurrency checking but transaction management as well. NetWare's Transaction Tracking System (TTS) provides a rollback capability to transactions that did not complete due to power failures or other incidents that interrupt the processing of a transaction.

*Future File Systems:* Most of the file integrity issues raised here will, we hope, be nonissues within the next few years. This is because the next generation of personal computer operating systems (e.g., OS/2) and network operating systems (e.g., OS/2 LAN Manager based) will have a consistent filing system. Application programs will have a consistent set of compatible programming interfaces that would support their running on a network without the need for tricky, and most often inconsistent, file- and record-locking facilities. Network programs, such as 3Com's 3+Open and the IBM OS/2 LAN Server program, which are both based on Microsoft LAN Manager, are designed to support back-end processing of a global database application. They have an integral SQL database engine (IBM OS/2 LAN Server) or are compatible with such a database engine (Microsoft OS/2 LAN Manager and Novell NetWare).

Finally, if the network is installed by a systems house offering the microcomputer LAN as part of a solution, a special adaptation of applications or system software may be provided as part of the installation. In this case it is best to check with the systems house regarding the specifics of file security before implementing the LAN.

### **Future Trends**

*Token-ring:* The IBM Token-Ring Network is expected to become the dominant networking scheme in the early 1990s, overtaking Ethernet as the leader in number of installed systems. Several clear advantages of token-ring make it an attractive choice. The deterministic token-passing access method makes performance under load predictable and slow to degrade as traffic increases. This predictability and consistency also facilitate expansion, as administrators can judge the effect additional stations will have on the network before actually installing them.

Token-ring is also more fault tolerant, since workstations are attached in a physical star topology to a hub called a multistation access unit (MAU), and the MAUs are linked to form the ring. This arrangement of hardware makes faults easier to isolate and facilitates quick repair.

IBM's range of systems, from PCs to the largest mainframes, can attach to its Token-Ring Network without special devices such as bridges. Keeping in mind that IBM still holds the largest share by far of the business computing market, it should be obvious that this kind of connectivity makes token-ring the network of choice for many potential users. IBM's 1988 introduction of 16M-bit-per-second token-ring presently makes it one of the fastest networks available.

While IBM dominates the token-ring market with a 90 percent share, other vendors have their own ideas about issues in token-ring implementation. The Open Token Foundation (OTF) was formed in December 1988 to help vendors adhere to IEEE standards for token-ring. OTF's 10 full members and 16 associate members include 3Com, Proteon, Gateway, Digital Equipment, Texas Instruments, and National Semiconductor. Thus far, IBM has declined OTF membership but joined OTF members in a multivendor interoperability demonstration at the 1989 NetWorld show in Dallas.

Several vendors have begun to market 16M token-ring networks that run on economical unshielded twisted-pair wiring. IBM initially opposed this trend on the grounds that unshielded cabling is prone to noise interference, particularly at high speeds, as in the 16M bps version. IBM has, however, joined with other token-ring vendors in an IEEE 802.5 Unshielded Twisted Pair study group. Other vendors participating in this group are AT&T, NCR, Proteon, Ungermann-Bass, David Systems, SynOptics, Western Digital, and Cabletron.

*FDDI:* The Fiber Distributed Data Interface (FDDI) is an ANSI standard for a high-speed fiber optic network. Running at 100M bits per second, FDDI is expected to be used as a high-speed backbone connecting multiple LANs in a single building or as a Metropolitan Area Network (MAN) connecting LANs dispersed over several buildings. Other areas where FDDI is likely to be used are in process control and other realtime applications, where high-speed response is critical to performance, and in applications such as medical imaging that involve the transfer of graphics.

FDDI employs a token-passing ring topology with two separate rings, a primary and a secondary. Under normal conditions all traffic travels on the primary ring. If a cable fault interrupts data flow on the primary ring, the network stations involved can automatically reconfigure the path to use the secondary ring. Any station attached to the physical ring must be a dual attachment station; that is, one that connects to both primary and secondary rings. Another attachment method allows many single attachment stations to connect to concentrators on the physical ring, but in the event of a cable break between the concentrator and the single attachment station, automatic reconfiguration is impossible. Concentrators will, however, provide an economical method of attaching several stations to the ring.

*Distributed Processing:* Fully distributed application processing is perhaps the most important development on the local area network horizon. With the full implementation of IBM's OS/2 LAN Server under the Systems Application Architecture (SAA) umbrella, and with network implementations based on the Microsoft OS/2 LAN Manager and complying with the IBM SAA specification, all

connected nodes, from the desktop workstation to the mainframe, would become peers. These developments portend that applications will communicate not only with each other peer to peer, but that processing loads can be dynamically distributed for efficient use of CPU resources. For the PC LAN market, distributed application processing offers many advantages.

The major drawback of current PC LAN systems is the inefficient use of CPU power across the network. File servers do nothing but push blocks of data between their local disk storage and client stations' memory and/or disk storage. Because all processing is done at client stations, even a simple query in a database application creates much data traffic over the cable. Bottlenecks can then ensue, negatively affecting response time when there are many such activities running simultaneously. Security is also compromised, because the client station gains access to the entire database instead of receiving extracted information.

*SQL Databases:* The biggest promise of OS/2 networks is support of SQL-compatible database engines on server machines. This capability allows database applications to execute in two modes—front-end processing of user programs takes place at a user workstation, and back-end processing of core database functions takes place on the database server machine. The potential for improvements in security and reductions in unnecessary network traffic is substantial. LANs for interconnecting OS/2-based systems are also said to provide basic network management functions, including audit trails, network use statistics and report generation, and realtime network administration. Because the industry still awaits a standard for network management, some of the network management software that would be available cannot be expected to be full functioned.

Vendors are wary of incompatibility problems if and when a network management standard is adopted. In the meantime, some vendors feel that offering network management products that are partially compatible with IBM's NetView/PC network management program is a safe bet in the short term. The local area network was never designed to facilitate distributed applications processing, but to provide ease of communications among interconnected computers. Incompatible hardware, operating systems, and communications

protocols that many organizations must contend with, however, necessitated some level of integration in which LANs would play a key role. LANs alone cannot resolve the incompatibility problems in today's computing environments, but they have been the catalyst for impelling standardization efforts, and they surely will continue to do so.

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## Selection Guidelines

### Advantages and Restrictions of LANs

Today's local area network is a wonderfully sophisticated engine for moving several streams of data concurrently, rapidly, reliably, and inexpensively from one physical interface to another. This is, of course, rapidly changing; LANs are slowly becoming the vehicles for true distributed data processing. Every major advantage now offered by a local area network, however, is balanced by one or more restrictions. Some restrictions are built into the technology; others will fall by the wayside as vendors and standards bodies advance the technology.

### Resource Sharing

A local area network allows a large number of intelligent devices to share resources, including storage devices, program loads, and data files. Sharing of hardware such as disks, printers, and connections to outside communications distributes the cost of that hardware among all participating devices and offers large savings compared to the installation of individual disk drives, printers, and modems at each station on the network. Sharing software enhances security, since all attached devices use not only the same version but the same master copy of a given program, and further reduces the need for separate storage hardware. Sharing data increases the reliability of a database, ensuring that changes made by one user are immediately available to all other users.

Resource sharing is perhaps the greatest advantage currently offered by local area networking. Unfortunately, current commercial technology limits resource sharing to mutually compatible devices. Incompatible computers or workstations can share the same disk drive but cannot read or update each other's files. Some users can implement LANs in which one vendor provides all-inclusive solutions: the network, the computers, the storage

media, and the software. In such systems, all devices are mutually compatible by definition. Other users, especially those using the local area network to integrate an existing array of incompatible devices, cannot accept a single-vendor solution. For new users, or those who wish to replace an entire existing facility with new equipment, the single-vendor option presents a different set of disadvantages: It precludes mixing, matching, and price shopping.

Some users are large enough or sophisticated enough to design their own answers to the compatibility problem, but even for these users, the effort can be difficult and costly. Most users must rely on a vendor to ensure compatibility, and many vendors know that compatibility sells products.

Many local area network vendors offer aids to compatibility including protocol conversion and file format conversion. Vendors specializing in networks for personal computers are most likely to offer format conversion, especially among file formats for popular models such as the Apple Macintosh and the IBM Personal Computer. Vendors of large-scale, general-purpose networks offer protocol conversion, usually allowing asynchronous ASCII terminals to emulate IBM 2780/3780 BSC or IBM 3270 BSC or SDLC terminals. For many local area networks, protocol conversion is an everyday task; such networks must convert any end-user signal to an internal network protocol for transmission.

Although many commercially available LANs still do not offer protocol or file format conversion, their numbers are shrinking rapidly. The movement toward standardization offers some hope, but more for communications protocols than for file formats. Even for protocols, it may be too early to adopt a universal standard for local area networking. Just as the potential for resource sharing is the major current advantage of local area networking, the incompatibilities blocking that potential's realization form the major current restriction.

### **Integration of Functions**

The capability to integrate a wide range of functions into a single, harmonious system is another potential advantage of LANs. A local area network can provide a rational framework around which management can build everything from office procedures to strategies for planning, purchasing, and

growth. By focusing on the LAN, creative managers can establish an orderly hierarchy of job functions and of hardware, facilitating the flow of responsibility and information in their organizations.

Implementing a management system in hardware is, however, restrictive. A large investment in a given organizational plan generates a proportional amount of inertia against which efforts to change that plan must struggle. Increasing the efficiency of a good system makes it better; increasing the efficiency of a bad system makes it worse.

No hardware system is a panacea, however attractive it may be. The greater a technology's potential to affect an organization, the more carefully managers must plan its implementation. A local area network is only a tool. Creative management can make it a powerful and effective tool.

### **Higher Channel Speed**

A high data transfer rate is inherent in our definition of a local area network. Most LANs transfer data at rates ranging from 1M bps to 16M bps, and the Fiber Distributed Data Interface (FDDI) will reach 100M bps, a rate many times faster than those available over conventional switched facilities. High throughput rates are indispensable for such applications as high-resolution, movable color graphics, which need megabits of information to paint a single screen, and bulk data transfer among mainframe computers. Users must realize that these high data rates apply to throughput over a multiplexed facility, the network's shared main data channel, and are difficult to translate into turnaround and response times applicable to end users.

Turnaround time on a local area network depends as much on the kinds of applications sharing the network as on the total throughput. Three or four high-resolution CAD/CAM stations can generate as much network traffic as 30 or 40 word processors. Fully interactive applications can generate more than twice as much traffic as simple data entry.

Potential LAN users must avoid infatuation with data transfer numbers and look carefully at the size of the proposed network and the nature of the applications to be installed. The network's access method also plays a large part in determining throughput and turnaround time under different loads.

### **Simplicity and Flexibility**

Most local area networks use a simple and elegant architecture with control distributed among the participating stations. Since the entire network does not depend on a single polling or switching device, such networks tolerate isolated failures quite well. A hardware or software failure in one station usually affects only that station. Distributed control also eases reconfiguration and expansion; participating devices in most LAN architectures need not be aware of the precise number or arrangement of the other stations. Users can move or add stations on such networks with relative ease. A LAN's simplicity and flexibility are among its most notable selling points. Again, however, poor initial planning can negate this advantage. Users must plan for both device failures and growth. A faulty network attachment unit is easy to replace, but only if a spare is on hand. An inflexible cable layout might have to be replaced completely in order to expand the network.

### **Security**

By design, most local area networks are easy to tap. This makes networks easy to expand and reconfigure but makes it virtually impossible to prevent simple physical intrusion. At the current state of the art, lack of data security is arguably the biggest disadvantage of a local area network. New, simpler tapping mechanisms exacerbate the problem. Some vendors have addressed the security problem by implementing data encryption as an add-on feature, but encryption can only prevent the use of intercepted data. A relatively unsophisticated vandal can still easily jam or destroy data.

Users should never allow plant security applications, such as card-access locks or security video, to share the same cable plant as everyday data applications. Separate networks should be established for secure and open facilities; if necessary, such networks can be interconnected through a secure bridge or gateway that can block unwanted signals. If possible, redundant cabling should be installed, so that an intentional or unintentional break in the cable will not bring down the network.

The increased use of optical fiber in LANs will alleviate many of these security problems. Fiber optic cable is virtually impossible to tap and is immune to electromagnetic interference (EMI) and radio frequency interference (RFI). See the section

on Transmission Media under LAN Technology for more information on optical fiber.

### **Alternatives to LANs**

For some applications, LANs are either too costly or too unsophisticated technologically. Other technologies are available that can do the job better.

For simple port selection or port contention among one or more computers and a network of terminals, a local area network is simply overkill. In such situations, users wish only to gain access to host-resident applications; the host computers handle requests for storage and peripheral service. Their terminals are usually unintelligent, asynchronous devices with no capability to share software with the host or with one another; these terminals also need to communicate with only one computer. Applications requiring simple port selection and contention are most common on university campuses or in their industrial counterparts' research and development labs.

For port selection among a small number of similar computers with similar operating systems, a shared front-end processor is more effective than a local area network. When mutually incompatible computers are involved, a port selection switch or a data PBX is the best choice. Both front-end processors and data switches have been available for years and offer all the benefits of proven technologies: stable interfaces; time-tested maintenance and control procedures; established, reliable vendors; and a history of satisfied customers. Users should not risk using an infant technology for simple applications when less risky alternatives are available.

Large-scale, fully integrated voice and data networks lie at the other end of the spectrum. No existing LAN can handle a full load of voice telephone traffic along with a full load of data. Local area networks are a creation of the data processing industry, and their technology has bypassed, not solved, the problems of voice communications that the telephone industry has been addressing for decades.

From the telephone industry comes the voice/data PBX, a circuit switch built on a digital matrix and designed to handle both voice and data traffic. In data handling applications, such systems represent a technology even younger than the LAN, and their data transmission capabilities are still somewhat narrow. Nonetheless, they do offer a number

of advantages for large offices in which management would like at least the capability to place a terminal on every desk. Any large office must have a telephone network and, in a large plant, the costs saved by having data applications share that network rather than installing a separate cable plant for data can more than make up for the high initial cost of a voice/data PBX. The big switches' present data handling limitations are not really an issue; vendors will have corrected any bugs long before current LAN vendors teach their networks to switch voice calls.

Both data switch and voice/data PBX vendors are heating up the competition with LAN technology. The resulting products are hybrids of local area networks and traditional circuit switches; individual switches handle local communications in their own domains while participating in a network of similar switches based on a LAN technology such as the token-passing ring. Several vendors of data-only switches now offer such hybrids.

#### **Pricing Considerations**

Costs are one of the hardest elements of LAN design to analyze. Comparison is difficult because, in many cases, users are trying to compare disparate systems and because costs are declining rapidly as the market develops. In considering price, many of the rules of thumb that apply to long-haul networks and to data processing technologies in general are applicable to LAN networks:

- Older, established technologies are less expensive than state-of-the-art and experimental technologies.
- Equipment available off the shelf is less expensive than customized systems.
- Prices increase as the level of network services increases.
- Price increases as speed and performance increase.

One frequently used leveler is "average price per workstation connection." The price per connection for a LAN may, however, vary widely, depending on what the price includes. When we asked vendors to approximate the price per connection for their LAN products, the prices they quoted ranged from \$50 to nearly \$40,000, depending on whether the price was simply the cost of tapping a user station into a preexisting LAN, or whether the total cost of the whole network system—including cabling, transmission components, network management hardware and software, connection hardware, installation, and technical support—was averaged over a typical number of workstations.

When requesting preliminary price estimates from several vendors, we suggest users describe a configuration that approximates their needs and specify which components should be included in the price, giving true grounds for comparison. Right now, the typical price to tap a user terminal into a LAN (\$200 to \$1,000) may be more than the cost of the terminal itself. As with other new technologies, however, prices are dropping as the number of users increases and volume production methods are implemented. When LAN standards are accepted, and the interface-on-a-chip becomes available, the connection price is expected gradually to become negligible, comparable to the cost of installing an extra telephone connection on a PBX system. ■



# Local Area Network Products: Comparison Columns

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**Synopsis**

**Editor's Note**

This report contains specification and pricing information on eight categories of products for use with LANs: network operating systems, network servers, network interface cards, wiring centers, diskless workstations, bridges, routers/brouters, and gateways. For more detailed information on the technology behind these products, see Report 520-201. For information on the LAN marketplace, see Report 520-101.

**Comparison Column Highlights**

During November and December 1990, Datapro surveyed nearly 300 vendors known or believed to be manufacturers of products that fall in the eight categories contained in this report. The resulting comparison columns spotlight the characteristics and pricing of over 1,000 products offered by more than 200 vendors. (Please note that most of the vendors included in this report offer products in two or more categories. To make it easier for you to locate appropriate vendor information, a separate vendor list has been included for each product category.) The breakdown of number of vendors and products by product category is listed in Table 1.

*The absence of any company or product from these columns means that the company either failed to respond to our repeated information requests or declined to be part of the survey.*

In "Comparison Column Entry Descriptions," we have briefly defined the row headings in the columns. We suggest that the reader consult these descriptions before reading the columns. There are separate descriptions for the eight product categories.

When a vendor did not provide information for a specific entry and we could not locate that information in our files, we have listed "None identified" on the appropriate line. In addition to the lines allocated for vendors to indicate specified information about their products, we have added space at the bottom of the columns for vendor comments about options or special features.

Datapro would like to take this opportunity to thank those vendors listed for their help in providing you with up-to-date, accurate information.

**Table 1. Vendor/Product Breakdown**

	Vendors	Products
Network Operating Systems	38	58
Network Servers	42	92
Network Interface Cards	112	612
Wiring Centers	48	159
Diskless Workstations	30	67
Bridges	59	129
Routers/Brouters	41	69
Gateways	52	116

## Vendors

### Network Operating Systems

#### Alloy Computer Products

165 Forest Street  
Marlborough, MA 01752 (508) 481-8500, (800) 544-7551

#### Artisoft, Inc.

575 E. River Road  
Tucson, AZ 85704 (602) 293-6363

#### AT&T

295 N. Maple Avenue  
Basking Ridge, NJ 07920 (201) 221-8694

#### Banyan Systems, Inc.

120 Flanders Road  
Westboro, MA 01581 (508) 898-1000, (800) 828-2404

#### Bell & Howell Document Management Products Co.

6800 McCormick Road  
Chicago, IL 60645 (708) 675-7600, (800) 327-4608

#### CBIS, Inc.

5875 Peachtree Industrial Boulevard  
Building 100, Unit 170  
Norcross, GA 30092 (404) 446-1332

#### Cogent Data Technologies, Inc.

175 West Street  
P.O. Box 926  
Friday Harbor, WA 98250 (206) 378-2929

#### Corvus Systems, Inc.

160 Great Oaks Boulevard  
San Jose, CA 95119 (408) 281-4100, (800) 426-7887

#### D-Link Systems, Inc.

5 Musick  
Irvine, CA 92718 (714) 455-1688

#### Datapoint Corp.

9725 Datapoint Drive  
San Antonio, TX 78229-8500 (512) 699-7000, (800) 733-1500

#### Digital Communications Associates, Inc.

1000 Alderman Drive  
Alpharetta, GA 30202 (404) 442-4000, (800) 241-4762

#### Digital Equipment Corp.

146 Main Street  
Maynard, MA 01754-2571 (508) 493-5111, (800) 344-4825

#### DNA Networks, Inc.

351 Phoenixville Pike  
Malvern, PA 19355 (215) 296-7420, (800) 999-3622

#### DSC Communications Corp.

3101 Scott Blvd  
Santa Clara, CA 95054 (408) 954-5000, (800) BUY NEXOS

#### EXZEL Corp.

7721 East Gray Road  
Suite 101  
Scottsdale, AZ 85260 (602) 951-8503, (800) 833-3897

#### Grapevine LAN Products, Inc.

P.O. Box 3416  
Redmond, WA 98073-3416 (206) 869-2707

#### Hewlett Packard Co.

19091 Pruneridge Avenue  
Cupertino, CA 95014 (800) 572-0900

#### IN-Net Corp.

15150 Avenue of Science  
Suite 100  
San Diego, CA 921283495 (619) 487-3693, (800) 283-3334

#### International Business Machines Corp. (IBM)

Old Orchard Road  
Armonk, NY 10504 (914) 764-1900

#### Invisible Software, Inc.

1142 Chess Drive  
Foster City, CA 94404 (415) 570-5967

#### Microsoft Corp.

One Microsoft Way  
Redmond, WA 980526399 (206)-882-8080, (800)-426-9400

#### Moses Computers

15466 Los Gatos Boulevard  
Los Gatos, CA 95032 (408) 358-1550

#### Motorola Computer Systems

10700 N. DeAnza Boulevard  
Cupertino, CA 95014 (408) 255-0900

#### NCR Corp.

1700 S. Patterson Boulevard  
Dayton, OH 45479 (513) 445-5000

#### Novell, Inc.

122 East 1700, South  
Provo, UT 84606 (801) 429-5900

#### Quantum Software Systems, Ltd.

175 Terrence Matthews Crescent  
Kanata, ON Canada K2M 1W8 (613) 591-0931

#### The Santa Cruz Operation, Inc.

400 Encinal Street  
Santa Cruz, CA 95060 (408) 425-7222, (800) 726-8649

#### Sitka Corp.

Berkeley, CA

#### Solid Technologies

333 S. Beverly Drive  
Suite 103  
Beverly Hills, CA 90212 (213) 785-0030, (800) 422-2966

**3X USA**

One Executive Drive  
Fort Lee, NJ 07024 (201) 592-6874

**3Com Corp.**

5400 Bayfront Plaza  
P.O. Box 58145  
Santa Clara, CA 95052-8145 (408) 764-5000, (800) 638-3266

**Torus Systems, Inc.**

240-B Twin Dolphin Drive  
Redwood City, CA 94065 (415) 594-9336, (800) 872-5335

**US Sage**

2005 Tree Fork Lane, Suite 113  
Longwood, FL 32750 (407) 331-4400, (800) 999-6770

**Ungermann-Bass, Inc.**

3900 Freedom Circle  
P.O. Box 95054  
Santa Clara, CA 95052 (408) 496-0111, (800) 999-3236

**Waterloo Microsystems Inc.**

295 Phillip Street  
Waterloo, ON Canada N2L 3W8 (519) 884-3141

**Watlan, Inc.**

160 Columbia Street W.  
Waterloo, ON Canada N2L 3L3 (519) 746-0550

**Webcorp**

3000 Bridgeway  
Sausalito, CA 94965 (415) 331-1449

**Zytec Systems**

5323 Spring Valley Road  
Dallas, TX 75240 (214) 991-9966

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**Network Servers**

**Acer, Inc.**

401 Charcot Avenue  
San Jose, CA 95131 (408) 922-0333, (800) 777-5277

**Advanced Digital Corp.**

5432 Production Drive  
Huntington Beach, CA 92649 (714) 891-4004

**Altos Computer Systems**

2641 Orchard Parkway  
San Jose, CA 95134 (408) 432-6200, (800) 258-6787

**American Mitac Corp.**

410 E. Plumeria Drive  
San Jose, CA 95134 (408) 432-1160, (800) 648-2287

**American Research Corp.**

1101 Monterey Pass Road  
Monterey Park, CA 91754 (213) 265-0835, (800) 423-3877

**Apple Computer, Inc.**

20525 Mariani Avenue  
Cupertino, CA 95014 (408) 996-1010

**Arche Technologies, Inc.**

48881 Kato Road  
Fremont, CA 94539 (415) 623-8100, (800) 422-4674

**AST Research Inc.**

16215 Alton Parkway, P.O. Box 19658  
Irvine, CA 92713-9658 (714) 727-4141

**AT&T**

295 N. Maple Avenue  
Basking Ridge, NJ 07920 (201) 221-8694

**Banyan Systems, Inc.**

120 Flanders Road  
Westboro, MA 01581 (508) 898-1000, (800) 828-2404

**Bell & Howell Document Management Products Co.**

6800 McCormick Road  
Chicago, IL 60645 (708) 675-7600, (800) 327-4608

**Bethel Computer**

1723 21st Street  
Santa Monica, CA 90404 (213) 828-1415

**Compex, Inc.**

4055 E. LaPalma, Unit C  
Anaheim, CA 92807 (714) 630-7302

**Core International, Inc.**

7171 N. Federal Highway  
Boca Raton, FL 33487 (407) 997-6044

**Datamedia Corp.**

20 Trafalgar Square  
Nashua, NH 03063 (603) 886-1570, (800) 362-4636

**Datapoint Corp.**

9725 Datapoint Drive  
San Antonio, TX 78229-8500 (512) 699-7000, (800) 733-1500

**Digital Equipment Corp.**

146 Main Street  
Maynard, MA 01754-2571 (508) 493-5111, (800) 344-4825

**DSC Communications Corp.**

3101 Scott Blvd  
Santa Clara, CA 95054 (408) 954-5000, (800) BUY NEXOS

**DTK Computer, Inc.**

15711 E. Valley Boulevard  
City of Industry, CA 91744 (818) 333-7533

**Gandalf Data, Inc.**

1020 S. Noel Avenue  
Wheeling, IL 60090 (708) 541-6060, (800) 426-3253

**Harris Adacom**

16001 Dallas Parkway  
Dallas, TX 75248 (214) 386-2000

**Hewlett-Packard Co.**

19091 Pruneridge Avenue  
Cupertino, CA 95014 (800) 572-0900

**JC Information Systems**

161 Whitney Place  
Fremont, CA 94539 (415) 659-8440

**Lancer Research**

557 W. Covina Boulevard  
San Dimas, CA 91773 (714) 592-6003, (800) 966-8866

**Lanmaster**

1401 North 14 Street  
Temple, TX 76501 (817) 771-2124, (800) 441-6189

**Maco Networks, Inc.**

802 E. Martintown Rd., BTC 361  
North Augusta, SC 29841 (803) 278-7225

**Morton Management, Inc.**

12079 Tech Road  
Silver Spring, MD 20904 (301) 622-5600, (800) 548-5744

**Motorola Computer Systems**

10700 N. DeAnza Boulevard  
Cupertino, CA 95014 (408) 255-0900

**NCR Corp.**

1700 S. Patterson Boulevard  
Dayton, OH 45479 (513) 445-5000, (800) 543-1710

**NetFRAME Systems**

1545 Barber Lane  
Milpitas, CA 95035 (408) 944-0600, (800) 852-3726

**Network & Communication Technology, Inc.**

24 Wampum Road  
Park Ridge, NJ 07656 (201) 307-9000

**The Network Connection**

1324 Union Hill Road  
Alpharetta, GA 30201 (404) 751-0889, (800) 327-4853

**Samsung Informations Systems America, Inc.**

3655 N. First Street  
San Jose, CA 95134 (408) 434-5400, (800) 446-0262

**Solid Technologies**

333 S. Beverly Drive  
Suite 103  
Beverly Hills, CA 90212 (213) 785-0030, (800) 422-2966

**Storage Dimensions, Inc.**

Subsidiary of Maxtor Corp.  
2145 Hamilton Avenue  
San Jose, CA 95125 (408) 879-0300

**Sun Microsystems, Inc.**

2550 Garcia Avenue  
Mountain View, CA 94043 (415) 960-1300, (800) 821-4643

**TeleVideo Systems, Inc.**

550 E. Brokaw Road  
San Jose, CA 95161 (408) 954-8333, (800) 835-3228

**3Com Corp.**

5400 Bayfront Plaza  
P.O. Box 58145  
Santa Clara, CA 95052-8145 (408) 764-5000, (800) 638-3266

**Top Microsystems**

5850 Amapola Drive  
San Jose, CA 95129 (408) 980-9813

**Wang Laboratories, Inc.**

One Industrial Avenue  
Lowell, MA 01851 (508) 459-5000, (800) 225-0654

**Watlan, Inc.**

160 Columbia Street W.  
Waterloo, ON Canada N2L 3L3 (519) 746-0550

**Zetaco, Inc.**

6850 Shady Oak Road  
Eden Prairie, MN 55344 (612) 941-9480, (800) 423-3020

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**Network Interface Cards**
**Able Computer Communications**

2652 McGaw Avenue  
Irvine, CA 92714 (714) 553-1188

**Acer, Inc.**

401 Charcot Avenue  
San Jose, CA 95131 (408) 922-0333, (800) 777-5277

**ADI Systems, Inc.**

2121 Ringwood Avenue  
San Jose, CA 95131 (408) 944-0100

**Advanced Digital Corp.**

5432 Production Drive  
Huntington Beach, CA 92649 (714) 891-4004

**Allen-Bradley Co., Inc.**

747 Alpha Drive  
Highland Heights, OH 44143 (216) 449-6700

**Allied Telesis Inc.**

627 National Avenue  
Mountain View, CA 94043 (415) 964-2771

**Altos Computer Systems**

2641 Orchard Parkway  
San Jose, CA 95134 (408) 432-6200, (800) 258-6787

**American Research Corp.**

1101 Monterey Pass Road  
Monterey Park, CA 91754 (213) 265-0835, (800) 423-3877

**Andrew Corp.**

2771 Plaza Del Amo  
Torrance, CA 90503 (213) 320-7126, (800) 733-0331

**Apple Computer, Inc.**

20525 Mariani Avenue  
Cupertino, CA 95014 (408) 996-1010

**Artisoft, Inc.**

575 E. River Road  
Tucson, AZ 85704 (602) 293-6363

**Asante Technologies, Inc.**

405 Tasman Drive  
Sunnyvale, CA 94089 (408) 734-4844

**AST Research Inc.**

16215 Alton Parkway, P.O. Box 19658  
Irvine, CA 92713-9658 (714) 727-4141

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Basking Ridge, NJ 07920 (201) 221-8694

**Bethel Computer**

1723 21st Street  
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**BICC Data Networks, Inc.**

1800 W. Park Drive  
Westborough, MA 01581 (508) 898-2422, (800) 447-6526

**Cabletron Systems, Inc.**

35 Industrial Way, P.O. Box 6257  
East Rochester, NH 03867 (603) 332-9400

**Canai, Computer and Network Architecture Inc.**

59 Iber Road  
Stittsville, ON Canada K2S 1E7 (613) 831-8300

**CASE/Datatel, Inc.**

55 Carnegie Plaza  
Cherry Hill, NJ 08003 (609) 424-4451, (800) 424-4451

**CBIS, Inc.**

5875 Peachtree Industrial Boulevard  
Building 100, Unit 170  
Norcross, GA 30092 (404) 446-1332

**Chipcom Corp.**

118 Turnpike Road  
Southborough, MA 01772 (508) 460-8900, (800) 228-9930

**CMC**

125 Cremona Drive  
Santa Barbara, CA 93117 (805) 968-4262, (800) 262-8023

**CNet Technology**

62 Bonaventura Drive  
San Jose, CA 95134 (408) 954-8000

**Codenoll Technology Corp.**

1086 N. Broadway  
Yonkers, NY 10701 (914) 965-6300

**Cogent Data Technologies, Inc.**

175 West Street

P.O. Box 926  
Friday Harbor, WA 98250 (206) 378-2929

**Commtext Inc.**  
1655 Crofton Boulevard  
Crofton, MD 21114-1341 (301) 721-3666

**Compatible Systems Corp.**  
P.O. Drawer 17220  
Boulder, CO 80308 (303) 444-9532, (800) 356-0283

**Compex, Inc.**  
4055 E. LaPalma, Unit C  
Anaheim, CA 92807 (714) 630-7302

**Concord Communications, Inc.**  
753 Forest Street  
Marlboro, MA 01752 (508) 460-4646

**Corman Technologies, Inc.**  
75 Bathurst Drive  
Waterloo, ON Canada N2V 1N2 (519) 884-4430

**Corvus Systems, Inc.**  
160 Great Oaks Boulevard  
San Jose, CA 95119 (408) 281-4100, (800) 426-7887

**D-Link Systems, Inc.**  
5 Musick  
Irvine, CA 92718 (714) 455-1688

**Datapoint Corp.**  
9725 Datapoint Drive  
San Antonio, TX 78229-8500 (512) 699-7000, (800) 733-1500

**David Systems**  
701 E. Evelyn Avenue  
Sunnyvale, CA 94086 (408) 720-8000

**Dayna Communications, Inc.**  
50 S. Main Street, Fifth Floor  
Salt Lake City, UT 84144 (801) 531-0600

**DayStar Digital, Inc.**  
5556 Atlanta Highway  
Flowery Branch, GA 30542 (404) 967-2077, (800) 962-2077

**DFI, Inc.**  
2544 Port Street  
West Sacramento, CA 95691 (916) 373-1234

**Digital Communications Associates, Inc.**  
1000 Alderman Drive  
Alpharetta, GA 30202 (404) 442-4000, (800) 241-4762

**Digital Equipment Corp.**  
146 Main Street  
Maynard, MA 01754-2571 (508) 493-5111, (800) 344-4825

**DNA Networks, Inc.**  
351 Phoenixville Pike  
Malvern, PA 19355 (215) 296-7420, (800) 999-3622

**DSC Communications Corp.**  
3101 Scott Boulevard  
Santa Clara, CA 95054 (408) 954-5000, (800) BUY NEXOS

**DTK Computer, Inc.**  
15711 E. Valley Boulevard  
City of Industry, CA 91744 (818) 333-7533

**Earth Computer Technologies**  
P.O. Box 8067  
10525 Lawson River Avenue  
Fountain Valley, CA 92728 (714) 964-5784, (800) 544-7551

**Edimax Computer Co.**  
3350 Scott Boulevard, Building 9A  
Santa Clara, CA 95054 (408) 496-1105

**FiberCom, Inc.**  
P.O. Box 11966  
Roanoke, VA 24022-1966 (703) 342-6700, (800) 423-1183

**Frontier Technologies Corp.**  
3510 N. Oakland Avenue  
Milwaukee, WI 53211 (414) 964-8689

**Gandalf Data, Inc.**  
1020 S. Noel Avenue  
Wheeling, IL 60090 (708) 541-6060, (800) 426-3253

**Gateway Communications, Inc.**  
2941 Alton Avenue  
Irvine, CA 92714 (714) 553-1555, (800) 367-6555

**General Technology, Inc.**  
415 Pineda Court  
Melbourne, FL 32940 (407) 242-2733, (800) 274-2733

**h-three Systems**  
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Research Triangle Park, NC 27709 (919) 549-8334, (800) 622-7464

**Hayes Microcomputer Products, Inc.**  
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Atlanta, GA 30348 (404) 449-8791

**Hewlett-Packard Co.**  
Business Computing Div.  
19091 Pruneridge Avenue  
Cupertino, CA 95014 (800) 752-0900

**IMC Networks Corp.**  
1342 Bell Avenue, Unit 3E  
Tustin, CA 92680 (714) 259-1020, (800) 624-1070

**International Business Machines Corp. (IBM)**  
Old Orchard Road  
Armonk, NY 10504 (914) 764-1900

**International Communications Equipment**  
17945 Sky Park Circle  
Suite G  
Irvine, CA 92714 (714) 660-0191, (800) 486-7800

**Interphase Corp.**  
13800 Senlac  
Dallas, TX 75234 (214) 919-9000

**Invisible Software, Inc.**  
1142 Chess Drive  
Foster City, CA 94404 (415) 570-5967

**JC Information Systems**  
161 Whitney Place  
Fremont, CA 94539 (415) 659-8440

**Kodiak Technology**  
1338 Ridder Park Drive  
San Jose, CA 95131 (408) 441-6900

**Lancer Research**  
557 W. Covina Boulevard  
San Dimas, CA 91773 (714) 592-6003, (800) 966-8866

**Lanmaster**  
1401 North 14 Street  
Temple, TX 76501 (817) 771-2124, (800) 441-6189

**LANNET Data Communications, Inc.**  
7711 Center Avenue  
Suite 600  
Huntington Beach, CA 92647 (714) 891-1964

**Lans Plus Canada, Inc.**  
277 De La Commune E.  
Montreal, PQ Canada H2Y 1J2 (514) 875-9023

**Lantana Technology**

4393 Viewridge Avenue  
Suite A  
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**Longshine Technology**

2013 N. Capitol Avenue  
San Jose, CA 95132 (408) 942-1746

**Madge Networks, Inc.**

40 Airport Parkway  
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San Jose, CA 95110 (408) 441-1300, (800) 876-2343

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15466 Los Gatos Boulevard  
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**Motorola Computer Systems**

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Cupertino, CA 95014 (408) 255-0900

**Multi-Tech Systems, Inc.**

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Mounds View, MN 55112 (612) 785-3500, (800) 328-9717

**Mylex Corp.**

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**National Semiconductor**

2900 Semiconductor Dr.  
Santa Clara, CA 95052 (408) 721-5000, (800) 538-8510

**Netronix**

1372 N. McDowell Boulevard  
Petaluma, CA 94954 (707) 762-2703, (800) 282-2535

**Network Interface Corp.**

15019 West 95 Street  
Lenexa, KS 66215 (913) 894-2277, (800) 343-2853

**NetWorth, Inc.**

8101 Ridgepoint Drive  
Irving, TX 75063 (214) 869-1331, (800) 544-5255

**Novell, Inc.**

122 East 1700, South  
Provo, UT 84606 (801) 429-5900

**NTI Group, Inc.**

3265 Kifer Road  
Santa Clara, CA 95051 (408) 739-2180

**Olicom USA**

2100 Willowbrook Way  
Plano, TX 75075 (214) 596-0011

**Optical Data Systems, Inc.**

1101 E. Arapaho Road  
Richardson, TX 75081 (214) 234-6400

**Performance Technology**

8000 IH 10W No. 800  
San Antonio, TX 78230 (512) 349-2000, (800) 825-5267

**Plexcom, Inc.**

65 Moreland Road  
Simi Valley, CA 93065 (805) 522-3333

**Proteon, Inc.**

Two Technology Drive  
Westborough, MA 01581-5008 (508) 898-2800

**PureData Ltd.**

1740 South I-35  
Carrollton, TX 75006 (214) 242-2040

**Quantum Software Systems, Ltd.**

175 Terrence Matthews Crescent  
Kanata, ON Canada K2M 1W8 (613) 591-0931

**Racal InterLan**

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Boxborough, MA 01749 (508) 263-9929, (800) 526-8255

**Racore Computer Products, Inc.**

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**Samsung Informations Systems America, Inc.**

3655 N. First Street  
San Jose, CA 95134 (408) 434-5400, (800) 446-0262

**Sitka Corp.**

950 Marina Village Parkway  
Alameda, CA 94501 (415) 769-9669, (800) 445-8677

**Solid Technologies**

333 S. Beverly Drive  
Suite 103  
Beverly Hills, CA 90212 (213) 785-0030, (800) 422-2966

**Standard Microsystems Corp.**

35 Marcus Boulevard  
Hauppauge, NY 11788 (516) 273-3100

**TeleVideo Systems, Inc.**

550 E. Brokaw Road  
San Jose, CA 95161 (408) 954-8333, (800) 835-3228

**Thirdware Computer Products**

3300 Corporate Avenue #116  
Ft. Lauderdale, FL 33331 (305) 389-9009, (800) 446-5987

**Thomas-Conrad Corp.**

1908-R Kramer Lane  
Austin, TX 78758 (512) 836-1935, (800) 332-8683

**3Com Corp.**

5400 Bayfront Plaza  
P.O. Box 58145  
Santa Clara, CA 95052-8145 (408) 764-5000, (800) 638-3266

**Tiara Computer Systems, Inc.**

1901 Shoreline Boulevard  
Mountain View, CA 94043 (415) 965-1700

**Top Microsystems**

5850 Amapola Drive  
San Jose, CA 95129 (408) 980-9813

**Torus Systems, Inc.**

240-B Twin Dolphin Drive  
Redwood City, CA 94065 (415) 594-9336, (800) 872-5335

**Toshiba America Information Systems, Inc.**

Computer Systems Division  
PO Box 19724  
Irvine, CA 92713 (714) 583-3700, (800) 334-3445

**Tri-Data Corp.**

3270 Scott Road  
Santa Clara, CA 95054 (408) 727-3270, (800) 874-3282

**TRW**

Information Networks Div.  
23800 Hawthorne Boulevard  
Torrance, CA 90505 (213) 373-9161

**Ungermann-Bass, Inc.**

3900 Freedom Circle

P.O. Box 95054  
Santa Clara, CA 95052 (408) 496-0111, (800) 999-3236

**Univation Inc.**  
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Milpitas, CA 95035 (408) 263-1200, (800) 221-5842

**US Sage**  
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Longwood, FL 32750 (407) 331-4400, (800) 999-6770

**Wang Laboratories, Inc.**  
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Lowell, MA 01851 (508) 459-5000, (800) 225-0654

**Watlan, Inc.**  
160 Columbia Street W.  
Waterloo, ON Canada N2L 3L3 (519) 746-0550

**Western Digital Corp.**  
8105 Irvine Center  
Irvine, CA 92718 (714) 747-2033, (800) 847-6181

**Xinetron**  
2330-B Walsh Ave.  
Santa Clara, CA 95051 (408) 727-5509, (800) 345-4415

**Xircom**  
22231 Mulholland Highway, Suite 114  
Woodland Hills, CA 91364 (818) 884-8755, (800) 874-7875

**Xylogics, Inc.**  
53 Third Ave.  
Burlington, MA 01803 (617) 272-8140, (800) 225-3317

**YamaTech Connectivity Solutions**  
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**Zenith Electronics Corp.**  
1000 Milwaukee Avenue  
Glenview, IL 60025 (708) 391-8000

**Zytec Systems**  
5323 Spring Valley Road  
Dallas, TX 75240 (214) 991-9966

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## Wiring Centers

**Allied Telesis Inc.**  
627 National Avenue  
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**Andrew Corp.**  
2771 Plaza Del Amo  
Torrance, CA 90503 (213) 320-7126, (800) 733-0331

**Artel Communications Corp.**  
22 Kane Industrial Drive  
Hudson, MA 01749 (508) 562-2100, (800) 225-0228

**Artisoft, Inc.**  
575 E. River Road  
Tucson, AZ 85704 (602) 293-6363

**AT&T**  
295 N. Maple Avenue  
Basking Ridge, NJ 07920 (201) 221-8694

**BICC Data Networks, Inc.**  
1800 W. Park Drive  
Westborough, MA 01581 (508) 898-2422, (800) 447-6526

**Cabletron Systems, Inc.**  
35 Industrial Way, P.O. Box 6257  
East Rochester, NH 03867 (603) 332-9400

**Chipcom Corp.**  
118 Turnpike Road  
Southborough, MA 01772 (508) 460-8900, (800) 228-9930

**Codenoll Technology Corp.**  
1086 N. Broadway  
Yonkers, NY 10701 (914) 965-6300

**Commtext Inc.**  
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Crofton, MD 21114-1341 (301) 721-3666

**Datapoint Corp.**  
9725 Datapoint Drive  
San Antonio, TX 78229-8500 (512) 699-7000, (800) 733-1500

**Datatec Industries**  
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Fairfield, NJ 07004 (201) 808-4000, (800) DATATEC

**David Systems**  
701 E. Evelyn Avenue  
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**Digital Communications Associates, Inc.**  
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Alpharetta, GA 30202 (404) 442-4000, (800) 241-4762

**Digital Equipment Corp.**  
146 Main Street  
Maynard, MA 01754-2571 (508) 493-5111, (800) 344-4825

**Fibermux Corp.**  
9310 Topanga Canyon Boulevard  
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1101 E. Arapaho Road  
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**Ship Star Assoc.**

36 Woodhill Drive  
Suite 19  
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**Standard Microsystems Corp.**

35 Marcus Boulevard  
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100 Otis Street  
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**SynOptics Communications, Inc.**

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5400 Bayfront Plaza  
P.O. Box 58145  
Santa Clara, CA 95052-8145 (408) 764-5000, (800) 638-3266

**Transition Engineering**

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16215 Alton Parkway, P.O. Box 19658  
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Santa Monica, CA 90404 (213) 828-1415

**Cubix Corp.**

2800 Lockheed Way  
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**Daedalus Group**

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Salt Lake City, UT 84116 (801) 575-6600

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20 Trafalgar Square  
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9725 Datapoint Drive  
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**Digital Equipment Corp.**

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Suite G  
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**Kimtron Corp.**

4181 Business Center  
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**Lanmaster**

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**Liberty Electronics**

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36C Muckly Drive  
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**Sun Microsystems, Inc.**

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**TeleVideo Systems, Inc.**

550 E. Brokaw Road  
San Jose, CA 95161 (408) 954-8333, (800) 835-3228

**3Com Corp.**

5400 Bayfront Plaza  
P.O. Box 58145  
Santa Clara, CA 95052-8145 (408) 764-5000, (800) 638-3266

**Top Microsystems**

5850 Amapola Drive  
San Jose, CA 95129 (408) 980-9813

**Wyse Technology, Inc.**

3471 N. First Street  
San Jose, CA 95134 (408) 473-1200, (800) 438-9973

**Xinetron**

2330-B Walsh Ave.  
Santa Clara, CA 95051 (408) 727-5509, (800) 345-4415

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**Bridges**

**Advanced Computer Communications**

720 Santa Barbara Street  
Santa Barbara, CA 93101 (805) 963-9431, (800) 444-7854

**ALANTEC**

101 Hammond Avenue  
Fremont, CA 94539 (415) 770-1050

**Allen-Bradley Co., Inc.**

747 Alpha Drive  
Highland Heights, OH 44143 (216) 449-6700

**Allied Telesis Inc.**

627 National Avenue  
Mountain View, CA 94043 (415) 964-2771

**Andrew Corp.**

2771 Plaza Del Amo  
Torrance, CA 90503 (213) 320-7126, (800) 733-0331

**Applitek Corp.**

100 Brickstone Square  
Andover, MA 01810 (508) 475-4050, (800) 526-2489

**Artel Communications Corp.**

22 Kane Industrial Drive  
Hudson, MA 01749 (508) 562-2100, (800) 225-0228

**AT&T**

295 N. Maple Avenue  
Basking Ridge, NJ 07920 (201) 221-8694

**BICC Data Networks, Inc.**

1800 W. Park Drive  
Westborough, MA 01581 (508) 898-2422, (800) 447-6526

**Cabletron Systems, Inc.**

35 Industrial Way, P.O. Box 6257  
East Rochester, NH 03867 (603) 332-9400

**CASE/Datatel, Inc.**

55 Carnegie Plaza  
Cherry Hill, NJ 08003 (609) 424-4451, (800) 424-4451

**CBIS, Inc.**

5875 Peachtree Industrial Boulevard  
Building 100, Unit 170  
Norcross, GA 30092 (404) 446-1332

**Chipcom Corp.**

118 Turnpike Road  
Southborough, MA 01772 (508) 460-8900, (800) 228-9930

**Codex Corp.**

20 Cabot Boulevard  
Mansfield, MA 02048 (508) 261-4000, (800) 446-6336

**Concord Communications, Inc.**

753 Forest Street  
Marlboro, MA 01752 (508) 460-4646

**CrossComm Corp.**

140 Locke Drive  
Marlborough, MA 01752 (508) 481-4060

**Cryptall Communications Corp.**

2 Thurber Boulevard  
Smithfield, RI 02917 (401)-232-7600

**Datapoint Corp.**

9725 Datapoint Drive  
San Antonio, TX 78229-8500 (512) 699-7000, (800) 733-1500

**Dayna Communications, Inc.**

50 S. Main Street, Fifth Floor  
Salt Lake City, UT 84144 (801) 531-0600

**Develcon Electronics Ltd.**

515 Consumers Road  
Suite 500  
Willowdale, ON Canada M2J 4Z2 (306) 495-8666

**Digital Communications Associates, Inc.**

1000 Alderman Drive  
Alpharetta, GA 30202 (404) 442-4000, (800) 241-4762

**Digital Equipment Corp.**

146 Main Street  
Maynard, MA 01754-2571 (508) 493-5111, (800) 344-4825

**Dupont Electronics**

Electro-Optic Products Group  
P.O. Box 13625  
Research Triangle Park, NC 27709 (919) 481-5100, (800) 888-5261

**Fairchild Data Corp.**

350 N. Hayden Road  
Scottsdale, AZ 85257 (602) 949-1155

**FiberCom, Inc.**

P.O. Box 11966  
Roanoke, VA 24022-1966 (703) 342-6700, (800) 423-1183

**Fibermux Corp.**

9310 Topanga Canyon Boulevard  
Chatsworth, CA 91311 (818) 709-6000

**Fibronics International Inc.**

Communications Way  
Independence Park  
Hyannis, MA 02601 (508) 778-0700, (800) 456-3279

**Halley Systems, Inc.**

2730 Orchard Parkway  
San Jose, CA 95134 (408) 432-2600

**Hayes Microcomputer Products, Inc.**

P.O. Box 105203  
Atlanta, GA 30348 (404) 449-8791

**Hewlett-Packard Co.**

19091 Pruneridge Avenue  
Cupertino, CA 95014 (800) 572-0900

**IN-Net Corp.**

15150 Avenue of Science  
Suite 100  
San Diego, CA 92128-3495 (619) 487-3693, (800) 283-3334

**Infotron Systems Corp.**

9 N. Olney Avenue  
Cherry Hill, NJ 08003 (609) 424-9400

**Interlink Computer Systems, Inc.**

47370 Fremont Boulevard  
Fremont, CA 94538 (415) 657-9800, (800) 422-3711

**International Business Machines Corp. (IBM)**

Old Orchard Road  
Armonk, NY 10504 (914) 764-1900

**LANEX Corp.**

7120 Columbia Gateway Drive  
Columbia, MD 21046 (301) 312-2200

**LANNET Data Communications, Inc.**

7711 Center Avenue  
Suite 600  
Huntington Beach, CA 92647 (714) 891-1964

**Lantana Technology**

4393 Viewridge Avenue  
Suite A  
San Diego, CA 92123 (619) 565-6400

**Maco Networks, Inc.**

802 E. Martintown Rd., BTC 361  
North Augusta, SC 29841 (803) 278-7225

**Microcom, Inc.**

500 River Ridge Drive  
Norwood, MA 02062-5028 (617) 551-1000

**NCR Corp.**

1700 S. Patterson Boulevard  
Dayton, OH 45479 (513) 445-5000, (800) 543-0710

**Netronix**

1372 N. McDowell Boulevard  
Petaluma, CA 94954 (707) 762-2703, (800) 282-2535

**Network Resources Corp.**

2450 Autumnvale Drive  
San Jose, CA 95131 (408) 263-8100

**Optical Data Systems, Inc.**

1101 E. Arapaho Road  
Richardson, TX 75081 (214) 234-6400

**Performance Technology**

8000 IH 10W No. 800  
San Antonio, TX 78230 (512) 349-2000, (800) 825-5267

**Persoft, Inc.**

465 Science Drive  
Madison, WI 53711 (608) 273-6000, (800) EMULATE

**Plexcom, Inc.**

65 Moreland Road  
Simi Valley, CA 93065 (805) 522-3333

**Racal InterLan**

155 Swanson Road  
Boxborough, MA 01749 (508) 263-9929, (800) 526-8255

**Racal-Milgo**

1601 N. Harrison Parkway  
Sunrise, FL 33323-2899 (305) 846-1601, (800) 327-4440

**Raycom Systems, Inc.**

6395 Gunpark Drive  
Boulder, CO 80301 (303) 530-1620, (800) 373-1620

**Retix**

2644 30th Street  
Santa Monica, CA 90405-3009 (213) 399-2200

**The Santa Cruz Operation, Inc.**

400 Encinal Street  
Santa Cruz, CA 95060 (408) 425-7222, (800) 726-8649

**Ship Star Assoc.**

36 Woodhill Drive  
Suite 19  
Newark, DE 19711 (302) 738-7782

**Symicron, Inc.**

904 Silver Spur Road No. 677  
Rolling Hills Estates, CA 90274 (213) 541-3375

**SynOptics Communications, Inc.**

501 E. Middlefield Road  
Mountain View, CA 94043 (415) 960-1100, (800) 735-8023

**3Com Corp.**

5400 Bayfront Plaza  
P.O. Box 58145  
Santa Clara, CA 95052-8145 (408) 764-5000, (800) 638-3266

**TRW**

Information Networks Div.  
23800 Hawthorne Boulevard  
Torrance, CA 90505 (213) 373-9161

**Ungermann-Bass, Inc.**

3900 Freedom Circle  
P.O. Box 95054  
Santa Clara, CA 95052 (408) 496-0111, (800) 999-3236

**Vitalink Communications Corp.**

6607 Kaiser Drive  
Fremont, CA 94555 (415) 794-1100

**Wang Laboratories, Inc.**  
One Industrial Avenue  
Lowell, MA 01851 (508) 459-5000, (800) 225-0654

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## **Routers/Brouters**

**Advanced Computer Communications**  
720 Santa Barbara Street  
Santa Barbara, CA 93101 (805) 963-9431, (800) 444-7854

**Allen-Bradley Co., Inc.**  
747 Alpha Drive  
Highland Heights, OH 44143 (216) 449-6700

**Apple Computer, Inc.**  
20525 Mariani Avenue  
Cupertino, CA 95014 (408) 996-1010

**APT Communications**  
9607 Dr. Perry Road  
Ijamsville, MD 21754 (301) 831-1182

**AT&T**  
295 N. Maple Avenue  
Basking Ridge, NJ 07920 (201) 221-8694

**CASE/Datatel, Inc.**  
55 Carnegie Plaza  
Cherry Hill, NJ 08003 (609) 424-4451, (800) 424-4451

**cisco Systems, Inc.**  
1525 O'Brien Drive  
Menlo Park, CA 94025 (415) 326-1941, (800) 553-6387

**CMC**  
125 Cremona Drive  
Santa Barbara, CA 93117 (805) 968-4262, (800) 262-8023

**Compatible Systems Corp.**  
P.O. Drawer 17220  
Boulder, CO 80308 (303) 444-9532, (800) 356-0283

**CrossComm Corp.**  
140 Locke Drive  
Marlborough, MA 01752 (508) 481-4060

**Digital Equipment Corp.**  
146 Main Street  
Maynard, MA 01754-2571 (508) 493-5111, (800) 344-4825

**Eicon Technology Corp.**  
2196 32nd Avenue  
Lachine, PQ Canada H8T 3H7 (514) 631-2592

**Fibermux Corp.**  
9310 Topanga Canyon Boulevard  
Chatsworth, CA 91311 (818) 709-6000

**Fibronics International Inc.**  
Communications Way  
Independence Park  
Hyannis, MA 02601 (508) 778-0700, (800) 456-3279

**Gateway Communications, Inc.**  
2941 Alton Avenue  
Irvine, CA 92714 (714) 553-1555, (800) 367-6555

**General DataComm, Inc.**  
1579 Straits Turnpike  
Middlebury, CT 06762 (203) 574-1118

**Halley Systems, Inc.**  
2730 Orchard Parkway  
San Jose, CA 95134 (408) 432-2600

**Hewlett-Packard Co.**  
19091 Pruneridge Avenue  
Cupertino, CA 95014 (800) 572-0900

**Interlink Computer Sciences, Inc.**  
47370 Fremont Boulevard  
Fremont, CA 94538 (415) 657-9800, (800) 422-3711

**Mitek OpenConnect Systems, Corp.**  
2033 Chennault Drive  
Carrollton, TX 75006 (214) 490-4090

**NCR Corp.**  
1700 S. Patterson Boulevard  
Dayton, OH 45479 (513) 445-5000, (800) 543-0710

**Network Resources Corp.**  
2450 Autumnvale Drive  
San Jose, CA 95131 (408) 263-8100

**Network Systems Corp.**  
7600 Boone Avenue North  
Minneapolis, MN 55428 (612) 424-4888

**Newport Systems Solutions, Inc.**  
4019 Westerly Place  
Suite 103  
Newport Beach, CA 92660 (714) 752-1511, (800) 662-4677

**Niwot Networks**  
1930 Central Avenue  
Suite E  
Boulder, CO 80301 (303) 444-7765

**Novell, Inc.**  
122 East 1700, South  
Provo, UT 84606 (801) 429-5900

**NTI Group, Inc.**  
3265 Kifer Road  
Santa Clara, CA 95051 (408) 739-2180

**Phaser Systems, Inc.**  
651 Gateway Boulevard  
Suite 400  
South San Francisco, CA 94080 (415) 952-6300

**Promptus Communications, Inc.**  
207 High Point Ave.  
Portsmouth, RI 02871 (401) 683-6100, (800) 777-LANS

**Proteon, Inc.**  
Two Technology Drive  
Westborough, MA 01581-5008 (508) 898-2800

**Retix**  
2644 30th Street  
Santa Monica, CA 90405-3009 (213) 399-2200

**The Santa Cruz Operation, Inc.**  
400 Encinal Street  
Santa Cruz, CA 95060 (408) 425-7222, (800) 726-8649

**Shiva**  
1 Cambridge Center  
Cambridge, MA 02142 (617) 864-8500, (800) 458-3550

**SynOptics Communications, Inc.**  
501 E. Middlefield Road  
Mountain View, CA 94043 (415) 960-1100, (800) 735-8023

**3Com Corp.**  
5400 Bayfront Plaza  
P.O. Box 58145  
Santa Clara, CA 95052-8145 (408) 764-5000, (800) 638-3266

**Tri-Data Corp.**  
3270 Scott Road  
Santa Clara, CA 95054 (408) 727-3270, (800) 874-3282

**Ungermann-Bass, Inc.**  
3900 Freedom Circle  
P.O. Box 95054  
Santa Clara, CA 95052 (408) 496-0111, (800) 999-3236

**Unisync Inc.**  
1380 W. 9th Street  
Upland, CA 91786 (714) 985-5088

**Vitalink Communications Corp.**  
6607 Kaiser Drive  
Fremont, CA 94555 (415) 794-1100

**Wellfleet Communications**  
15 Crosby Drive  
Bedford, MA 01730 (617) 275-2400

**Zenith Electronics Corp.**  
1000 Milwaukee Avenue  
Glenview, IL 60025 (708) 391-8000

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## Gateways

**Able Computer Communications**  
2652 McGaw Avenue  
Irvine, CA 92714 (714) 553-1188

**Advanced Digital Corp.**  
5432 Production Drive  
Huntington Beach, CA 92649 (714) 891-4004

**Applitek Corp.**  
100 Brickstone Square  
Andover, MA 01810 (508) 475-4050, (800) 526-2489

**APT Communications**  
9607 Dr. Perry Road  
Ijamsville, MD 21754 (301) 831-1182

**AST Research Inc.**  
16215 Alton Parkway, P.O. Box 19658  
Irvine, CA 92713-9658 (714) 727-4141

**AT&T**  
295 N. Maple Avenue  
Basking Ridge, NJ 07920 (201) 221-8694

**Attachmate Corp.**  
13231 SE 36th Street  
Bellevue, WA 98006 (206) 644-4010, (800) 426-6283

**Avatar Corp.**  
65 South Street  
Hopkinton, MA 01748 (508) 435-3000, (800) 282-3270

**CASE/Datatel, Inc.**  
55 Carnegie Plaza  
Cherry Hill, NJ 08003 (609) 424-4451, (800) 424-4451

**Chi Corp.**  
31200 Carter Street  
Solon, OH 44139 (216) 349-8600, (800) 354-0599

**Commtext Inc.**  
1655 Crofton Boulevard  
Crofton, MD 21114-1341 (301) 721-3666

**Data Interface Systems Corp.**  
8701 N. Lopac, Suite 415  
Austin, TX 78759 (512) 699-7000, (800) 351-4244

**Datapoint Corp.**  
9725 Datapoint Drive  
San Antonio, TX 78229-8500 (512) 699-7000, (800) 733-1500

**Develcon Electronics Ltd.**  
515 Consumers Road

Suite 500  
Willowdale, ON Canada M2J 4Z2 (306) 495-8666

**Digital Communications Associates, Inc.**  
1000 Alderman Drive  
Alpharetta, GA 30202 (404) 442-4000, (800) 241-4762

**Digital Equipment Corp.**  
146 Main Street  
Maynard, MA 01754-2571 (508) 493-5111, (800) 344-4825

**Eicon Technology Corp.**  
2196 32nd Avenue  
Lachine, PQ Canada H8T 3H7 (514) 631-2592

**Frontier Technologies Corp.**  
3510 N. Oakland Avenue  
Milwaukee, WI 53211 (414) 964-8689

**Gateway Communications, Inc.**  
2941 Alton Avenue  
Irvine, CA 92714 (714) 553-1555, (800) 367-6555

**Harris Adacom**  
16001 Dallas Parkway  
Dallas, TX 75248 (214) 386-2000

**Hewlett-Packard Co.**  
19091 Pruneridge Avenue  
Cupertino, CA 95014 (800) 572-0900

**ICOT**  
3801 Zanker Road  
San Jose, CA 95150 (408) 433-3300, (800) SNA-3270

**IDEAssociates, Inc.**  
29 Dunham Road  
Billerica, MA 01821 (508) 663-6878, (800) 257-5027

**IN-Net Corp.**  
15150 Avenue of Science  
Suite 100  
San Diego, CA 92128-3495 (619) 487-3693, (800) 283-3334

**Infotron Systems Corp.**  
9 N. Olney Avenue  
Cherry Hill, NJ 08003 (609) 424-9400

**Interlink Computer Sciences, Inc.**  
47370 Fremont Boulevard  
Fremont, CA 94538 (415) 657-9800, (800) 422-3711

**International Business Machines Corp. (IBM)**  
Old Orchard Road  
Armonk, NY 10504 (914) 764-1900

**Jupiter Technology, Inc./Intel Corp.**  
2402 W. Beardsley Road  
Phoenix, AZ 85027 (602) 869-4023

**McData Corp.**  
310 Interlocken Parkway  
Broomfield, CO 80021 (303) 460-9200

**Mitek OpenConnect Systems, Corp.**  
2033 Chennault Drive  
Carrollton, TX 75006 (214) 490-4090

**Multi-Tech Systems, Inc.**  
2205 Woodale Drive E.  
Mounds View, MN 55112 (612) 785-3500, (800) 328-9717

**National Semiconductor Corp.**  
2900 Semiconductor Drive  
Santa Clara, CA 95052-8090 (408) 721-5000, (800) 538-8510

**Netlink, Inc.**  
3214 Spring Forest Road  
Raleigh, NC 27604 (919) 878-8612, (800) 638-5465

**Network Software Associates, Inc.**  
39 Argonaut  
Laguna Hills, CA 92656 (714) 768-4013

**Novell, Inc.**  
122 East 1700, South  
Provo, UT 84606 (801) 429-5900

**NTI Group, Inc.**  
3265 Kifer Road  
Santa Clara, CA 95051 (408) 739-2180

**ParaData Computer Networks, Inc.**  
37695 Interchange Drive  
Farmington Hills, MI 48335 (313) 478-8400, (800) GATEWAY

**Passport Communications, Inc.**  
2755 Campus Drive  
Suite 175  
San Mateo, CA 94403 (415) 571-9583, (800) 767-9583

**Rabbit Software Corp.**  
7 Great Valley Parkway  
Malvern, PA 19355 (215) 647-0440, (800) 722-2462

**Racal InterLan**  
155 Swanson Road  
Boxborough, MA 01749 (508) 263-9929, (800) 526-8255

**Retix**  
2644 30th Street  
Santa Monica, CA 90405-3009 (213) 399-2200

**The Santa Cruz Operation, Inc.**  
400 Encinal Street  
Santa Cruz, CA 95060 (408) 425-7222, (800) 726-8649

**Shiva**  
1 Cambridge Center  
Cambridge, MA 02142 (617) 864-8500, (800) 458-3550

**Symicron, Inc.**  
904 Silver Spur Road No. 677  
Rolling Hills Estates, CA 90274 (213) 541-3375

**TDT Group Inc.**  
1070 E. Indiantown Road, Suite 208  
Jupiter, FL 33477 (407) 575-9988

**3Com Corp.**  
5400 Bayfront Plaza  
P.O. Box 58145  
Santa Clara, CA 95052-8145 (408) 764-5000, (800) 638-3266

**Tri-Data Corp.**  
3270 Scott Road  
Santa Clara, CA 95054 (408) 727-3270, (800) 874-3282

**Ungermann-Bass, Inc.**  
3900 Freedom Circle  
P.O. Box 95054  
Santa Clara, CA 95052 (408) 496-0111, (800) 999-3236

**Unisync Inc.**  
1380 W. 9th Street  
Upland, CA 91786 (714) 985-5088

**Wall Data Inc.**  
17769 Northeast 78 Place  
Redmond, WA 98052 (206) 883-4777, (800) 433-3388

**Wang Laboratories, Inc.**  
One Industrial Avenue  
Lowell, MA 01851 (508) 459-5000, (800) 225-0654

**Waterloo Microsystems Inc.**  
295 Phillip Street  
Waterloo, ON Canada N2L 3W8 (519) 884-3141

# Network Operating Systems

## Comparison Column Entry Descriptions

A network operating system is the software that controls communication and resource sharing over the underlying hardware medium of the network and provides users and administrators with the functionality of distributed processing. Vendors responded to questions about the environment in which each particular operating system exists and the various software interfaces provided to connect it to the hardware and to other industry-standard networking schemes.

**Vendor and Product Name.** This entry lists the manufacturer and name of each operating system. In most cases, it also includes the current version of the operating system.

**Characteristics Server Memory Required (minimum), Bytes.** This

entry indicates the amount of RAM required on the network server.

**Server Operating System.** Some network operating systems run under a standard microcomputer operating system. This entry indicates which of several standard operating systems is used.

**Workstation Memory Required (minimum), Bytes.** This entry indicates the amount of RAM required in each workstation.

**Network Interface Standards Supported.** This entry lists several industry standards for interfacing hardware or separate processes running on different machines.

**Protocols Supported.** A protocol is a set of procedures that establish, maintain, and control communications. Proto-

cols include Transmission Control Protocol/Internet Protocol (TCP/IP), Xerox Network Systems (XNS), DECnet (Digital Equipment Corp.'s network), Open Systems Interconnection (OSI), IBM Systems Network Architecture (SNA), and X.25 (CCITT's packet-switching protocol).

**LANs Supported.** Vendors selected Ethernet, Starlan, Token-Ring, Arcnet, AppleTalk, FDDI, or Other. Ethernet is a baseband carrier sense multiple access with collision detection (CSMA/CD) network that uses a linear bus topology and operates at 10M bps. Starlan is similar to Ethernet but uses a star topology with central hubs and can operate at 1M or 10M bps. Token-Ring refers to a LAN designed with a ring topology, running at speeds of 4M or 16M bps, that uses the token-passing technique. Arcnet is a baseband LAN that uses a ring or bus topology, runs at 2.5M bps, and also uses a token-passing access method. AppleTalk is Apple's Macintosh networking protocol that can run on most

industry-standard networking schemes. FDDI stands for Fiber Distributed Data Interface and is a 100M bps fiber optic network.

**Pricing/Support Price (\$).** Vendors provided a wide range of pricing information. Many vendors provided a price for their operating system that supports a defined number of users (e.g., a 10-user network). Other vendors provided an average price per node or station. Still others provided pricing for a pre-packaged version of the software. The comments section was often used to explain pricing differences between vendors.

**Date of First Delivery.** This entry tells how long the product has been commercially available.

**Support Supplied by.** Increasingly, products are serviced by the dealer or via a third-party service arrangement.

**Comments.** This entry includes space for any features, functions, or products not covered by the entries above.

Vendor	Alloy Computer Products	Alloy Computer Products	Artisoft, Inc.	AT&T
Product	386/Multiware 2.01	NTNX 2.1	LANTastic NOS A/I 3.02	StarGroup Software LAN Manager Server
<b>Characteristics</b>				
Server Memory Req., Min. (bytes)	2M	640K	256K	None identified
Server Operating System	DOS	DOS	DOS	UNIX
Workstation Memory Req., Min. (bytes)	0	0	256K	None identified
Network Interface Standards Supported	RS-232	RS-232	NETBIOS	NETBIOS
Protocols Supported	SNA; X.25	NETBIOS	None	OSI; X.25
LANs Supported	Proprietary	Proprietary	Arcnet; Ethernet; Starlan; Token-Ring	Ethernet; Starlan; Token-Ring
<b>Pricing/Support</b>				
Price (\$)	See comments	See comments	495	1,895
Date of First Delivery	None identified	None identified	June 1988	None identified
Support Supplied by	None identified	None identified	Vendor	Vendor
<b>Comments</b>	Contact vendor for pricing information.	Contact vendor for pricing information.		Price shown is for 8 users; unlimited users-\$3,495.

Vendor	Banyan Systems, Inc.	Banyan Systems, Inc.	Banyan Systems, Inc.	Banyan Systems, Inc.
Product	VINES SMP 4.0	VINES Team for 386 Platforms 4.0	VINES for 386 Platforms 4.0	VINES for 486 Platforms 4.0
<b>Characteristics</b>				
Server Memory Req., Min. (bytes)	8M	4M	4M	4M
Server Operating System	UNIX on server/DOS on client	UNIX on server/DOS on client	UNIX on server/DOS on client	UNIX on server/DOS on client
Workstation Memory Req., Min. (bytes)	256K	256K	256K	256K
Network Interface Standards Supported	ISDN; NDIS; NETBIOS; Named Pipes	ISDN; NDIS; NETBIOS; Named Pipes	ISDN; NDIS; NETBIOS; Named Pipes	ISDN; NDIS; NETBIOS; Named Pipes
Protocols Supported	SMTP; SNA; TCP/IP; X.25	SMTP; SNA; TCP/IP; X.25	SMTP; SNA; TCP/IP; X.25	SMTP; SNA; TCP/IP; X.25
LANs Supported	Ethernet; LanStar; Omnet; ProNET; Starlan; VistaLAN	Arcnet; Ethernet; LanStar; Omnet; ProNET; Starlan; Token-Ring	Arcnet; Ethernet; LanStar; Omnet; ProNET; Starlan; Token-Ring; VistaLAN	Arcnet; Ethernet; LanStar; Omnet; ProNET; Starlan; Token-Ring
<b>Pricing/Support</b>				
Price (\$)	13,995	2,495	5,995	7,490
Date of First Delivery	September 1990	August 1989	June 1988	June 1990
Support Supplied by	Dealer; Third party; Vendor	Dealer; Third party; Vendor	Dealer; Third party; Vendor	Dealer; Third party; Vendor
<b>Comments</b>	Supports true symmetric operation of multiple processors in systems like Compaq Systempro; all server-based network applications and services can run on whichever CPU is available. Compatible with other VINES versions.	A network solution for stand-alone workgroups and remote offices with a maximum of 10 users; can incorporate such services as file, print, mail, host connectivity, and communications. Offers most features avail on the standard VINES package.	A standards-based distributed network operating system for local or global networking of personal computers, minicomputers, and mainframes in corporate-wide applications; unique features include Street-Talk global directory services.	A standards-based distributed network operating system for local or global networking of personal computers, minicomputers, and mainframes in corporate-wide applications; unique features include Street-Talk global directory services.

Vendor	Bell & Howell Document Management Products Co.	CBIS, Inc.	CBIS, Inc.	Cogent Data Technologies, Inc.
<b>Product</b>	<b>Image Search Plus LAN</b>	<b>Network OS Plus 7.0A</b>	<b>Network-EZ II 2.0A</b>	<b>LAN Manager 2.0</b>
<b>Characteristics</b>				
Server Memory Req., Min. (bytes)	2M	640K	640K	5M
Server Operating System	DOS	DOS	DOS	None identified
Workstation Memory Req., Min. (bytes)	640K	512K	512K	512K; 640K
Network Interface Standards Supported	NETBIOS	NETBIOS	NETBIOS	NDIS; NETBIOS
Protocols Supported	TCP/IP	OSI	OSI	OSI; TCP/IP; XNS
LANs Supported	Ethernet	Arcnet; BUSS; Ethernet; Starlan; Token-Ring	BUSS	AppleTalk; Arcnet; Ethernet; Starlan; Token-Ring
<b>Pricing/Support Price (\$)</b>	82,000	1,520	See comments	6,490
Date of First Delivery	July 1988	None identified	None identified	None identified
Support Supplied by	Vendor	Vendor	Vendor	None identified
<b>Comments</b>	Network above is designed for managing documents on optical disk media; price includes document management software, imaging boards, 2 high resolution monitors on workstation; (2) SCSI boards, device driver software, cable, etc.	Free telephone technical support; price shown is for 8 users.	Contact vendor for pricing information; free telephone technical support.	Price shown is unlimited version.

Vendor	Corvus Systems, Inc.	D-Link Systems, Inc.	Datapoint Corp.	Digital Communications Associates, Inc.
<b>Product</b>	<b>PC/NOS 2.1</b>	<b>LANsmart Network OS 2.10</b>	<b>NOE (Network Operating Environment)</b>	<b>10NET Plus LAN OS 4.20.10</b>
<b>Characteristics</b>				
Server Memory Req., Min. (bytes)	256K	640K	2M	128K
Server Operating System	DOS	DOS	None identified	DOS
Workstation Memory Req., Min. (bytes)	128K	512K	1M	128K
Network Interface Standards Supported	NETBIOS	NETBIOS; NETBOIS/IPX	NETBIOS	NETBIOS; SMB
Protocols Supported	X.25	DECnet; IPX; TCP/IP	3270; SNA; TCP/IP; X.25	None identified
LANs Supported	Arcnet; Ethernet; Omninet; TandyLink; Token-Ring	10BASE-T; Arcnet; Ethernet; Pocket LAN; Token-Ring	Arcnet; Ethernet; Token-Ring	Arcnet; Ethernet; Starlan; Token-Ring
<b>Pricing/Support Price (\$)</b>	1,395	395	See comments	149, max. price is 1,595
Date of First Delivery	November 1986	January 1990	April 1990	July 1990
Support Supplied by	Vendor	Dealer; Third party; Vendor	Vendor	Dealer; Vendor
<b>Comments</b>			Contact vendor for pricing information.	Compatible with Windows 3.0; includes free E-mail and memory relief.

Vendor	Digital Equipment Corp.	DNA Networks, Inc.	DSC Communications Corp.	DSC Communications Corp.
Product	PCSA 2.2	DNA Networks 3.37	NEXOS 286-24 2.80	NEXOS 286-8 2.80
<b>Characteristics</b>				
Server Memory Req., Min. (bytes)	2M	40K	640K	640K
Server Operating System	DOS; OS/2; Ultrix; VMS	DOS	NEXOS	NEXOS
Workstation Memory Req., Min. (bytes)	1M	5K	512K	512K
Network Interface Standards Supported	Named Pipes	NETBIOS	NETBIOS	NETBIOS
Protocols Supported	DECnet; OSI; SNA; TCP/IP	None identified	NEXOS	NEXOS
LANs Supported	Ethernet; FDDI	DNA Networks	Arcnet; Ethernet; Omnet; Token-Ring	Arcnet; Ethernet; Omnet; Token-Ring
Pricing/Support Price (\$)	See comments	See comments	995	495
Date of First Delivery Support Supplied by	None identified Vendor	August 1989 Dealer	November 1988 Dealer; Vendor	November 1988 Dealer; Vendor
Comments	Contact vendor for pricing information.	Operating system is bundled with file server interface card.	BootROMS available for DSC Arcnet and Ethernet cards and for Novell Ethernet and Novell-compatible Ethernet cards; supports up to 24 users per server; 30-day money back guarantee.	BootROMS available for Dsc Arcnet and Ethernet cards and for Novell Ethernet and Novell compatible Ethernet cards; supports up to 8 users per server; 30-day money back guarantee.

Vendor	DSC Communications Corp.	DSC Communications Corp.	EXZEL Corp.	Grapevine LAN Products, Inc.
Product	NEXOS 386-255 2.80	NEXOS 386-8 2.80	EasyNetwork 1.88	GV LAN OS 2.0
<b>Characteristics</b>				
Server Memory Req., Min. (bytes)	2M	2M	640K	64K
Server Operating System	NEXOS	NEXOS	DOS	DOS
Workstation Memory Req., Min. (bytes)	512K	512K	512K	64K
Network Interface Standards Supported	NETBIOS	NETBIOS	NETBIOS	NETBIOS
Protocols Supported	NEXOS	NEXOS	None identified	None
LANs Supported	Arcnet; Ethernet; Omnet; Token-Ring	Arcnet; Ethernet; Omnet; Token-Ring	Arcnet; Ethernet	Arcnet; Ethernet; Serial
Pricing/Support Price (\$)	3,295	1,995	139, max. price is 649	695
Date of First Delivery Support Supplied by	November 1988 Dealer; Vendor	November 1988 Dealer; Vendor	February 1990 Dealer; Vendor	June 1987 Dealer; Vendor
Comments	BootROMS available for DSC Arcnet and Ethernet cards and for Novell Ethernet and Novell-compatible Ethernet cards. Supports up to 255 users per server. 30-day money back guarantee.	BootROMS available for DSC Arcnet and Ethernet cards and for Novell Ethernet and Novell compatible Ethernet cards. Supports up to 8 users per server. 30-day money back guarantee.	Pricing shown is for network starter kits, including networking cards, software, and 20-foot cable; networks 2 IBM or compatible PCs.	Peer-to-peer LAN for IBM PC compatibles; pull-down menus provide point and shoot access to printers, drives, and E-mail from within an application; Windows 3.0 compatible; price shown is for 5-user license.

Vendor	Hewlett-Packard Co.	Hewlett-Packard Co.	Hewlett-Packard Co.	IN-Net Corp.
Product	HP LAN Manager 1.1	HP LAN Manager/X 1.0 HP-UX	HP LAN Manager/X1.1 386/486	FiberTalk 1000 NMS
<b>Characteristics</b>				
Server Memory Req., Min. (bytes)	8M	8M	8M	3M
Server Operating System	OS/2	UNIX	UNIX	OS/2
Workstation Memory Req., Min. (bytes)	4M; 640K	4M; 640K	640K	None identified
Network Interface Standards Supported	NDIS; NETBIOS; Named Pipes	NDIS; NETBIOS; Named Pipes	NDIS; NETBIOS; Named Pipes	None identified
Protocols Supported	TCP/IP	TCP/IP	TCP/IP; X.25	None identified
LANs Supported	Ethernet; Starlan; Token-Ring	Ethernet; Starlan; Token-Ring	Token-Ring	FDDI
<b>Pricing/Support</b>				
Price (\$)	1,295	2,000	1,495	8,000
Date of First Delivery	March 1991	November 1989	March 1991	July 1989
Support Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Price shown is for 5 users; unlimited license is \$3,995; for OS/2 and MS-DOS workstations.	Price shown is for 8 users.	Includes ARPA/Berkeley Services for UNIX 386; unlimited license is \$3,995.	

Vendor	International Business Machines Corp. (IBM)	International Business Machines Corp. (IBM)	Invisible Software, Inc.	Microsoft Corp.
Product	OS/2 LAN Server 1.3	PC LAN Program 1.31	Net/30 2.0	OS/2 LAN Manager 2.0
<b>Characteristics</b>				
Server Memory Req., Min. (bytes)	None identified	None identified	640K	5M; 6M
Server Operating System	OS/2	DOS	DOS	OS/2; UNIX
Workstation Memory Req., Min. (bytes)	3M; 512K	None identified	512K	3M; 512K
Network Interface Standards Supported	APPC; NDIS; NETBIOS	APPC; NETBIOS	NETBIOS	APPC; NDIS; Named Pipes
Protocols Supported	OSI; SNA; TCP/IP	SNA; TCP/IP	None identified	OSI; SNA; TCP/IP
LANs Supported	Ethernet; Token-Ring	Ethernet; Token-Ring	Ethernet; Proprietary	Arcnet; Ethernet; FDDI; Token-Ring
<b>Pricing/Support</b>				
Price (\$)	1,040	225	See comments	995
Date of First Delivery	None identified	None identified	October 1989	None identified
Support Supplied by	Vendor	Vendor	Dealer; Vendor	Dealer
<b>Comments</b>	Price shown is one-time license fee.		Bundled with network cards; free customer support.	Price shown for server and 5 workstations; unlimited workstations - \$5495.

Vendor	Moses Computers	Motorola Computer Systems	NCR Corp.	Novell, Inc.
<b>Product</b>	<b>ChosenNOS 1.10</b>	<b>SMB Server 1.0</b>	<b>NCR NetWare/X 1.5</b>	<b>Advanced Netware 2.15</b>
<b>Characteristics</b>				
Server Memory Req., Min. (bytes)	24K	640K	4M	2.5M
Server Operating System	DOS	UNIX	UNIX	NetWare
Workstation Memory Req., Min. (bytes)	33K	512K	512K	512K
Network Interface Standards Supported	NETBIOS	NETBIOS	NCR Netware Core Protocols; NETBIOS	IPX/SPX; NETBIOS
Protocols Supported	SMB	DECnet; OSI; SNA; TCP/IP; X.25; XNS	IPX	X.25; XNS
LANs Supported	ChosenLAN	AppleTalk; Arcnet; Ethernet; FDDI; Token-Ring	Ethernet	AppleTalk; Arcnet; Ethernet; FDDI; Starlan; Token-Ring
<b>Pricing/Support</b>				
Price (\$)	499	950, max. price is 4,800	6,500, max. price is 12,000	3,295
Date of First Delivery	1990	1987	April 1990	February 1989
Support Supplied by	Vendor	Vendor	Dealer; Vendor	Dealer; Third party; Vendor
<b>Comments</b>	Incorporates Adaptive Through-out Control (ATC) for throughput rate; price shown is 5-user starter kit; supports software written for IBM PC LAN Program.	Server is LAN Manager compatible.	NCR's version of portable NetWare; runs on Unix V.3 on NCR Towers and Unix V.4 on NCR System 3000 models; access to TCP/IP, NFS, SNA through communications packages running on Unix server provided to Netware DOS clients through terminal emulation.	Price shown is per server; NetWare is hardware-independent.

Vendor	Novell, Inc.	Novell, Inc.	Novell, Inc.	Novell, Inc.
<b>Product</b>	<b>ELS NetWare Level I 2.12</b>	<b>ELS NetWare Level II 2.15</b>	<b>NetWare 386 3.1</b>	<b>SFT Netware 2.15</b>
<b>Characteristics</b>				
Server Memory Req., Min. (bytes)	1M; 2M	1M; 2M	4M	2.5M
Server Operating System	NetWare	NetWare	NetWare	NetWare
Workstation Memory Req., Min. (bytes)	70K	70K	128K	512K
Network Interface Standards Supported	IPX/SPX; NETBIOS	IPX/SPX; NETBIOS	IPX/SPX; NETBIOS; Named Pipes	IPX/SPX; NETBIOS
Protocols Supported	None identified	None identified	OSI; TCP/IP; X.25	X.25; XNS
LANs Supported	Arcnet; Ethernet; Starlan; Token-Ring	AppleTalk; Arcnet; Ethernet; Starlan; Token-Ring	AppleTalk; Arcnet; Ethernet; FDDI; Starlan; Token-Ring	AppleTalk; Arcnet; Ethernet; FDDI; Starlan; Token-Ring
<b>Pricing/Support</b>				
Price (\$)	795	1,895	7,995	4,995
Date of First Delivery	September 1987	August 1988	June 1990	December 1988
Support Supplied by	Dealer; Third party; Vendor	Dealer; Third party; Vendor	Dealer; Third party; Vendor	Dealer; Third party; Vendor
<b>Comments</b>	Four-user version of NetWare designed for PC LAN users in the small business and professional office environments with basic networking needs.	Eight-user version of NetWare designed for PC LAN users in the small business, professional office, and small workgroup environments with advanced networking needs (internetworking, Macintosh support, server-based application).		Price shown is per server; NetWare is hardware-independent.

Vendor	Quantum Software Systems, Ltd.	The Santa Cruz Operation, Inc.	Sitka Corp.	Sitka Corp.
Product	QNX 2.15	SCO Xenix-Net	DosTOPS Network Bundle 3.0	MacTOPS Network Bundle 3.0
<b>Characteristics</b>				
Server Memory Req., Min. (bytes)	150K	1M	640K	1M
Server Operating System	QNX	DOS; Xenix	DOS; Macintosh; UNIX; VMS	Macintosh
Workstation Memory Req., Min. (bytes)	512K	None identified	512K	1M
Network Interface Standards Supported	None identified	NETBIOS; SMB	AppleTalk	AppleTalk
Protocols Supported	SNA; TCP/IP; X.25	TCP/IP	AppleTalk	AppleTalk
LANs Supported	Arcnet	Ethernet; Starlan; Token-Ring	AppleTalk; Ethernet	AppleTalk
<b>Pricing/Support</b>				
Price (\$)	450	695	249	299
Date of First Delivery	1982	June 1987	March 1990	January 1990
Support Supplied by	Vendor	Vendor	Dealer; Vendor	Vendor
<b>Comments</b>	Price is for standalone computer or first node on network.	SMB Protocol Distributed File-System product that supports NETBIOS, can be used over SCO TCP/IP, third party TCP/IP, and IBM Broadband PC Network, price shown is per connection.	\$995 for a 10-pack.	Price shown is per workstation; peer-to-peer file sharing system for Macintosh allows connection to PCs and Sun Workstations running DosTOPS and SunTOPS; includes print spooling, 20-user InBox E-mail, and PC/Macintosh file translators.
Vendor	Sitka Corp.	Solid Technologies	3Com Corp.	3X USA
Product	SunTOPS 2.2b	Solid LAN Operating System 1.6	3+ Open LAN Manager 2.0	Link-16
<b>Characteristics</b>				
Server Memory Req., Min. (bytes)	None identified	640K	4M	130K
Server Operating System	UNIX	DOS	OS/2	DOS
Workstation Memory Req., Min. (bytes)	None identified	512K	640K	80K
Network Interface Standards Supported	AppleTalk	NETBIOS	NDIS; NETBIOS; Named Pipes	NETBIOS
Protocols Supported	AppleTalk	None identified	OSI; TCP/IP; XNS	None identified
LANs Supported	AppleTalk; Ethernet	Arcnet; Ethernet	AppleTalk; Ethernet; Starlan; Token-Ring	3X Link-16
<b>Pricing/Support</b>				
Price (\$)	1,395	See comments	995	139
Date of First Delivery	April 1989	None identified	October 1988	1988
Support Supplied by	Vendor	Dealer; Vendor	Dealer; Third party; Vendor	Dealer; Vendor
<b>Comments</b>	Price shown for cartridge version; \$1295 for SPARC floppy version; file sharing software to allow Macintoshes & PCs to use the Sun workstation as a non-dedicated server; also includes software to allow the Sun workstation to print to Appletalk printers.	Included with price of hardware; a peer-to-peer network operating system that runs all applications written for IBM PC LAN and Novell NetWare.	Price shown is for 5-user server package; unlimited user server package is \$6,490; add-on products provide electronic mail, internetwork routing, remote PC dial-in access, X.500 directory service, diskless PC remote booting, and network management.	Price shown is per node.

Vendor	Torus Systems, Inc.	Ungermann-Bass, Inc.	US Sage	Waterloo Microsystems Inc.
<b>Product</b>	Tapestry II 2.0	Net/One LAN Manager 2.0	MainLAN 3.X	PORT 2.5
<b>Characteristics</b>				
Server Memory Req., Min. (bytes)	None identified	2M; 5M	50K	2M
Server Operating System	DOS; OS/2	OS/2	DOS	DOS
Workstation Memory Req., Min. (bytes)	None identified	1M	15K	512K
Network Interface Standards Supported	NETBIOS; SMB	NDIS; NETBIOS; Named Pipes	NETBIOS	NETBIOS
Protocols Supported	TCP/IP; X.25	TCP/IP; XNS	OSI	X.25
LANs Supported	Arcnet; Ethernet; Starlan; Token-Ring	Ethernet; Token-Ring	Ethernet	Arcnet; Token-Ring
<b>Pricing/Support</b>				
Price (\$)	2,995	5,995	199.00, max. price is 1,499.00	2,895
Date of First Delivery	January 1988	October 1990	October 1990	April 1985
Support Supplied by	Vendor	Vendor	Vendor	Dealer; Vendor
<b>Comments</b>				
	Icon-based graphical user interface; supports up to 64,000 stations; price shown is for 8-station network.		\$199 for MainLAN; \$1,499 for MainLAN/386.	Peer-to-peer LAN operating system for IBM PS/2, PC/XT/AT and compatibles; with Waterloo PORT Expander, the network can be increased in 25-user increments to 250 users; price stated is for 25-user version.

Vendor	Waterloo Microsystems Inc.	Watlan, Inc.	Watlan, Inc.	Watlan, Inc.
<b>Product</b>	PORT Lite 2.5	Watstar/A2	Watstar/E10	Watstar/p10
<b>Characteristics</b>				
Server Memory Req., Min. (bytes)	2M	640K	640K	640K
Server Operating System	DOS	RealTime Executive	RealTime Executive	RealTime Executive
Workstation Memory Req., Min. (bytes)	640K	512K	512K	512K
Network Interface Standards Supported	NETBIOS	NETBIOS	NETBIOS	NETBIOS
Protocols Supported	None identified	TCP/IP	TCP/IP	TCP/IP
LANs Supported	Arcnet; Token-Ring	Arcnet	Ethernet	ProNET-10; Token-Ring
<b>Pricing/Support</b>				
Price (\$)	695	2,250	4,995	4,995
Date of First Delivery	1988	None identified	None identified	None identified
Support Supplied by	Dealer; Vendor	Vendor	Vendor	Vendor
<b>Comments</b>				
	Peer-to-peer entry-level LAN operating system for IBM PS/2, PC/XT/AT, and compatibles; with PORT Lite Expander, the network can be increased in 5-user increments to 25 users; price stated is for 5-user version.	Intended for small workgroups (up to 30 nodes); bridges at Watstar server enable integration of these networks to systems with up to 40,000 nodes; includes network services and utilities.	Intended for multi-purpose Ethernet systems; bridges at Watstar servers provide connectivity to large-scale systems; includes network services and utilities.	Includes utilities and security functions; supports high capacity (4GB) network servers and over 200,000 user IDs; bridged to other Watstar LANS via Watstar servers; services include account manager, diagnostics, E-mail.

Vendor	Webcorp	Zytec Systems
Product	WEB Network Operating System 2.05	Triac/PC 1.5
<b>Characteristics</b>		
Server Memory Req., Min. (bytes)	55K	120K
Server Operating System	DOS	DOS
Workstation Memory Req., Min. (bytes)	55K	0
Network Interface Standards Supported	IPX emulation; NetWare	NETBIOS; SNB and Extended SMB
Protocols Supported	IPX; OSI	TCP/IP; XNS
LANs Supported	AppleTalk; Arcnet; Ethernet; FDDI; Starlan; Token-Ring	Arcnet; Ethernet; Zytec 815 Custom
<b>Pricing/Support</b>		
Price (\$)	2,495, site license	See comments
Date of First Delivery	July 1990	1988
Support Supplied by	Dealer; Vendor	Vendor
<b>Comments</b>	Peer-to-peer network operating system that features an easy-to-use interface, advanced memory efficiency, extensibility, hardware independence, and network security and management tools; designed for workgroups and small businesses.	Free with starter kits.

## Network Servers Comparison Column Entry Descriptions

A number of different products are marketed as network servers. We have tried to fit each product to the specifications listed, to provide an accurate representation of that product's capabilities. Our survey form provided each vendor with a number of choices for each parameter listed. Space was provided to write in an answer when the proper choices for that vendor were not listed.

**Vendor and Model.** This entry lists the manufacturer and exact model number or name of each device.

### **Characteristics**

**Processor.** The processor controls the basic functions of the network server. The most popular processors used in net-

work servers are the Intel 80286 and 80386; some newer machines use the 80486. Some servers also use Intel's older 80186 or 8088. Motorola's 68000 and 68020 are also used in some network servers.

### **Disk Capacity, Bytes.**

The network server's disk capacity defines much of its functionality. The larger the disk capacity, the more files and data the server can store and distribute. This answer is given in bytes; an answer of 1M represents 1 megabyte (1 million bytes) of disk capacity.

### **Minimum Memory, Bytes.**

This entry indicates the amount of RAM resident on the network server.

### **Number of Expansion Slots.** Like personal com-

puters, network servers generally offer expansion slots for the attachment of interface boards and peripherals. A network interface board usually must be installed in one of the expansion slots to connect the server to the network.

**Operating System Software Supported.** Servers must be capable of running the network's operating system software in order to operate on the LAN. Some of the most commonly used network operating systems are Novell NetWare, 3+ / 3+ Open from 3Com, Banyan VINES, Microsoft OS/2 LAN Manager, and IBM OS/2 LAN Server.

**Network Interfaces Supported.** As mentioned earlier, most servers must be configured with a network interface board in order to operate over the LAN. A server may support Ethernet, Arcnet, token-ring, Starlan, AppleTalk, or FDDI connections. Many servers

provide support for a number of these.

**Tape Backup.** Many servers provide tape backup to protect stored data in case of a power outage or other event during which data might be lost.

### **Pricing/Support**

**Price (\$).** Network servers are available with a wide range of prices, depending on the configuration and functionality of the unit.

### **Date of First Delivery.**

This entry tells how long the product has been commercially available.

**Standard Warranty.** Warranties offered differ from vendor to vendor. Many offer one-year warranties; some offer less.

**Service Supplied by.** Increasingly, products are serviced by the dealer or via a third-party service arrangement.

**Comments.** This entry includes space for any features, functions, or products not covered by the entries above.

Vendor	Acer, Inc.	Acer, Inc.	Acer, Inc.	Advanced Digital Corp.
<b>Product</b>	1100/20	1100/25	1100/32	Powerlite
<b>Characteristics</b>				
Processor	80386	80386	80386	80286; 80386
Minimum Disk Capacity (bytes)	None identified	None identified	None identified	40M
Maximum Disk Capacity (bytes)	676M	676M	676M	100M
Minimum Memory (bytes)	2M	2M	4M	1M
Number of Expansion Slots	8	8	8	4
Operating System Software Supported	NetWare	NetWare	NetWare	NetWare
Network Interfaces Supported	Arcnet; Ethernet; Token-Ring	Arcnet; Ethernet; Token-Ring	Arcnet; Ethernet; Token-Ring	Arcnet; Ethernet
Tape Backup	Optional	Optional	Optional	Not Available
<b>Pricing/Support</b>				
Price (\$)	3,395	4,795	6,495	2,500
Date of First Delivery	September 1988	February 1989	July 1989	1989
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Dealer; third party; vendor	Dealer; third party; vendor	Dealer; third party; vendor	Third party; vendor
<b>Comments</b>	Price shown is 2M-byte configuration.	Price shown is 2M-byte configuration.	Price shown is 4M-byte configuration.	

Vendor	Altos Computer Systems	Altos Computer Systems	Altos Computer Systems	Altos Computer Systems
<b>Product</b>	386 Series 1000 Model 25	386 Series 1000 Model 33	486 System 1000	486 System 5000
<b>Characteristics</b>				
Processor	80386	80386	80486	80486
Minimum Disk Capacity (bytes)	90M	170M	170M	440M
Maximum Disk Capacity (bytes)	5G	5G	5G	30G
Minimum Memory (bytes)	4M	4M	4M	8M
Number of Expansion Slots	2	2	2	8
Operating System Software Supported	Altos System V/386 3.1	Altos System V/386 3.1	Altos System V/386 3.1	Altos UNIX system V/386 3.2
Network Interfaces Supported	Ethernet	Ethernet	Ethernet	Ethernet
Tape Backup	Standard	Standard	Standard	Standard
<b>Pricing/Support</b>				
Price (\$)	15,500	17,700	20,850	See comments
Date of First Delivery	October 1988	April 1989	January 1989	May 1990
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Dealer; third party; vendor			
<b>Comments</b>				Contact vendor for pricing information.

Vendor	American Mitac Corp.	American Research Corp.	Apple Computer, Inc.	Arche Technologies, Inc.
Product	4000G	3885/25C	AppleShare File Server 2.0	Legacy 386-25
<b>Characteristics</b>				
Processor	80386	80386	68020	80386
Minimum Disk Capacity (bytes)	1M	None identified	20M	None identified
Maximum Disk Capacity (bytes)	8M	1.2M	1G	1.52G
Minimum Memory (bytes)	4M	2M	1M	2M
Number of Expansion Slots	8	8	6	7
Operating System Software Supported	3+ /3+ Open; NetWare; OS/2 LAN Manager; VINES	NetWare	3+ /3+ Open; AFP; NetWare; OS/2 LAN Manager	NetWare
Network Interfaces Supported	Arcnet; Ethernet; FDDI; Starlan; Token-Ring	Arcnet; Ethernet	AppleTalk; Arcnet; Ethernet; FDDI; Token-Ring	Arcnet; Ethernet; FDDI; Token-Ring
Tape Backup	Not Available	Optional	Optional	Not Available
<b>Pricing/Support</b>				
Price (\$)	4,595	4,631	799	See comments
Date of First Delivery	None identified	None identified	June 1988	October 1990
Standard Warranty	1 year	1 year	90 days	2 years
Service Supplied by	Third party	None identified	Dealer	Dealer; third party; vendor
<b>Comments</b>	BellAtlantic service 1 year on site.		File server software; runs on dedicated Macintosh; supports Macintoshes, MS-DOS PCs, and Apple II workstations.	Contact vendor for pricing information.

Vendor	Arche Technologies, Inc.	Arche Technologies, Inc.	Arche Technologies, Inc.	Arche Technologies, Inc.
Product	Legacy 386-33	Legacy 486-33	Legacy Profile 386-25	Legacy Profile 386-33
<b>Characteristics</b>				
Processor	80386	80486	80386	80386
Minimum Disk Capacity (bytes)	None identified	None identified	None identified	None identified
Maximum Disk Capacity (bytes)	1.52G	1.52G	2.28G	2.28G
Minimum Memory (bytes)	4M	4M	2M	4M
Number of Expansion Slots	8	8	7	8
Operating System Software Supported	NetWare	NetWare	NetWare	NetWare
Network Interfaces Supported	Arcnet; Ethernet; FDDI; Token-Ring	Arcnet; Ethernet; FDDI; Token-Ring	Arcnet; Ethernet; FDDI; Token-Ring; Unix; Xenix	Arcnet; Ethernet; FDDI; Token-Ring
Tape Backup	Not Available	Not Available	Not Available	Not Available
<b>Pricing/Support</b>				
Price (\$)	See comments	See comments	See comments	See comments
Date of First Delivery	March 1990	October 1990	October 1990	March 1990
Standard Warranty	2 years	2 years	2 years	2 years
Service Supplied by	Dealer; third party; vendor	Dealer; third party; vendor	Dealer; third party; vendor	Dealer; third party; vendor
<b>Comments</b>	Contact vendor for pricing information.	Contact vendor for pricing information.	Contact vendor for pricing information.	Contact vendor for pricing information.

Vendor	Arche Technologies, Inc.	AST Research Inc.	AT&T	AT&T
Product	Legacy Profile 486-33	Premium 486/25TE	6386/25 WGS	6386E/33 WGS Model S
<b>Characteristics</b>				
Processor	80486	80486	80386	80386
Minimum Disk Capacity (bytes)	None identified	330M	None identified	1.5G
Maximum Disk Capacity (bytes)	1.52G	1G	380M	6.6G
Minimum Memory (bytes)	4M	4M	4M	4M
Number of Expansion Slots	8	10	8	10
Operating System Software Supported	NetWare	3+ /3+ Open; DOS; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; UNIX; VINES	AT&T StarGroup Software; NetWare; VINES	AT&T UNIX System V/386 3.2.2; NetWare; VINES
Network Interfaces Supported	Arcnet; Ethernet; FDDI; Token-Ring	Arcnet; Ethernet; Token-Ring	Ethernet; FDDI; Starlan	Ethernet; FDDI; Starlan; Token-Ring
Tape Backup	Not Available	Optional	Optional	Standard
<b>Pricing/Support</b>				
Price (\$)	See comments	7,995, max. price is 15,495	6,375	17,400, max. price is 22,225
Date of First Delivery	October 1990	May 1989	September 1989	December 1989
Standard Warranty	2 years	1 year	1 year	1 year
Service Supplied by	Dealer; third party; vendor	Dealer; third party; vendor	Vendor	Vendor
<b>Comments</b>	Contact vendor for pricing information.			Available in base, UNIX multiuser, & Network Server configurations; twisted-pair Ethernet (10M Starlan card) is pre-installed as well as AT&T PMX/starMAIL.

Vendor	AT&T	Banyan Systems, Inc.	Banyan Systems, Inc.	Bell & Howell Document Management Products Co.
Product	6386E/33 WGS	Banyan/CNS 386	Banyan/CNS 486	Record Server
<b>Characteristics</b>				
Processor	80386	80386	Intel i486	80386
Minimum Disk Capacity (bytes)	None identified	80M	146M	300M
Maximum Disk Capacity (bytes)	600M	660M	660M	300M
Minimum Memory (bytes)	4M	4M	8M	2M
Number of Expansion Slots	10	8	8	8
Operating System Software Supported	AT&T UNIX System V/386 3.2.2; NetWare; VINES	VINES	VINES	DOS
Network Interfaces Supported	Ethernet; Fiber; Starlan; Token-Ring	Arcnet; Ethernet; Omnet; Starlan; Token-Ring	Arcnet; Ethernet; Omnet; Starlan; Token-Ring	Ethernet
Tape Backup	Optional	Optional; Standard	Optional; Standard	Standard
<b>Pricing/Support</b>				
Price (\$)	11,475, max. price is 13,575	21,995	31,395	21,760
Date of First Delivery	October 1989	June 1988	January 1990	July 1988
Standard Warranty	1 year	90 days	90 days	1 year
Service Supplied by	Vendor	Dealer; third party; vendor	Dealer; third party; vendor	Vendor
<b>Comments</b>	Standard configurations includes 4MB RAM, combination floppy/hard disk ESDI controller; supports X Windows application development.	386-based network server, fully optimized for Banyan's network operating system; price shown is base.	High-end server based on Intel's i486 CPU; fully optimized for Banyan's VINES network operating system; price shown is base.	

Vendor	Bethel Computer	Bethel Computer	Compex, Inc.	Core International, Inc.
<b>Product</b>	286 FS	386 FS	System	386/33
<b>Characteristics</b>				
Processor	80286	80386	80386	80386
Minimum Disk Capacity (bytes)	None identified	None identified	None identified	150M
Maximum Disk Capacity (bytes)	None identified	None identified	1.5G	5G
Minimum Memory (bytes)	1M	1M	16M	4M
Number of Expansion Slots	8	8	8	8
Operating System Software Supported	NetWare	NetWare	NetWare	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES
Network Interfaces Supported	Arcnet; Ethernet	Arcnet; Ethernet	Arcnet; Ethernet; Token-Ring	Arcnet; Ethernet; Starlan; Token-Ring
Tape Backup	Optional	Optional	None identified	Optional
<b>Pricing/Support</b>				
Price (\$)	2,000	2,000	5,995	8,000
Date of First Delivery	1987	1987	May 1990	August 1987
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Third party
<b>Comments</b>	Can be ordered according to customers' configurations.	Can be ordered according to customers' configurations.	Multi channel disk control, multi channel network interface control.	

Vendor	Datamedia Corp.	Datamedia Corp.	Datamedia Corp.	Datapoint Corp.
<b>Product</b>	NETmate/dx25 386/25-01/-04	NETmate/dx33 386/33-01/-A0	NETmate/dx425 486/25-01/-04	7850
<b>Characteristics</b>				
Processor	80386	80386	80486	80486
Minimum Disk Capacity (bytes)	40M	40M	100M	142M
Maximum Disk Capacity (bytes)	170M	170M	170M	3G
Minimum Memory (bytes)	2M	2M	4M	16M
Number of Expansion Slots	3	3	3	5
Operating System Software Supported	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	NOE
Network Interfaces Supported	Arcnet; Ethernet; Starlan; Token-Ring	Arcnet; Ethernet; Starlan; Token-Ring	Arcnet; Ethernet; Starlan; Token-Ring	Arcnet; Ethernet; Token-Ring
Tape Backup	Not Available	Not Available	Not Available	Optional
<b>Pricing/Support</b>				
Price (\$)	4,095, max. price is 4,820	5,295, max. price is 6,690	7,795, max. price is 9,190	See comments
Date of First Delivery	August 1990	August 1990	August 1990	April 1990
Standard Warranty	1 year	1 year	1 year	30 days
Service Supplied by	Vendor	Vendor	Vendor	Third party
<b>Comments</b>				Symmetric, multi-processor, 80486 based system; maximum memory now available is 32MB and can support 4 Arcnet connections; contact vendor for pricing information.

Vendor	Datapoint Corp.	Digital Equipment Corp.	DSC Communications Corp.	DSC Communications Corp.
Product	7950	DECstation 200-300 Series	NS165-255	NS165-8
<b>Characteristics</b>				
Processor	80386	80286; 80386; RISC/VAX	80386	80386
Minimum Disk Capacity (bytes)	276M	20M	165M	165M
Maximum Disk Capacity (bytes)	30G	None identified	None identified	None identified
Minimum Memory (bytes)	16M	1M	2M	2M
Number of Expansion Slots	20	6	8	8
Operating System Software Supported	NOE	None identified	NEXOS 386-255 (bundled)	NEXOS 386-8 (bundled)
Network Interfaces Supported	Arcnet; Ethernet; Token-Ring	Ethernet; FDDI	Arcnet; Ethernet; Token-ring	Arcnet; Ethernet; Token-ring
Tape Backup	Optional	Optional	Standard	Standard
<b>Pricing/Support</b>				
Price (\$)	See comments	See comments	10,495	9,295
Date of First Delivery	April 1988	None identified	November 1988	November 1988
Standard Warranty	30 days	90 days	1 year	1 year
Service Supplied by	Third party	Vendor	Dealer; vendor	Dealer; vendor
<b>Comments</b>	Contact vendor for pricing information.	Contact vendor for pricing information.	20 Mhz CPU; 2MB system; 150MB tape unit; installed with NEXOS 386-255 user.	20 Mhz CPU; 2MB system memory; 105MB tape; installed with NEXOS 386-8 user.

Vendor	DSC Communications Corp.	DSC Communications Corp.	DSC Communications Corp.	DSC Communications Corp.
Product	NS260-255	NS260-8	NS680-255	NS80-8
<b>Characteristics</b>				
Processor	80386	80386	80386	80386
Minimum Disk Capacity (bytes)	260M	260M	680M	80M
Maximum Disk Capacity (bytes)	520M	520M	1.36G	160M
Minimum Memory (bytes)	4M	4M	4M	2M
Number of Expansion Slots	8	8	8	8
Operating System Software Supported	NEXOS 386-255 (bundled)	NEXOS 386-8 (bundled)	NEXOS 386-255 (bundled)	NEXOS 386-8 (bundled)
Network Interfaces Supported	Arcnet; Ethernet; Token-ring	Arcnet; Ethernet; Token-ring	Arcnet; Ethernet; Token-ring	Arcnet; Ethernet; Token-ring
Tape Backup	Standard	Standard	Standard	Standard
<b>Pricing/Support</b>				
Price (\$)	14,695	13,495	16,295	8,495
Date of First Delivery	November 1989	None identified	November 1989	November 1988
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Dealer; vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
<b>Comments</b>	33 Mhz CPU; 150MB tape.	33 MHz CPU; 150MB tape.	33 Mhz CPU; 105MB tape.	20 Mhz CPU/2MB system memory; 150MB tape unit; installed with NEXOS 386-8 8 user.

Vendor	DTK Computer, Inc.	DTK Computer, Inc.	DTK Computer, Inc.	DTK Computer, Inc.
Product	KEEN-2000 (Desktop)	KEEN-2000 (Tower)	KEEN-2500 (Desktop)	KEEN-2503 (Tower)
<b>Characteristics</b>				
Processor	80286; 80386	80386	80386	80386
Minimum Disk Capacity (bytes)	None identified	None identified	None identified	None identified
Maximum Disk Capacity (bytes)	None identified	None identified	None identified	None identified
Minimum Memory (bytes)	1M	1M	8M	8M
Number of Expansion Slots	8	8	8	8
Operating System Software Supported	NetWare	NetWare	NetWare	NetWare
Network Interfaces Supported	Arcnet; Ethernet	Arcnet; Ethernet	Arcnet; Ethernet	Arcnet; Ethernet
Tape Backup	None identified	None identified	Not Available	Not Available
<b>Pricing/Support</b>				
Price (\$)	1,099	1,325	1,899	2,049
Date of First Delivery	None identified	None identified	None identified	None identified
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Dealer	Dealer	Dealer	Dealer

**Comments**

Vendor	DTK Computer, Inc.	Gandalf Data, Inc.	Harris Adacom	Hewlett-Packard Co.
Product	KEEN-3304 (Tower)	StarPort	9574 Strategy Network Controller	HP 3000
<b>Characteristics</b>				
Processor	80386	80286; 80386	80386	68000; 80286; 80386; HP RISC
Minimum Disk Capacity (bytes)	None identified	None identified	None identified	40M
Maximum Disk Capacity (bytes)	None identified	None identified	None identified	1G
Minimum Memory (bytes)	8M	640K	4M	1M; 2M; 640K
Number of Expansion Slots	8	12	6	7; 8; 9
Operating System Software Supported	NetWare	NetWare	UNIX	3+ /3+ Open; HP Officeshare, HP LAN Manager; NetWare
Network Interfaces Supported	Arcnet; Ethernet	Arcnet; Ethernet; Token-Ring	Ethernet; Token-Ring	Ethernet; Starlan; Token-Ring
Tape Backup	Not Available	Standard	Optional	Optional
<b>Pricing/Support</b>				
Price (\$)	3,099	See comments	See comments	4,000
Date of First Delivery	None identified	January 1988	August 1990	January 1986
Standard Warranty	1 year	None identified	1 year	1 year; 30 days; 90 days
Service Supplied by	Dealer	Vendor	Vendor	Vendor

**Comments**

Provides DOS applications & Netware LAN functionality to ASCII terminals, and serves as a network server for PCs. Contact vendor for pricing information.

Enables connection of coax terminals, token-ring LAN devices and Ethernet LAN devices to an IBM host; contact vendor for pricing information.

HP PC LAN Networks support both dedicated and non-dedicated file servers ranging from PC-DOS & OS/2, to UNIX to MPE; price shown is base.

Vendor	Hewlett-Packard Co.	Hewlett-Packard Co.	JC Information Systems	JC Information Systems
Product	HP 9000	HP Vectra	5188-620	5196-320
<b>Characteristics</b>				
Processor	68000; 80286; 80386; HP RISC	68000; 80286; 80386; HP RISC	80286	80386
Minimum Disk Capacity (bytes)	40M	40M	0	0
Maximum Disk Capacity (bytes)	1G	1G	320M	760M
Minimum Memory (bytes)	1M	1M	1M	1M
Number of Expansion Slots	7; 8; 9	7; 8; 9	8	8
Operating System Software Supported	3+ /3+ Open; HP Officeshare, HP LAN Manager; NetWare	3+ /3+ Open; HP Officeshare, HP LAN Manager; NetWare	CBIS Network O/S; NetWare	CBIS Network O/S; NetWare
Network Interfaces Supported	Ethernet; Starlan; Token-Ring	Ethernet; Starlan; Token-Ring	Arcnet; Ethernet; Starlan	Arcnet; Ethernet; Starlan
Tape Backup	Optional	Optional	Optional	Optional
<b>Pricing/Support</b>				
Price (\$)	4,000	4,000	945	1,795
Date of First Delivery	January 1986	January 1986	July 1988	August 1989
Standard Warranty	1 year; 30 days; 90 days	1 year; 30 days; 90 days	1 year	1 year
Service Supplied by	Vendor	Vendor	Dealer	Dealer
<b>Comments</b>	HP PC LAN Networks support both dedicated and non-dedicated file servers ranging from PC-DOS & OS/2, to UNIX to MPE.	HP PC LAN Networks support both dedicated and non-dedicated file servers ranging from PC-DOS & OS/2, to UNIX to MPE; price shown is base.	20MHz operation, up to 8M RAM at full CPU speed, 0 wait-state; utility and diagnostic software provided.	25MHz operation with 32K cache; up to 32M RAM directly addressed by CPU; utility and diagnostic software provided.

Vendor	Lancer Research	Lanmaster	Maco Networks, Inc.	Morton Management, Inc.
Product	FS300/FS400 Series	Lanmaster File Servers	LANFrame	GigaServer
<b>Characteristics</b>				
Processor	80386; 80486	80286; 80386	80386; 80486	80386; 80486
Minimum Disk Capacity (bytes)	80M	20M	300M	160M
Maximum Disk Capacity (bytes)	600M	None identified	4.8G	2.3G
Minimum Memory (bytes)	1M	1M	32M	16M
Number of Expansion Slots	8	5; 8	8	12; 8
Operating System Software Supported	NetWare	3+ /3+ Open; LifeNet; NetWare; Network OS; VINES; ViaNet	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program
Network Interfaces Supported	Arcnet; Ethernet	Arcnet; Ethernet; Token-Ring	AppleTalk; Arcnet; Ethernet; Starlan; Token-Ring	Arcnet; Ethernet; FDDI; Starlan; Token-Ring
Tape Backup	Optional	Optional	Optional	Optional
<b>Pricing/Support</b>				
Price (\$)	2,400, max. price is 6,100	See comments	See comments	3,495, max. price is 22,995
Date of First Delivery	October 1990	September 1988	April 1989	January 1989
Standard Warranty	1 year	2 years	5 years (motherboard)	1 year; 3 years
Service Supplied by	Dealer; vendor	Dealer; vendor	Vendor	Dealer; third party; vendor
<b>Comments</b>		Lanmaster servers ship custom configured or as a turnkey system with NetWare; contact vendor for pricing information.	Contact vendor for pricing information.	Industrial duty LAN servers, desktop or rackmounted configurations; 1-year overnight replacement.

Vendor	Motorola Computer Systems	NCR Corp.	NCR Corp.	NCR Corp.
Product	Multipersonal Computer	System 3340 for NCR NetWare/ X	System 3345 for NCR NetWare/ X	System 3445 for NCR NetWare/ X
<b>Characteristics</b>				
Processor	M88100	80486	80486	80486
Minimum Disk Capacity (bytes)	300M	100M	340M	None identified
Maximum Disk Capacity (bytes)	20G	700M	2G	3.3G
Minimum Memory (bytes)	16M	8M	8M	8M
Number of Expansion Slots	7	4	4	7
Operating System Software Supported	UNIX	NetWare; UNIX V.4	NetWare; UNIX V.4	NetWare; UNIX V.4
Network Interfaces Supported	AppleTalk; Arcnet; Ethernet; FDDI; Token-Ring	Ethernet	Ethernet	Ethernet
Tape Backup	Standard	Standard	Standard	Standard
<b>Pricing/Support</b>				
Price (\$)	23,985, max. price is 59,985	7,995	7,995	7,995
Date of First Delivery	June 1990	February 1991	February 1991	February 1991
Standard Warranty	1 year	30 days	30 days	30 days
Service Supplied by	Third party; vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Each system is bundled with UNIX, Ethernet, X/Motif, Looking Glass desktop Manager, Uniplex Office Automation, SoftPC for DOS applications and a FrameMaker demo 3 X-terminals also included.	Price is for network software.	Price is for network software.	Price is for network software.

Vendor	NetFRAME Systems	Network & Communication Technology, Inc.	The Network Connection	The Network Connection
Product	NF100/NF300/NF400	Rack Mount Server System	Triumph 3000/2000	Triumph 4000
<b>Characteristics</b>				
Processor	80386; 80486	80386	80286; 80386	80486
Minimum Disk Capacity (bytes)	380M	40M	20M	20M
Maximum Disk Capacity (bytes)	42.7G	4.8G	1.2G	1.2G
Minimum Memory (bytes)	8M	2M	1M	1M
Number of Expansion Slots	8	8	8	8
Operating System Software Supported	NetWare; OS/2 LAN Manager	NetWare; PC LAN Program	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES
Network Interfaces Supported	AppleTalk; Ethernet; Token-Ring	Arcnet; Ethernet; Starlan; Token-Ring	AppleTalk; Arcnet; Ethernet; FDDI; Starlan; Token-Ring	AppleTalk; Arcnet; Ethernet; FDDI; Starlan; Token-Ring
Tape Backup	Optional	Optional	Optional	Optional
<b>Pricing/Support</b>				
Price (\$)	19,950	See comments	See comments	See comments
Date of First Delivery	November 1989	June 1988	None identified	None identified
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Dealer	Dealer	Third party; vendor	Third party; vendor
<b>Comments</b>		Contact vendor for pricing information. Holds 4.5 full height disk drives; chassis includes rack slides for easy access.	Guaranteed 24-hour replacement; contact vendor for pricing information.	Guaranteed 24-hour replacement; contact vendor for pricing information.

Vendor	The Network Connection	The Network Connection	Samsung Informations Systems America, Inc.	Samsung Informations Systems America, Inc.
<b>Product</b>	<b>Triumph AT Terminal</b>	<b>Triumph TNX</b>	<b>386A3</b>	<b>386AE</b>
<b>Characteristics</b>				
Processor	68000 Series; 80286; 80386	68000 Series; 80386; 80486	80386	80386
Minimum Disk Capacity (bytes)	20M	20M	None identified	None identified
Maximum Disk Capacity (bytes)	1.2G	1.2G	None identified	None identified
Minimum Memory (bytes)	1M	1M	4M	4M
Number of Expansion Slots	8	8	8	8
Operating System Software Supported	3+/3+Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+/3+Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	NetWare	NetWare
Network Interfaces Supported	AppleTalk; Arcnet; Ethernet; FDDI; Starlan; Token-Ring	AppleTalk; Arcnet; Ethernet; FDDI; Starlan; Token-Ring	Arcnet; Ethernet	Arcnet; Ethernet; FDDI; Starlan; Token-Ring
Tape Backup	Optional	Optional	Not available	Not available
<b>Pricing/Support</b>				
Price (\$)	See comments	See comments	4,999	3,299
Date of First Delivery	None identified	None identified	May 1991	1987
Standard Warranty	1 year	1 year	1 year; Intellogic trace on-site	Intellogic trace on-site; one
Service Supplied by	Third party; vendor	Third party; vendor	Dealer; third party; vendor	Dealer; third party; vendor
<b>Comments</b>	Guaranteed 24-hour replacement; contact vendor for pricing information.	Guaranteed 24-hour replacement; contact vendor for pricing information.	33MHz CPU Speed, Samsung Advanced BIOS, 100% NetWare compatible, NetWare certified, up to 16MB capacity, up to 256KB cache, Novell FDC/DCB controller card is standard, five half-height drive bays available.	Novell-co-labelled filesaver; 16Mhz CPU speed; expendable to 8M, 1.2M diskette drive, 2S/1P, 375W power supply, Novell DCB/FCB optional, five drive bays (half-height) available, Samsung Novell Advanced NetWare BIOS.
Vendor	Solid Technologies	Solid Technologies	Storage Dimensions, Inc.	Sun Microsystems, Inc.
<b>Product</b>	<b>386-25 LAN Server</b>	<b>386-SX LAN Server</b>	<b>FileMaster Series</b>	<b>SPARCserver 330</b>
<b>Characteristics</b>				
Processor	80386	80386	80386	SPARC
Minimum Disk Capacity (bytes)	100M	100M	150M	669M
Maximum Disk Capacity (bytes)	600M	600M	2G	3.6G
Minimum Memory (bytes)	2M	2M	4M	8M
Number of Expansion Slots	8	8	8	6; 9
Operating System Software Supported	Solid LAN Operating System	Solid LAN Operating System	NetWare; VINES	SunOS (BSD UNIX 4.3)
Network Interfaces Supported	Solid LAN Network Cards Supported	Solid LAN Network Cards Supported	Arcnet; Ethernet; FDDI; Token-Ring	Ethernet; FDDI; Starlan
Tape Backup	Optional	Optional	Not available	Standard
<b>Pricing/Support</b>				
Price (\$)	2,637	2,237	7,799, max. price is 13,389	29,900
Date of First Delivery	None identified	None identified	December 1989	April 1989
Standard Warranty	1 year	1 year	One year	90 days
Service Supplied by	Vendor	Vendor	Third party	Vendor
<b>Comments</b>	Pre-installed with the Solid LAN Operating system and user's choice of Solid LAN networking card.	Installed with the Solid LAN Operating system and user's choice of Solid LAN networking card.	High performance file server optimized for NetWare 286 & NetWare 386.	

Vendor	Sun Microsystems, Inc.	Sun Microsystems, Inc.	Sun Microsystems, Inc.	TeleVideo Systems, Inc.
Product	SPARCserver 490	SPARCserver 2	SPARCserver 470	Tele386/25
<b>Characteristics</b>				
Processor	SPARC	SPARC	SPARC	80386
Minimum Disk Capacity (bytes)	711M	669M	669M	0
Maximum Disk Capacity (bytes)	29G	7.6G	9.2G	150M
Minimum Memory (bytes)	32M	16M	32M	4M
Number of Expansion Slots	16	3	12	12
Operating System Software Supported	SunOS (BSD UNIX 4.3)	SunOS (BSD UNIX 4.3)	SunOS (BSD UNIX 4.3)	NetWare; SCO Xenix
Network Interfaces Supported	Ethernet; FDDI; Starlan	Ethernet	Ethernet; FDDI; Starlan	Ethernet
Tape Backup	Optional	Standard	Standard	Not available
<b>Pricing/Support</b>				
Price (\$)	99,900	24,595	59,900	3,995
Date of First Delivery	None identified	November 1990	May 1990	April 1989
Standard Warranty	90 days	90 days	90 days	1 year
Service Supplied by	Vendor	Vendor	Vendor	Third party
<b>Comments</b>				

Vendor	TeleVideo Systems, Inc.	TeleVideo Systems, Inc.	3Com Corp.	3Com Corp.
Product	Tele386TE	Tele486Te	3Server/500	3Server/600
<b>Characteristics</b>				
Processor	80386	80486	80386	80486
Minimum Disk Capacity (bytes)	80M	80M	150M	150M
Maximum Disk Capacity (bytes)	200M	200M	4G	4G
Minimum Memory (bytes)	4M	4M	8M	8M
Number of Expansion Slots	7	7	4	4
Operating System Software Supported	NetWare	NetWare; OS/2 LAN Manager; SCO Xenix	3+ /3+ Open; NetWare; OS/2 LAN Manager	3+ /3+ Open; NetWare; OS/2 LAN Manager
Network Interfaces Supported	Ethernet	Ethernet	AppleTalk; Ethernet; Token-Ring	AppleTalk; Ethernet; Token-Ring
Tape Backup	Not available	Not available	Optional	Optional
<b>Pricing/Support</b>				
Price (\$)	5,245	9,995	8,345, max. price is 16,145	22,300
Date of First Delivery	December 1990	January 1991	August 1989	October 1990
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Dealer; third party	Dealer
<b>Comments</b>			Network-optimized server running multiple services at once; ported memory architecture allows concurrent disk and network I/Os; supports additional functions including mail service, internetwork routing, printer service, and network bridging.	Network optimized server; utilizes a 128KB cache memory to provide peak performance to network users; employs triported memory architecture; supports file, printer, and mail service, internetwork routing, and concurrent CPU and disk I/O.

Vendor	Top Microsystems	Top Microsystems	Wang Laboratories, Inc.	Wang Laboratories, Inc.
Product	TF-286	TF-386	LS-125	LS-140
<b>Characteristics</b>				
Processor	80286	80386	80386	80486
Minimum Disk Capacity (bytes)	40M	40M	80M	80M
Maximum Disk Capacity (bytes)	400M	400M	2.3G	2.3G
Minimum Memory (bytes)	640K	640K	4M	4M
Number of Expansion Slots	6; 8	6; 8	10	10
Operating System Software Supported	NetWare	NetWare	VINES	VINES
Network Interfaces Supported	Arcnet; Ethernet; Token-Ring	Arcnet; Ethernet; Token-Ring	Arcnet; Ethernet; FDDI; Starlan; Token-Ring	Arcnet; Ethernet; FDDI; Starlan; Token-Ring
Tape Backup	Optional	Optional	Standard	Standard
<b>Pricing/Support</b>				
Price (\$)	1,100	2,200	23,995	25,795
Date of First Delivery	September 1989	September 1989	January 1990	May 1990
Standard Warranty	1 year	1 year	90 days	90 days
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>			Price shown is base.	Price shown is base.

Vendor	Wang Laboratories, Inc.	Wang Laboratories, Inc.	Wang Laboratories, Inc.	Wang Laboratories, Inc.
Product	LS-50	LS-65	PC 280/20	PC 350/16S
<b>Characteristics</b>				
Processor	80386	80386	80286	80386
Minimum Disk Capacity (bytes)	60M	60M	40M	40M
Maximum Disk Capacity (bytes)	642M	1.2G	642M	400M
Minimum Memory (bytes)	4M	4M	1M	2M
Number of Expansion Slots	8	8	8	5
Operating System Software Supported	3+ /3+ Open; NetWare; VINES			
Network Interfaces Supported	Arcnet; Ethernet; FDDI; Starlan; Token-Ring			
Tape Backup	Optional	Optional	Optional	Optional
<b>Pricing/Support</b>				
Price (\$)	14,010	14,740	3,790	14,000
Date of First Delivery	December 1989	April 1990	January 1990	October 1989
Standard Warranty	90 days	90 days	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>				

Vendor	Wang Laboratories, Inc.	Watlan, Inc.	Watlan, Inc.	Zetaco, Inc.
Product	PC 480	ELS Series	HPS Series	NETstor Server
<b>Characteristics</b>				
Processor	80486	80286	80386	80186
Minimum Disk Capacity (bytes)	60M	75M	500M	3G
Maximum Disk Capacity (bytes)	1.2G	330M	3.5G	80G
Minimum Memory (bytes)	2M	640K	640K	None identified
Number of Expansion Slots	8	6	6	9
Operating System Software Supported	3+ / 3+ Open; NetWare; VINES	Watstar/pc	Watstar/pc	UNIX
Network Interfaces Supported	Arcnet; Ethernet; FDDI; Starlan; Token-Ring	Token-Ring	Token-Ring	Ethernet
Tape Backup	Optional	Optional	Optional	Standard
<b>Pricing/Support</b>				
Price (\$)	16,590	6,000	76,000	See comments
Date of First Delivery	June 1990	January 1984	January 1984	January 1989
Standard Warranty	1 year	1 year	1 year	90 days
Service Supplied by	Vendor	Vendor	Vendor	Third party
<b>Comments</b>		Entry-level Watstar/pc network servers.	Includes 8-inch platter high duty cycle disk storage for LANs with heavy user traffic.	Contact vendor for pricing information.

# Network Interface Cards

## Comparison Column Entry Descriptions

Interface cards plug into an expansion slot on the PC to be networked. They provide the computer with its physical connection to the network. We have tried to fit each product to the specifications listed, to provide an accurate representation of that product's capabilities. Our survey form provided each vendor with a number of choices for each parameter listed. Space was provided to write in an answer when the choices listed were inadequate to describe a specific product.

**Vendor and Model.** This entry lists the manufacturer and exact model number or name of each device.

**Characteristics LANs Supported.** Vendors selected Ethernet, Starlan, Token-Ring, Arcnet, AppleTalk, FDDI, or

Other. Ethernet is a baseband carrier sense multiple access with collision detection (CSMA/CD) network that uses a linear bus topology and operates at 10M bps. Starlan is similar to Ethernet but uses a star topology with central hubs and can operate at 1M or 10M bps. Token-Ring refers to a LAN designed with a ring topology, running at speeds of 4M or 16M bps, that uses the token-passing technique. Arcnet is a baseband LAN that uses a ring or bus topology, runs at 2.5M bps, and also uses a token-passing access method. AppleTalk is Apple's Macintosh networking protocol that can run on most industry-standard networking schemes. FDDI stands for Fiber Distributed Data Interface and is a 100M bps fiber optic network.

**Microcomputer Bus Supported.** Entries in this category specify the machine and bus a card is designed for. Entries include IBM PC, PC AT (ISA), or compatible; the Extended Industry Standard Architecture (EISA); the IBM Micro Channel Architecture (MCA) used in PS/2 Models 50 and above; Apple Macintosh II Nu-Bus; or other models/makes.

**Bus Size.** This entry indicates the number of physical connections to the main data path of the computer and is largely dependent on the "bus supported" entry above. Cards for the IBM PC bus, for example, are 8-bit cards; those for the PC AT (ISA) bus may be 8- or 16-bit cards.

**Maximum Data Rate, bps.** The speed at which data is carried over the network is specified. Entries include 2.5M, 4M, 10M, 16M, and other.

**Media Supported.** Entries here indicate the type of cable used to connect network devices and include Standard Ethernet coaxial, Thin Ethernet coaxial, Broadband coaxial,

Shielded twisted pair, Unshielded twisted pair, Optical fiber, and Other.

**Operating Systems Supported.** Vendors specified which of several major network operating systems are supported by the interface card. Entries include Novell NetWare, 3Com 3+/3+ Open, IBM PC LAN Program, Banyan VINES, Microsoft OS/2 LAN Manager, IBM OS/2 LAN Server, and Other.

**Pricing/Support Price.** The basic price of the unit, excluding any options, is noted here.

**Date of First Delivery.** The date when the vendor first delivered the product to market.

**Standard Warranty.** Vendors indicated the length of their warranties.

**Service Supplied by.** The vendor usually offers service on an on-site or factory repair/return basis. In some cases, a dealer or third party provides service.

**Comments.** In this space, vendors listed special characteristics of their products, such as additional capabilities, features, or software not covered in the column.

Vendor	Able Computer Communications	Acer, Inc.	Acer, Inc.	Acer, Inc.
Product	FP 106	5220	5220A	5270
Characteristics LANs Supported	Proprietary	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	Q-Bus	AT (ISA)	AT (ISA)	MCA
Bus Size Maximum Data Rate (bps)	16-bit 1M	8-bit 10M	16-bit 10M	16-bit 10M
Media Supported	Optical fiber; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	VMS	NetWare	NetWare	NetWare
Pricing/Support Price (\$)	2,995	259	299	399
Date of First Delivery Standard Warranty	October 1988 1 year	None identified 1 year	None identified 1 year	None identified 1 year
Service Supplied by	Third party; vendor	Dealer; third party; vendor	Dealer; third party; vendor	Dealer; third party; vendor
Comments	Provides async connectivity for DEC VAX users; supports functionality of DECserver 550.	—	—	—

Vendor	ADI Systems, Inc.	ADI Systems, Inc.	ADI Systems, Inc.	ADI Systems, Inc.
Product	AQ-PCA 216	AQ-PCA 108	AQ-PCA 316	AQ-PCA 116
Characteristics LANs Supported	Arcnet	Arcnet	Arcnet	Arcnet
Microcomputer Bus Supported	AT (ISA)	AT (ISA)	AT (ISA)	AT (ISA)
Bus Size Maximum Data Rate (bps)	16-bit 2.5M	8-bit 2.5M	16-bit 2.5M	16-bit 2.5M
Media Supported	Baseband coaxial	Baseband coaxial	Unshielded twisted-pair	Baseband coaxial
Operating Systems Supported	NetWare; PC LAN Program; PowerLAN; 10Net+; Network-OS; LANtastic; Tapestry	NetWare; PC LAN Program; PowerLAN; 10Net+; Network-OS; LANtastic; Tapestry	NetWare; PC LAN Program; PowerLAN; 10Net+; Network-OS; LANtastic; Tapestry	NetWare; PC LAN Program; PowerLAN; 10Net+; Network-OS; LANtastic; Tapestry
Pricing/Support Price (\$)	325	149	325	275
Date of First Delivery Standard Warranty	1989 2 years	1989 2 years	1989 2 years	1989 2 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	Arcnet high impedance with hyper driver; VLSI technology.	VLSI technology.	Twisted-pair Arcnet with hyper driver; VLSI technology.	Arcnet adapter with hyper driver; VLSI technology.

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Vendor	ADI Systems, Inc.	ADI Systems, Inc.	ADI Systems, Inc.	ADI Systems, Inc.
Product	AQ-PCA 308	AQ-PCA 208	AQ-PCE 116-EM	AQ-PCE 116-TP
<b>Characteristics</b>				
LANs Supported	Arcnet	Arcnet	Ethernet	Ethernet
Microcomputer Bus Supported	AT (ISA)	AT (ISA)	AT (ISA)	AT (ISA)
Bus Size	8-bit	8-bit	16-bit	16-bit
Maximum Data Rate (bps)	2.5M	2.5M	10M	10M
Media Supported	Baseband coaxial	Baseband coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Unshielded twisted-pair
Operating Systems Supported	NetWare; PC LAN Program; PowerLAN; 10Net+; Network-OS; LANtastic; Tapestry	NetWare; PC LAN Program; PowerLAN; 10Net+; Network-OS; LANtastic; Tapestry	NetWare; PC LAN Program; PowerLAN; 10Net+; Network-OS; LANtastic; Tapestry	NetWare; PC LAN Program; PowerLAN; 10Net+; Network-OS; LANtastic; Tapestry
<b>Pricing/Support</b>				
Price (\$)	195	195	425	See comments
Date of First Delivery	1989	1989	1989	1990
Standard Warranty	2 years	2 years	2 years	2 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	High impedance Arcnet; VLSI technology.	High impedance Arcnet adapter; VLSI technology.	Ethernet with 128K buffer memory; Fujitsu EtherStar controller.	Twisted-pair Ethernet 10BASE-T; Fujitsu EtherStar controller; contact vendor for pricing information.

Vendor	ADI Systems, Inc.	ADI Systems, Inc.	ADI Systems, Inc.	ADI Systems, Inc.
Product	AQ-PCE 108-TP	AQ-PCE 100	AQ-PSA 100	AQ-PSE
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Arcnet	Ethernet
Microcomputer Bus Supported	AT (ISA)	AT (ISA)	MCA	MCA
Bus Size	8-bit	8-bit	16-bit	16-bit
Maximum Data Rate (bps)	10M	10M	2.5M	10M
Media Supported	Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial	Baseband coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	NetWare; PC LAN Program; PowerLAN; 10Net+; Network-OS; LANtastic; Tapestry	NetWare; PC LAN Program; PowerLAN; 10Net+; Network-OS; LANtastic; Tapestry	NetWare; PC LAN Program; PowerLAN; 10Net+; Network-OS; LANtastic; Tapestry	NetWare; PC LAN Program; PowerLAN; 10Net+; Network-OS; LANtastic; Tapestry
<b>Pricing/Support</b>				
Price (\$)	See comments	295	395	495
Date of First Delivery	1990	1989	1989	1989
Standard Warranty	2 years	2 years	2 years	2 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Twisted-pair Ethernet 10BASE-T; Fujitsu EtherStar controller; contact vendor for pricing information.	Ethernet adapter; Fujitsu EtherStar controller.	Micro Channel Arcnet.	Ethernet for Micro Channel; Fujitsu EtherStar controller.

Vendor	Advanced Digital Corp.	Allen-Bradley Co., Inc.	Allen-Bradley Co., Inc.	Allen-Bradley Co., Inc.
Product	Ethernet-ADNet	Intelligent Ethernet LAN Adapter	LAN/PC	MAP PLC Interface
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Arcnet	MAP 3.0
Microcomputer Bus Supported	AT (ISA)	AT (ISA); MCA; PC	AT (ISA); EISA; MCA; PC	Proprietary
Bus Size	None identified	16-bit; 8-bit	8-bit	None identified
Maximum Data Rate (bps)	10M; 4M	10M	2.5M	5M
Media Supported	Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Broadband coaxial	Broadband coaxial; Standard Ethernet coaxial
Operating Systems Supported	CBIS Network O/S; NetWare	None identified	3+/3+ Open; NetWare	MAP 3.0 MMS
<b>Pricing/Support</b>				
Price (\$)	395	1,095	See comments	See comments
Date of First Delivery	1989	1989	1984	1987
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Dealer; vendor	Vendor	Vendor	Vendor
Comments	—	TCP/IP support.	Contact vendor for pricing information.	Contact vendor for pricing information. Baseband/broadband/carrierband.

Vendor	Allied Telesis Inc.	Altos Computer Systems	Altos Computer Systems	American Research Corp.
Product	CentreCOM AT-1010	ACPA/1000	ACPA/AT	ARCboard-BU
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	Arcnet
Microcomputer Bus Supported	AT (ISA); PC	None identified	AT (ISA)	AT (ISA)
Bus Size	8-bit	16-bit	16-bit	None identified
Maximum Data Rate (bps)	10M	10M	10M	2.5M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	RG-62 A/U coaxial
Operating Systems Supported	NetWare; PC/TCP	Altos System V/386	Altos UNIX System	NetWare
<b>Pricing/Support</b>				
Price (\$)	395	See comments	See comments	135
Date of First Delivery	June 1989	None identified	None identified	None identified
Standard Warranty	2 years	1 year	1 year	1 year
Service Supplied by	Dealer; vendor	Dealer; third party; vendor	Dealer; third party; vendor	None identified
Comments	—	Contact vendor for pricing information. Networking board designed specifically to be installed in the 386 and 486 Series 1000 product line to allow provision of UNIX system resources to PC through Ethernet.	Contact vendor for pricing information. Included in Altos AT-Connection; comes with software designed to allow a PC connect to an AltosDOS/UNIX integrated LAN; specifically designed to work with Altos networking software.	—

Vendor	American Research Corp.	American Research Corp.	American Research Corp.	American Research Corp.
Product	ARCboard-ST	Etherboard-10BT	Etherboard-16B	Etherboard-8B
<b>Characteristics</b>				
LANs Supported	None identified	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	AT (ISA)	AT (ISA)	AT (ISA)	PC
Bus Size	None identified	None identified	16-bit	8-bit
Maximum Data Rate (bps)	2.5M	10M	10M	None identified
Media Supported	RG-62 A/U coaxial	Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	NetWare	NetWare	NetWare	NetWare
<b>Pricing/Support</b>				
Price (\$)	130	275	285	225
Date of First Delivery	None identified	None identified	None identified	None identified
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	None identified	None identified	None identified	None identified
Comments	—		—	—

Vendor	Andrew Corp.	Andrew Corp.	Andrew Corp.	Andrew Corp.
Product	TRA-4116AT	TRA-4116MCA	TRA-4116PC	TRA-AT
<b>Characteristics</b>				
LANs Supported	Token-Ring	Token-Ring	Token-Ring	Token-Ring
Microcomputer Bus Supported	AT (ISA)	MCA	PC	AT (ISA)
Bus Size	16-bit	16-bit	8-bit	16-bit
Maximum Data Rate (bps)	16M	16M	16M	4M
Media Supported	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair
Operating Systems Supported	3+ /3+ Open; NetWare; OS/2 LAN Manager; PC LAN Program	3+ /3+ Open; NetWare; OS/2 LAN Manager; PC LAN Program	3+ /3+ Open; NetWare; OS/2 LAN Manager; PC LAN Program	3+ /3+ Open; NetWare; OS/2 LAN Server; PC LAN Program
<b>Pricing/Support</b>				
Price (\$)	899	899	799	599
Date of First Delivery	October 1990	October 1990	October 1990	May 1989
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	On board memory can be upgraded to 512K.	On board memory can be upgraded to 512K.	On board memory can be upgraded to 512K.	—

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Products:  
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Vendor	Andrew Corp.	Andrew Corp.	Apple Computer, Inc.	Apple Computer, Inc.
Product	TRA-MCA	TRA-PC	EtherTalk NB Card	TokenTalk NB Card
<b>Characteristics</b>				
LANs Supported	Token-Ring	Token-Ring	Ethernet	Token-Ring
Microcomputer Bus Supported	MCA	AT (ISA); PC	NuBus	NuBus
Bus Size	16-bit	8-bit	16-bit	16-bit
Maximum Data Rate (bps)	4M	4M	10M	4M
Media Supported	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair
Operating Systems Supported	3+ /3+ Open; NetWare; OS/2 LAN Manager; PC LAN Program	3+ /3+ Open; NetWare; OS/2 LAN Server; PC LAN Program	3+ /3+ Open; NetWare; OS/2 LAN Manager	3+ /3+ Open; NetWare; OS/2 LAN Manager
<b>Pricing/Support</b>				
Price (\$)	599	499	699	1,249
Date of First Delivery	May 1989	May 1989	March 1987	August 1989
Standard Warranty	1 year	1 year	90 days	90 days
Service Supplied by	Vendor	Vendor	Dealer; third party	Dealer; third party
Comments	—	—	—	—

Vendor	Artisoft, Inc.	Artisoft, Inc.	Artisoft, Inc.	Artisoft, Inc.
Product	2Mbps	2Mbps MC	AE-2 Ethernet	AE-2 MC Ethernet
<b>Characteristics</b>				
LANs Supported	Proprietary	Proprietary	Ethernet	Ethernet
Microcomputer Bus Supported	AT (ISA); EISA; PC	MCA	EISA	MCA
Bus Size	8-bit	8-bit	16-bit; 8-bit	16-bit; 8-bit
Maximum Data Rate (bps)	2M	2M	10M	10M
Media Supported	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	LANtastic	LANtastic	LANtastic; NetWare; PC LAN Program	LANtastic; NetWare; PC LAN Program
<b>Pricing/Support</b>				
Price (\$)	249	349	349	449
Date of First Delivery	January 1988	December 1990	March 1990	December 1990
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	—	—	—	—

Vendor	Asante Technologies, Inc.	Asante Technologies, Inc.	Asante Technologies, Inc.	Asante Technologies, Inc.
Product	MacCon II/TR	MacCon+ IIE	MacCon+ IIET	MacCon+ IITR
Characteristics LANs Supported	Token-Ring	Ethernet	Ethernet	Token-Ring
Microcomputer Bus Supported	NuBus	NuBus	NuBus	NuBus
Bus Size Maximum Data Rate (bps)	32-bit 4M	32-bit 10M	32-bit 10M	32-bit 4M
Media Supported	Shielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial	Unshielded twisted-pair	Shielded twisted-pair; Un- shielded twisted-pair
Operating Systems Supported	AppleShare; NetWare; TOPS	3+ /3+ Open; AppleShare; Net- Ware; TOPS	3+ /3+ Open; AppleShare; Net- Ware; TOPS	NetWare; TOPS
Pricing/Support Price (\$)	695	495	495	795
Date of First Delivery Standard Warranty	None identified None identified	None identified None identified	None identified None identified	None identified None identified
Service Supplied by	Vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
Comments	—	—	10BASE-T compatible.	—

Vendor	Asante Technologies, Inc.	Asante Technologies, Inc.	Asante Technologies, Inc.	Asante Technologies, Inc.
Product	MacCon+ SE30E	MacCon+ SE30ET	MacCon+ SEE	Maccon+ SEET
Characteristics LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	SE/30	SE/30	SE	SE
Bus Size Maximum Data Rate (bps)	32-bit 10M	32-bit 10M	32-bit 10M	32-bit 10M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Unshielded twisted-pair	Unshielded twisted-pair	Unshielded twisted-pair
Operating Systems Supported	3+ /3+ Open; AppleShare; Net- Ware; TOPS	3+ /3+ Open; AppleShare; Net- Ware; TOPS	3+ /3+ Open; AppleShare; Net- Ware; TOPS	3+ /3+ Open; AppleShare; Net- Ware; TOPS
Pricing/Support Price (\$)	495	495	395	395
Date of First Delivery Standard Warranty	None identified None identified	None identified None identified	None identified None identified	None identified None identified
Service Supplied by	Dealer; vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
Comments	—	10BASE-T compatible.	10BASE-T compatible.	10BASE-T compatible.

Vendor	AST Research Inc.	AT&T	AT&T	AT&T
<b>Product</b>	<b>EtherNode</b>	<b>PC 6300 Network Access Unit</b>	<b>StarLAN 10 EN100 Network Access Unit</b>	<b>StarLAN 10 Fiber Network Access Unit</b>
<b>Characteristics</b>				
LANs Supported	Ethernet	Starlan	Ethernet; Starlan	Starlan
Microcomputer Bus Supported	AT (ISA); PC	AT (ISA)	AT (ISA)	AT (ISA)
Bus Size	8-bit	None identified	None identified	16-bit; 8-bit
Maximum Data Rate (bps)	10M	1M	10M	10M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Unshielded twisted-pair	Standard Ethernet coaxial; Unshielded twisted-pair	Optical fiber
Operating Systems Supported	NetWare; OS/2 LAN Manager	AT&T StarGroup Software; NetWare; VINES	AT&T StarGroup Software; NetWare; VINES	NetWare; VINES
<b>Pricing/Support</b>				
Price (\$)	395	295	495	500
Date of First Delivery	None identified	None identified	None identified	None identified
Standard Warranty	2 years	None identified	None identified	None identified
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	—	—	—	—

Vendor	AT&T	AT&T	Bethel Computer	Bethel Computer
<b>Product</b>	<b>StarLAN 10 MC200 Network Access Unit</b>	<b>StarLAN 10 PC Network Access Unit</b>	<b>AC 1600</b>	<b>AC 800</b>
<b>Characteristics</b>				
LANs Supported	Starlan	Starlan	Arcnet	Arcnet
Microcomputer Bus Supported	MCA	AT (ISA)	AT (ISA)	AT (ISA)
Bus Size	None identified	None identified	16-bit	8-bit
Maximum Data Rate (bps)	10M	10M	2.5M	2.5M
Media Supported	Unshielded twisted-pair	Unshielded twisted-pair	Baseband coaxial	Baseband coaxial
Operating Systems Supported	NetWare; VINES	AT&T StarGroup Software; NetWare; VINES	NetWare	NetWare
<b>Pricing/Support</b>				
Price (\$)	445	295	75, max. price is 125	75, max. price is 125
Date of First Delivery	None identified	None identified	1987	1987
Standard Warranty	None identified	None identified	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	—	—	—	—

Vendor	Bethel Computer	Bethel Computer	BICC Data Networks, Inc.	BICC Data Networks, Inc.
Product	EN 1600	EN 800	4101-0 ILSOLAN	4110-2 ISOLAN
Characteristics LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	AT (ISA)	AT (ISA)	AT (ISA)	AT (ISA)
Bus Size Maximum Data Rate (bps)	16-bit 10M	8-bit 10M	16-bit 10M	16-bit 10M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
Operating Systems Supported	NetWare	NetWare	3+ /3+ Open; NetWare; OS/2 LAN Manager; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; VINES
Pricing/Support Price (\$)	75, max. price is 125	75, max. price is 125	375	349
Date of First Delivery	1987	1987	None identified	1989
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	—	—	IBM-AT busmaster NIC with RJ45 port for connection to an unshielded twisted pair network and an AUJ interface for connection to other media.	IBM-AT busmaster NIC with BNC port for thin Ethernet connection and AUJ port for connection to other media.
Vendor	BICC Data Networks, Inc.	Cabletron Systems, Inc.	Cabletron Systems, Inc.	Cabletron Systems, Inc.
Product	4110-3 ISOLAN	E1000 Series	E2000 Series	E3000 Series
Characteristics LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	MCA	PC	AT (ISA)	MCA
Bus Size Maximum Data Rate (bps)	16-bit 16M	8-bit 10M	16-bit 10M	16-bit 10M
Media Supported	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
Operating Systems Supported	3+ /3+ Open; NetWare; OS/2 LAN Manager; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; VINES
Pricing/Support Price (\$)	375	215, max. price is 400	280, max. price is 500	375, max. price is 595
Date of First Delivery	1989	August 1989	August 1989	August 1989
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	IBM-MCA busmaster NIC with BNC port for thin Ethernet connection and AUJ port for connection to other media.	All drivers shipped with DNI card; support concurrent driver operation (user can run Novell & PC-NFS at same time); supports AUJ & somemedia typeport; incorporates LANVIEW LEDs for transmit, receive, link, & collision indications.	All drivers shipped with card; supports concurrent driver operation (can load multiple drivers at same time); supports both AUJ & some media type; incorporates LANVIEW LEDs indicating transmit, receive, link, & collision.	All drivers shipped with DNI card; supports multiple drivers loaded at once providing concurrent operation of ntwk. operating systems; supports AUJ & one media type connection; incorporates LANVIEW LEDs.

Vendor	Cabletron Systems, Inc.	Cabletron Systems, Inc.	Cabletron Systems, Inc.	Cabletron Systems, Inc.
Product	E4000 Series	E5000 Series	E6000 Series	T1000 Series
<b>Characteristics</b>				
LANs Supported	EtherTalk; Ethernet	EtherTalk; Ethernet	EtherTalk; Ethernet	Token-Ring
Microcomputer Bus Supported	SE	SE/30	NuBus	PC
Bus Size Maximum Data Rate (bps)	16-bit 10M	16-bit 10M	16-bit 10M	8-bit 4M
Media Supported	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair
Operating Systems Supported	AppleShare	AppleShare	AppleShare	NetWare; PC LAN Program
<b>Pricing/Support</b>				
Price (\$)	400, max. price is 595	400, max. price is 595	400, max. price is 595	See comments
Date of First Delivery	None identified	None identified	None identified	None identified
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Supports both AUI & some media type; incorporates LANVIEW LEDs indicating transmit, receive, collisions, & link.	Supports both AUI & some media port type; incorporates LANVIEW LEDs indicating transmit, receive, collision, & link.	Supports both AUI & some media type; incorporates LANVIEW LEDs indicating transmit, receive, collisions, & link.	Supports Type 1, 2, 6, 9, & 3 cabling; incorporates LANVIEW LEDs indicating activity, connection, 0-idle; for pricing information contact vendor.
Vendor	Cabletron Systems, Inc.	Cabletron Systems, Inc.	Cabletron Systems, Inc.	Canai, Computer and Network Architecture Inc.
Product	T2000 Series	T3000 Series	T6000 Series	Wavebus
<b>Characteristics</b>				
LANs Supported	Token-Ring	Token-Ring	Token-Ring; TokenTalk	Ethernet; FDDI; Token-Ring; Wavebus
Microcomputer Bus Supported	AT (ISA)	MCA	NuBus	AT (ISA); EISA; PC; VME
Bus Size Maximum Data Rate (bps)	16-bit 16M; 4M	32-bit 16M; 4M	16-bit 16M	16-bit; 32-bit 100M
Media Supported	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	Optical fiber
Operating Systems Supported	NetWare; PC LAN Program	NetWare; PC LAN Program	NetWare	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES
<b>Pricing/Support</b>				
Price (\$)	See comments	See comments	See comments	2,995
Date of First Delivery	None identified	None identified	None identified	August 1991
Standard Warranty	1 year	1 year	1 year	90 days
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Supports Type 1, 2, 6, 9, & 3 cabling; software selectable between 4M bps & 16M bps; incorporates LANVIEW LEDs; contact vendor for pricing information.	Supports Type 1, 2, 6, 9, & 3 cabling; software selectable; incorporates LANVIEW LEDs; contact vendor for pricing information.	Supports Types 1, 2, 6, 9, & 3 cabling; software configurable; incorporates LANVIEW LEDs; contact vendor for pricing information.	Wavebus is a 100Mbps fibre optic network, fully compatible with installed base of 802.3, 802.5, networks, at around one third of FDDI.

Vendor	CASE/Datatel, Inc.	CASE/Datatel, Inc.	CASE/Datatel, Inc.	CBIS, Inc.
<b>Product</b>	6520	6521	6522	Network-EZ II
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	BUSS
Microcomputer Bus Supported	AT (ISA); MCA	AT (ISA); MCA	AT (ISA); MCA	PC
Bus Size Maximum Data Rate (bps)	None identified 10M	None identified 10M	None identified 10M	None identified 2.5M; 4M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	None identified
Operating Systems Supported	NETBIOS I/P; NetWare; PC LAN Program; TOPS	NETBIOS I/P; NetWare; PC LAN Program; TOPS	NETBIOS I/P; NetWare; PC LAN Program; TOPS	Network EZ II
<b>Pricing/Support</b>				
Price (\$)	765	765	765	See comments
Date of First Delivery	December 1988	December 1988	December 1988	None identified
Standard Warranty	None identified	None identified	None identified	6 months
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Price shown is base.	Price shown is base.	Price shown is base.	Free telephone technical support. Contact vendor for pricing information.

Vendor	Chipcom Corp.	CMC	CMC	CMC
<b>Product</b>	Ornet/PC Fiber Adapter Card	CMC-1055 FDDI Adapter	CMC-1056 FDDI Adapter	CMC-130 Ethernet Adapter
<b>Characteristics</b>				
LANs Supported	Ethernet	FDDI	FDDI	Ethernet
Microcomputer Bus Supported	AT (ISA); PC	VMEbus	VMEbus	VMEbus
Bus Size Maximum Data Rate (bps)	8-bit 10M	16-bit; 32-bit; 8-bit 100M	16-bit; 32-bit; 8-bit 100M	16-bit; 32-bit; 8-bit 10M
Media Supported	Optical fiber	Optical fiber	Optical fiber	Standard Ethernet coaxial
Operating Systems Supported	3+ /3+ Open; Decnet-DOS; NetWare; PCSA; SCO Xenix	UNIX	UNIX	UNIX
<b>Pricing/Support</b>				
Price (\$)	795	8,950	9,950	3,195
Date of First Delivery	October 1989	January 1990	January 1990	None identified
Standard Warranty	1 year	2 years	2 years	2 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Supports TCP/IP, UNIX streams V.3, IBM OS/2 Extended Edition.	Single attachment intelligent FDDI station interface for VMEbus employing CMC's FXP architecture with an AM29000 RISC processor at 25MHz, 512KB DRAM dedicated to the processor, and 512KB multiport video DRAM.	Dual attachment intelligent FDDI station interface for VMEbus employing CMC's FXP architecture with an AM29000 RISC processor at 25MHz, 512KB DRAM dedicated to the processor, and 512KB multiport video DRAM.	Intelligent Ethernet adapter for VMEbus with a Motorola 68020 processor at 20MHz, 256KB DRAM dedicated to the processor and 256KB multiport Video DRAM, 802.3 10BASE5 thick coax Ethernet transceiver interface.

Vendor	CMC	CMC	CNet Technology	CNet Technology
<b>Product</b>	<b>ENPL-Series Ethernet Adapters</b>	<b>ENPi-Series Ethernet Adapters</b>	<b>190 SBT/2</b>	<b>CN 200E</b>
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Arcnet	Ethernet
Microcomputer Bus Supported	Multibus; VMEbus; Versabus	AT (ISA); Multibus; Q-Bus; UNIBus; VMEbus	AT (ISA); PC	AT (ISA)
Bus Size Maximum Data Rate (bps)	16-bit; 32-bit; 8-bit 10M	16-bit; 32-bit; 8-bit 10M	16-bit 2.5M	16-bit 10M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	RG 62 coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	UNIX	UNIX	NetWare	NetWare
<b>Pricing/Support</b>				
Price (\$)	1,595, max. price is 3,195	1,095, max. price is 3,150	545	439
Date of First Delivery	None identified	None identified	1989	1989
Standard Warranty	2 years	1 year; 2 years-VMEbus	5 years	5 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	A line of Ethernet link-level adapters for VMEbus, MULTIBus and VERSAbus host systems; targeted primarily toward developers who can't justify the purchase of an intelligent processor to off-load the protocol processing.		A line of intelligent Ethernet adapters for VMEbus, MULTIBus, Qbus, UNIBUS and PC/XT/AT host systems; these adapters increase the performance of the network by executing the communications protocols on-board.	

Vendor	CNet Technology	CNet Technology	CNet Technology	CNet Technology
<b>Product</b>	<b>CN 200E/2</b>	<b>CN 300E</b>	<b>CN 400E</b>	<b>CN 500E</b>
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	MCA	AT (ISA)	AT (ISA)	PC
Bus Size Maximum Data Rate (bps)	16-bit 10M	16-bit 10M	16-bit 10M	8-bit 10M
Media Supported	Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Unshielded twisted-pair
Operating Systems Supported	NetWare	NetWare	NetWare	NetWare
<b>Pricing/Support</b>				
Price (\$)	449	459	459	405
Date of First Delivery	None identified	1989	1989	1990
Standard Warranty	5 years	5 years	5 years	5 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	—	—	—	Conforms to 10BASE-T standards.

<b>Vendor</b>	CNet Technology	CNet Technology	CNet Technology	Codenoll Technology Corp.
<b>Product</b>	CN 600E	CN 800E	CN 800E/2	CodeNet-8300
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	AT (ISA)	AT (ISA)	MCA	EISA
Bus Size	16-bit	16-bit	16-bit	32-bit
Maximum Data Rate (bps)	10M	10M	10M	10M
Media Supported	Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial	Thin Ethernet coaxial	Optical fiber
Operating Systems Supported	NetWare	NetWare	NetWare	NetWare; OS/2 LAN Manager
<b>Pricing/Support</b>				
Price (\$)	405	405	445	1,295
Date of First Delivery	1990	1989	1989	January 1990
Standard Warranty	5 years	5 years	5 years	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Conforms to 10BASE-T standards.	—	Conforms to 10BASE-T and 10Base5. Complies with all IEEE 802.3 Ethernet standards.	Requires a single slot in any EISA bus computer and provides connection to a passive fiber optic Ethernet star.
<b>Vendor</b>	Codenoll Technology Corp.	Codenoll Technology Corp.	Codenoll Technology Corp.	Codenoll Technology Corp.
<b>Product</b>	CodeNet-8301	CodeNet-8320	CodeNet-8321	CodeNet-8331
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	EISA	MCA	MCA	AT (ISA); EISA; PC
Bus Size	32-bit	16-bit	16-bit	8-bit
Maximum Data Rate (bps)	10M	10M	10M	10M
Media Supported	Optical fiber	Optical fiber	Optical fiber	Optical fiber
Operating Systems Supported	NetWare; OS/2 LAN Manager	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES
<b>Pricing/Support</b>				
Price (\$)	1,295	895	895	595
Date of First Delivery	None identified	May 1990	May 1990	December 1989
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Requires a single expansion slot in any EISA bus computer and provides connection to an active Ethernet star.	Occupies a single expansion slot in an MCA computer and attaches to a passive fiber optic hub.	Occupies a single expansion slot in an MCA computer and attaches to an active fiber optic star hub.	—

Vendor	Codenoll Technology Corp.	Codenoll Technology Corp.	Codenoll Technology Corp.	Codenoll Technology Corp.
Product	CodeNet-8350	CodeNet-8601	CodeNet-8621	CodeNet-8631
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	AT (ISA); EISA; PC	EISA	MCA	AT (ISA); EISA; PC
Bus Size Maximum Data Rate (bps)	8-bit 10M	32-bit 10M	16-bit 10M	8-bit 10M
Media Supported	Optical fiber	Plastic optical fiber	Plastic optical fiber	Plastic optical fiber
Operating Systems Supported	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	NetWare; OS/2 LAN Manager	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES
<b>Pricing/Support</b>				
Price (\$)	585	1,295	795	495
Date of First Delivery Standard Warranty	December 1989 1 year	January 1991 1 year	January 1991 1 year	January 1991 1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	—	—	—	—

Vendor	Codenoll Technology Corp.	Cogent Data Technologies, Inc.	Cogent Data Technologies, Inc.	Cogent Data Technologies, Inc.
Product	CodeNet-9543	E/MASTER II AT/TP	E/MASTER II/AT	E/MASTER II MCA/TP
<b>Characteristics</b>				
LANs Supported	FDDI	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	AT (ISA); EISA	AT (ISA); EISA	AT (ISA); EISA	MCA
Bus Size Maximum Data Rate (bps)	16-bit 100M	16-bit 10M	16-bit 10M	16-bit 10M
Media Supported	Optical fiber	Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial	Unshielded twisted-pair
Operating Systems Supported	AT&T UNIX System V 3.2; NetWare; OS/2 LAN Manager; OS/2 LAN Server	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program
<b>Pricing/Support</b>				
Price (\$)	7,395	895	895	895
Date of First Delivery Standard Warranty	December 1989 1 year	None identified 1 year	None identified 1 year	None identified 1 year
Service Supplied by	Vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
Comments	—	—	—	—

Vendor	Cogent Data Technologies, Inc.	Cogent Data Technologies, Inc.	Commctx Inc.	Compatible Systems Corp.
Product	E/MASTER I	E/MASTER II MCA	CX-Card	Ether+
Characteristics LANs Supported	Ethernet	Ethernet	Proprietary	Ethernet
Microcomputer Bus Supported	AT (ISA); EISA	MCA	AT (ISA)	SLSI
Bus Size Maximum Data Rate (bps)	16-bit 10M	16-bit 10M	8-bit 2.048M	8-bit 10M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Optical fiber; Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
Operating Systems Supported	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program	Any NetBIOS; NetWare; PC LAN Program	3+/3+ Open; AppleShare; NetWare
Pricing/Support Price (\$)	695	895	1,995	495
Date of First Delivery Standard Warranty	None identified 1 year	None identified 1 year	1990 1 year	None identified 1 year
Service Supplied by	Dealer; vendor	Dealer; vendor	Vendor	Vendor
Comments	—	—	One of the PC components of Commctx's multimedia LAN [this LAN transports data full motion video; high quality stereo audio and voice to multimedia PCs when combined with Commctx Sound Subsystem board, PCs connected to Commctx Multi	Two models available: Ether+ supports thin or thick Ethernet, Ether+ Twisted Pair supports 10BASE-T or Thick Ethernet.
Vendor	Compatible Systems Corp.	Complex, Inc.	Complex, Inc.	Complex, Inc.
Product	Ether2	ANET-1	ANET-1/16	ANET-12
Characteristics LANs Supported	Ethernet	Arcnet	Arcnet	Arcnet
Microcomputer Bus Supported	NuBus	PC	AT (ISA)	PC
Bus Size Maximum Data Rate (bps)	16-bit 10M	8-bit 2.5M	16-bit 2.5M	8-bit 2.5M
Media Supported	Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Baseband coaxial	RG-62IU	RG 62 coaxial
Operating Systems Supported	3+/3+ Open; AppleShare; NetWare	NetWare	NetWare	NetWare
Pricing/Support Price (\$)	395	175	355	229
Date of First Delivery Standard Warranty	None identified 1 year	July 1987 2 years	September 1988 2 years	July 1987 2 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	Two models available: Ether2 supports thin or thick Ethernet, Ether2 Twisted Pair supports 10BASE-T or thick Ethernet.	Externally mounted node ID switch, socket for 8K boot ROM, diagnostic LEDs.	Externally mounted node ID switch, socket for 8K boot ROM, diagnostic LEDs.	Linear bus technology for RG62U Coax; supports 8 stations per 1000 chain; externally mounted Node ID switch socket for 8K boot ROM, diagnostic LEDs.

Vendor	Compex, Inc.	Compex, Inc.	Compex, Inc.	Compex, Inc.
Product	ANET-4	ANET-4/16	ANET-MC	ANET-TP
Characteristics				
LANs Supported	Arcnet	Arcnet	Arcnet	Arcnet
Microcomputer Bus Supported	PC	AT (ISA)	MCA	PC
Bus Size	8-bit	16-bit	8-bit	8-bit
Maximum Data Rate (bps)	2.5M	2.5M	2.5M	2.5M
Media Supported	RG-62IU	RG-62IU	RG-62IU	Shielded twisted-pair; Unshielded twisted-pair
Operating Systems Supported	NetWare	NetWare	NetWare	NetWare
Pricing/Support				
Price (\$)	345	395	395	175
Date of First Delivery	July 1987	September 1988	July 1987	July 1987
Standard Warranty	2 years	2 years	2 years	2 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	Provides network interface plus 4 active hubs (expandable to 16) socket for 8K ROM, diagnostic LEDs.	Provides network interface plus 4 active hubs (expandable to 16), externally mounted node ID switch, socket for 8K boot ROM, diagnostic LEDs.	Micro Channel Compatible supports programmable options select (POS) socket for 8K Boot ROM Diagnostic LEDs	Supports 10 Nodes on 300' daisy chain, externally mounted Node IDswitch, socket for 8K boot ROM, diagnostic LEDs.

Vendor	Compex, Inc.	Compex, Inc.	Compex, Inc.	Compex, Inc.
Product	ANET-TP/16	ENET-16/TP	ENET-M	ENET-M/16
Characteristics				
LANs Supported	Arcnet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	AT (ISA)	AT (ISA)	PC	AT (ISA)
Bus Size	16-bit	16-bit	8-bit	16-bit
Maximum Data Rate (bps)	2.5M	10M	10M	10M
Media Supported	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	NetWare	NetWare	NetWare	NetWare
Pricing/Support				
Price (\$)	395	395	295	375
Date of First Delivery	September 1988	October 1990	May 1988	1989
Standard Warranty	2 years	2 years	2 years	2 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	Supports 10 nodes on 300' daisy chain, externally mounted node IDswitch, socket for 8K boot ROM, diagnostic LEDs.	10 Base-T compatible.	Select for 8K boot ROM.	16K of high speed RAM mapped into 8K on host, socket for 8K boot ROM.

Vendor	Concord Communications, Inc.	Concord Communications, Inc.	Corman Technologies, Inc.	Corman Technologies, Inc.
<b>Product</b>	<b>Series 1210/1215</b>	<b>Series 1410</b>	<b>CorNet A111</b>	<b>CorNet A200</b>
<b>Characteristics</b>				
LANs Supported	Token Bus	Token Bus	Arcnet	Arcnet
Microcomputer Bus Supported	AT (ISA); PC	AT (ISA); MCA; PC	MCA	AT (ISA)
Bus Size Maximum Data Rate (bps)	16-bit; 8-bit 10M	16-bit; 8-bit 10M	8-bit 2.5M	16-bit 2.5M
Media Supported	Broadband coaxial; Optical fiber; carrierband	Broadband coaxial; Carrierband; Optical fiber	Baseband coaxial	Baseband coaxial; Unshielded twisted-pair
Operating Systems Supported	OSI	OSI	NetWare	NetWare
<b>Pricing/Support</b>				
Price (\$)	1,395	1,395	595	See comments
Date of First Delivery	September 1986	September 1986	January 1988	February 1990
Standard Warranty	90 days	90 days	2 years	2 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Provides full 7-layer OSI software conforming to MAP 3.0; Concord is IBM's authorized MAP application specialist; price shown is base.	Price shown is base; provides full 7-layer OSI software conforming to MAP 3.0. Concord is IBM's authorized MAP applications specialist.	Diagnostic LEDs.	Operates in 8K of memory space; certified Novell drivers included; star and bus topologies; active hubs available; contact vendor for pricing information.
Vendor	Corman Technologies, Inc.	Corman Technologies, Inc.	Corvus Systems, Inc.	Corvus Systems, Inc.
<b>Product</b>	<b>CorNet A300</b>	<b>CorNet AF102</b>	<b>16/4 Mbps Switchable Token Ring Cards</b>	<b>4 Mbps Token Ring Network Cards</b>
<b>Characteristics</b>				
LANs Supported	Arcnet	Arcnet	Token-Ring	Ethernet
Microcomputer Bus Supported	AT (ISA)	AT (ISA)	AT (ISA); MCA; PC	AT (ISA); MCA; PC
Bus Size Maximum Data Rate (bps)	8-bit 2.5M	8-bit 2.5M	16-bit; 32-bit; 8-bit 16M; 4M	16-bit; 8-bit 4M
Media Supported	Baseband coaxial; Unshielded twisted-pair	Optical fiber	IBM Type 1; IBM Type 3; Shielded twisted-pair; Unshielded twisted-pair	IBM Type 1; IBM Type 3; Shielded twisted-pair; Unshielded twisted-pair
Operating Systems Supported	NetWare	NetWare	NetWare; OS/2 LAN Manager; PC LAN Program	NetWare; OS/2 LAN Manager; PC LAN Program
<b>Pricing/Support</b>				
Price (\$)	See comments	See comments	745, max. price is 845	469, max. price is 569
Date of First Delivery	February 1990	January 1988	September 1990	September 1990
Standard Warranty	2 years	2 years	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Operates in 8K of memory space; certified Novell drivers included; star and bus topologies; active hubs available; contact vendor for pricing information.	Setup menu; diagnostic LEDs; active hubs available; contact vendor for pricing information.	—	—

Vendor	Corvus Systems, Inc.	Corvus Systems, Inc.	Corvus Systems, Inc.	Corvus Systems, Inc.
Product	Ethernet Card	Omninet/1 Micro Channel Card	Omninet/1 Transporter Card	Omninet/4 Card
<b>Characteristics</b>				
LANs Supported	Ethernet	Omninet	Omninet	Omninet
Microcomputer Bus Supported	PC	MCA	AT (ISA); PC; SE	AT (ISA); PC
Bus Size	8-bit	8-bit	8-bit	8-bit
Maximum Data Rate (bps)	10M	1M	1M	4M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair
Operating Systems Supported	NetWare; OS/2 LAN Manager; PC LAN Program; PCNOS; VINES	NetWare; OS/2 LAN Manager; PC LAN Program	NetWare; OS/2 LAN Manager; PC LAN Program	NetWare; OS/2 LAN Manager; PC LAN Program
<b>Pricing/Support</b>				
Price (\$)	240	329	159	269
Date of First Delivery	1989	May 1981	1981	March 1988
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	—	—	—	—

Vendor	Corvus Systems, Inc.	D-Link Systems, Inc.	D-Link Systems, Inc.	D-Link Systems, Inc.
Product	Omninet/4 Micro Channel Card	DA-100	DA-110	DA-120
<b>Characteristics</b>				
LANs Supported	Omninet	Arcnet	Arcnet	Arcnet
Microcomputer Bus Supported	MCA	PC	PC	PC
Bus Size	8-bit	8-bit	8-bit	8-bit
Maximum Data Rate (bps)	4M	4M	4M	4M
Media Supported	Shielded twisted-pair; Unshielded twisted-pair	RG-62	RG-62	RG-62
Operating Systems Supported	NetWare; OS/2 LAN Manager; PC LAN Program	3+ /3+ Open; LANSmart NOS; NetWare; PC LAN Program	3+ /3+ Open; LANSmart NOS; NetWare; PC LAN Program	3+ /3+ Open; LANSmart NOS; NetWare; PC LAN Program
<b>Pricing/Support</b>				
Price (\$)	449	195	225	260
Date of First Delivery	March 1988	March 1988	May 1988	May 1988
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Dealer; third party; vendor	Dealer; third party; vendor	Dealer; third party; vendor
<b>Comments</b>	—	—	—	—

Vendor	D-Link Systems, Inc.	D-Link Systems, Inc.	D-Link Systems, Inc.	D-Link Systems, Inc.
Product	DA-200	DA-300	DE-100	DE-100 TP
<b>Characteristics</b>				
LANs Supported	Arcnet	Arcnet	Ethernet	Ethernet
Microcomputer Bus Supported	AT (ISA); PC	MCA	PC	PC
Bus Size	16-bit	16-bit	8-bit	8-bit
Maximum Data Rate (bps)	4M	4M	10M	10M
Media Supported	RG-62	RG-62	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Unshielded twisted-pair
Operating Systems Supported	3+ /3+ Open; LANSmart NOS; NetWare; PC LAN Program	3+ /3+ Open; LANSmart NOS; NetWare; PC LAN Program	3+ /3+ Open; LANSmart NOS; NetWare; PC LAN Program; Sun NFS; TCP/IP; Xenix	3+ /3+ Open; LANSmart NOS; NetWare; PC LAN Program; Sun NFS; TCP/IP; Xenix
<b>Pricing/Support</b>				
Price (\$)	275	345	245	320
Date of First Delivery	January 1990	January 1990	March 1988	August 1990
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Dealer; third party; vendor	Dealer; third party; vendor	Dealer; third party; vendor	Dealer; third party; vendor
Comments	—	—	Compatible with Novell NE-1000 adapter.	Compatible with Novell NE-1000 Adapter; 10BASE-T compatible.

Vendor	D-Link Systems, Inc.	D-Link Systems, Inc.	D-Link Systems, Inc.	D-Link Systems, Inc.
Product	DE-150	DE-200	DE-200 TP	DE-300
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	PC	AT (ISA)	AT (ISA)	MCA
Bus Size	8-bit	16-bit	16-bit	16-bit
Maximum Data Rate (bps)	10M	10M	10M	10M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	3+ /3+ Open; LANSmart; NetWare; PC LAN Program; Sun NFS; TCP/IP; Xenix	3+ /3+ Open; LANSmart NOS; NetWare; PC LAN Program; Sun NFS; TCP/IP; Xenix	3+ /3+ Open; LANSmart NOS; NetWare; PC LAN Program; Sun NFS; TCP/IP; Xenix	3+ /3+ Open; LANSmart NOS; NetWare; PC LAN Program; Sun NFS; TCP/IP; Xenix
<b>Pricing/Support</b>				
Price (\$)	175	320	375	495
Date of First Delivery	February 1990	January 1989	August 1990	June 1989
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Dealer; third party; vendor	Dealer; third party; vendor	Dealer; third party; vendor	Dealer; third party; vendor
Comments	—	Compatible with Novell NE-2000 adapter.	Compatible with Novell NE-2000 adapter; 10BASE-T compatible.	—

Vendor	D-Link Systems, Inc.	D-Link Systems, Inc.	D-Link Systems, Inc.	D-Link Systems, Inc.
Product	DE-300 TP	DE-600 AUI	DE-600 Pocket LAN Adapter	DE-600 TP Pocket LAN Adapter
Characteristics	Ethernet			
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	MCA	Parallel port	Parallel port	Parallel port
Bus Size	16-bit	None identified	None identified	None identified
Maximum Data Rate (bps)	10M	10M	10M	10M
Media Supported	Standard Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial	Thin Ethernet coaxial	Standard Ethernet coaxial; Unshielded twisted-pair
Operating Systems Supported	3+ /3+ Open; LANSmart NOS; NetWare; PC LAN Program; Sun NFS; TCP/IP; Xenix	3+ /3+ Open; LANSmart NOS; NetWare; PC LAN Program; Sun NFS; TCP/IP; Xenix	3+ /3+ Open; LANSmart; NetWare; PC LAN Program; Sun NFS; TCP/IP; Xenix	3+ /3+ Open; LANSmart NOS; NetWare; PC LAN Program; Sun NFS; TCP/IP; Xenix
Pricing/Support	Price (\$)			
Price (\$)	495	495	495	495
Date of First Delivery	August 1990	February 1990	February 1990	February 1990
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Dealer; third party; vendor	Dealer; third party; vendor	Dealer; third party; vendor	Dealer; third party; vendor
Comments	10BASE-T compatible.	—	—	10BASE-T compatible.

Vendor	D-Link Systems, Inc.	Datapoint Corp.	David Systems	David Systems
Product	DX-100 8-Bit ARCnet Compatible	1722	Ether-T AT	Ether-T MC
Characteristics	Ethernet			
LANs Supported	Arcnet	Arcnet	Ethernet	Ethernet
Microcomputer Bus Supported	PC	PC	AT (ISA)	MCA
Bus Size	8-bit	16-bit; 8-bit	16-bit	16-bit
Maximum Data Rate (bps)	2.5M	2.5M	10M	10M
Media Supported	Shielded twisted-pair; unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Unshielded twisted-pair; coax	Standard Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Unshielded twisted-pair
Operating Systems Supported	LANSmart	None identified	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; VINES
Pricing/Support	Price (\$)			
Price (\$)	195	See comments	445	460
Date of First Delivery	June 1989	None identified	June 1990	August 1990
Standard Warranty	1 year	30 days	2 years	2 years
Service Supplied by	Dealer; vendor; third party	Third party	Vendor	Vendor
Comments		Contact vendor for pricing information.	UTP implementation is 10BASE-T; TCP/IP supported.	UTP implementation is 10BASE-T.

Vendor	David Systems	David Systems	Dayna Communications, Inc.	Dayna Communications, Inc.
Product	Ether-T PC	Ether-T PC/AT	DL/2	DL/2000
Characteristics LANs Supported	Ethernet	Ethernet	AppleTalk	AppleTalk
Microcomputer Bus Supported	PC	AT (ISA); PC	MCA	AT (ISA); PC
Bus Size Maximum Data Rate (bps)	8-bit 10M	16-bit 10M	32-bit 230K	32-bit 230K
Media Supported	Standard Ethernet coaxial; Un- shielded twisted-pair	Standard Ethernet coaxial; Un- shielded twisted-pair	Shielded twisted-pair; Un- shielded twisted-pair	Shielded twisted-pair; Un- shielded twisted-pair
Operating Systems Supported	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; VINES	NetWare	NetWare	NetWare
Pricing/Support Price (\$)	350	350	399	299
Date of First Delivery Standard Warranty	June 1990 2 years	September 1990 2 years	March 1990 1 year	March 1990 1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	UTP implementation is 10BASE-T; TCP/IP support.	Card adapts to 8-or 16-bit bus; UTP implementation is 10BASE-T.	—	—

Vendor	Dayna Communications, Inc.	Dayna Communications, Inc.	Dayna Communications, Inc.	Dayna Communications, Inc.
Product	DaynaPORT E/30	DaynaPORT E/II	DaynaPORT SE	DaynaTALK MC Card
Characteristics LANs Supported	Ethernet	Ethernet	Ethernet	AppleTalk
Microcomputer Bus Supported	SE/30	NuBus	SE	MCA
Bus Size Maximum Data Rate (bps)	16-bit 10M	16-bit 10M	16-bit 10M	32-bit 1.7M
Media Supported	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Shielded twisted-pair; Un- shielded twisted-pair
Operating Systems Supported	AppleShare; NetWare	AppleShare; NetWare	AppleShare; NetWare	NetWare
Pricing/Support Price (\$)	499	499	499	399
Date of First Delivery Standard Warranty	August 1990 1 year	August 1990 1 year	December 1990 1 year	February 1990 1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	—	—	—	—

Vendor	Dayna Communications, Inc.	DayStar Digital, Inc.	DayStar Digital, Inc.	DFI, Inc.
<b>Product</b>	DaynaTALK PC Card	LT200 Connection Interface Board (AT)	LT200 Connection Interface Board (MCA)	DFINET-300
<b>Characteristics</b>				
LANs Supported	LocalTalk	AppleTalk	AppleTalk	Ethernet
Microcomputer Bus Supported	AT (ISA); EISA; PC	AT (ISA); PC	MCA	PC
Bus Size Maximum Data Rate (bps)	32-bit 1.7M	8-bit 230K	8-bit 230K	8-bit 10M
Media Supported	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair	Shielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	NetWare	3+ /3+ Open; NetWare	3+ /3+ Open; NetWare	NetWare
<b>Pricing/Support</b>				
Price (\$)	299	249	395	349
Date of First Delivery	July 1990	1985	1989	January 1988
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	—	—	—	Volume discounts available.

Vendor	DFI, Inc.	Digital Communications Associates, Inc.	Digital Communications Associates, Inc.	Digital Communications Associates, Inc.
<b>Product</b>	DFINET-400	10M Coax Adapter	10M Fiber Adapter	10M Twisted Pair Adapter
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Starlan	Ethernet; Starlan
Microcomputer Bus Supported	AT (ISA)	AT (ISA); MCA	AT (ISA)	AT (ISA); MCA
Bus Size Maximum Data Rate (bps)	16-bit 10M	8-bit 10M	8-bit 10M	8-bit 10M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Optical fiber	Unshielded twisted-pair
Operating Systems Supported	NetWare	10NET Plus	10NET Plus	10NET Plus; NetWare
<b>Pricing/Support</b>				
Price (\$)	449	495, max. price is 549	795	425, max. price is 475
Date of First Delivery	January 1989	June 1989	June 1989	July 1990
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
<b>Comments</b>	Volume discounts available.	ISA version: \$495; MCA version: \$549.	—	Bundled with Novell driver; ISA version: \$425; MCA version: \$475.

Vendor	Digital Communications Associates, Inc.	Digital Communications Associates, Inc.	Digital Equipment Corp.	DNA Networks, Inc.
<b>Product</b>	<b>1M Fiber Adapter</b>	<b>IRMAtrac Token-Ring Adapter/Convertible</b>	<b>DEC EtherWorks PC LAN Controller Family</b>	<b>MegaNet Master</b>
<b>Characteristics</b>				
LANs Supported	Starlan	Token-Ring	Ethernet	DNA Networks
Microcomputer Bus Supported	AT (ISA)	AT (ISA); MCA; PC	MCA	AT (ISA); EISA; PC
Bus Size Maximum Data Rate (bps)	8-bit 1M	16-bit; 8-bit 16M; 4M	16-bit; 8-bit 10M	8-bit 10M
Media Supported	Optical fiber	Shielded twisted-pair; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Shielded twisted-pair
Operating Systems Supported	10NET Plus	3+ /3+ Open; NetWare; OS/2 LAN Manager; PC LAN Program	OS/2 LAN Manager; all NDIS compliant products	DNA Networks
<b>Pricing/Support</b>				
Price (\$)	595	895	See comments	695
Date of First Delivery	June 1988	October 1990	None identified	August 1989
Standard Warranty	1 year	1 year	90 days	1 year
Service Supplied by	Dealer; vendor	Vendor	Vendor	Dealer
<b>Comments</b>	—	4Mbps & 16Mbps; STP & UTP media; AT (ISA) and Microchannel bus architectures, all major LAN operating systems in one adapter through unique hardware design.	Contact vendor for pricing information.	DNA Networks operating systems is bundled at no charge.

Vendor	DNA Networks, Inc.	DNA Networks, Inc.	DNA Networks, Inc.	DNA Networks, Inc.
<b>Product</b>	<b>MegaNet Station</b>	<b>MicroNet Master</b>	<b>MicroNet Station</b>	<b>Microchannel Master</b>
<b>Characteristics</b>				
LANs Supported	DNA Networks	DNA Networks	DNA Networks	DNA Networks
Microcomputer Bus Supported	AT (ISA); EISA; PC	AT (ISA); EISA; PC	AT (ISA); EISA; PC	MCA
Bus Size Maximum Data Rate (bps)	8-bit 10M	8-bit 2M	8-bit 2M	8-bit 2.5M
Media Supported	Shielded twisted-pair	Shielded twisted-pair	Shielded twisted-pair	Shielded twisted-pair
Operating Systems Supported	DNA Networks	DNA Networks	DNA Networks	DNA Networks
<b>Pricing/Support</b>				
Price (\$)	395	295	See comments	695
Date of First Delivery	August 1989	January 1990	January 1990	April 1987
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Dealer	Dealer	Dealer	Dealer
<b>Comments</b>	—	DNA Networks operating system is bundled at no charge.	Contact vendor for pricing information.	DNA Networks operating system is bundled at no charge.

Vendor	DNA Networks, Inc.	DSC Communications Corp.	DSC Communications Corp.	DSC Communications Corp.
Product	Microchannel Station	NEXOS 8-bit Arcnet	NEXOS Arcnet/2	NEXOS Ether-16
<b>Characteristics</b>				
LANs Supported	DNA Networks	Arcnet	Arcnet	Ethernet
Microcomputer Bus Supported	MCA	AT (ISA)	MCA	AT (ISA); PC
Bus Size	8-bit	8-bit	8-bit	16-bit
Maximum Data Rate (bps)	2.5M	1.5M	1.5M	10M
Media Supported	Shielded twisted-pair	Baseband coaxial	Baseband coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	DNA Networks	NEXOS	NEXOS; NetWare; PC LAN Program	NEXOS; NetWare; PC LAN Program
<b>Pricing/Support</b>				
Price (\$)	395	395	695	495
Date of First Delivery	April 1987	January 1985	January 1989	November 1988
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Dealer	Vendor	Dealer; vendor	None identified
<b>Comments</b>	—	BootROM available for NEXOS OS.	MCA Arcnet NIC.	BootROMS available for NEXOS; NE2000 compatible ENIC.

Vendor	DSC Communications Corp.	DSC Communications Corp.	DTK Computer, Inc.	DTK Computer, Inc.
Product	NEXOS Ether-3500	NEXOS Turbonet/2	PCI-001	PCI-003
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Arcnet	Ethernet
Microcomputer Bus Supported	AT (ISA); PC	MCA	AT (ISA)	AT (ISA)
Bus Size	8-bit	8-bit	8-bit	8-bit
Maximum Data Rate (bps)	10M	10M	2.5M	10M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Shielded twisted-pair	Standard Ethernet coaxial
Operating Systems Supported	NEXOS; NetWare; PC LAN Program	NEXOS; NetWare; PC LAN Program	NetWare	NetWare
<b>Pricing/Support</b>				
Price (\$)	250	695	99	225
Date of First Delivery	November 1988	None identified	None identified	None identified
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Dealer; vendor	Vendor	Dealer	Dealer
<b>Comments</b>	BootROM available for NEXOS OS.	MCA Ethernet NIC.	—	—

Vendor	Earth Computer Technologies	Earth Computer Technologies	Earth Computer Technologies	Earth Computer Technologies
Product	Earthnet IIa/S	Earthnet IIe/R	Earthnet Ia/4	Earthnet Ia/S
<b>Characteristics</b>				
LANs Supported	Arcnet	Ethernet	Arcnet	Arcnet
Microcomputer Bus Supported	AT (ISA); PC	AT (ISA); PC	AT (ISA); PC	AT (ISA); PC
Bus Size	16-bit	16-bit	8-bit	8-bit
Maximum Data Rate (bps)	2.5M	10M	2.5M	2.5M
Media Supported	Broadband coaxial; RJ-62	Standard Ethernet coaxial; Thin Ethernet coaxial	Broadband coaxial; Unshielded twisted-pair; coax RG-62	Broadband coaxial; standard RJ-62
Operating Systems Supported	LANSmart; NetWare; PC LAN Program	LANSmart; NetWare; PC LAN Program	LANtastic; NetWare; Network OS; PowerLan	LANSmart
<b>Pricing/Support</b>				
Price (\$)	225	225	145	105
Date of First Delivery	None identified	None identified	None identified	None identified
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	—	—	—	

Vendor	Earth Computer Technologies	Earth Computer Technologies	Earth Computer Technologies	Earth Computer Technologies
Product	Earthnet Ie/8	Earthnet Ie/U	Earthnet MCA/S	Earthnet MCE/8
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Arcnet	Ethernet
Microcomputer Bus Supported	AT (ISA); PC	AT (ISA); PC	MCA	MCA
Bus Size	8-bit	8-bit	16-bit	16-bit
Maximum Data Rate (bps)	10M	10M	2.5M	10M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Unshielded twisted-pair	Broadband coaxial; RG-62	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	LANSmart; NetWare; PC LAN Program	LANSmart; NetWare; PC LAN Program	LANSmart; NetWare; PC LAN Program	LANSmart; NetWare; PC LAN Program
<b>Pricing/Support</b>				
Price (\$)	215	295	295	495
Date of First Delivery	None identified	None identified	None identified	None identified
Standard Warranty	1 year on enclosure and power supply	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	—	—	—	—

Vendor	Edimax Computer Co.	Edimax Computer Co.	FiberCom, Inc.	Frontier Technologies Corp.
<b>Product</b>	<b>AL Series</b>	<b>EN Series</b>	<b>WhisperLAN/PC</b>	<b>802.3/TP MCA Intelligent</b>
<b>Characteristics</b>				
LANs Supported	Arcnet	Ethernet	Ethernet	10BASE-T; Ethernet
Microcomputer Bus Supported	AT (ISA); PC	AT (ISA); PC	PC	MCA
Bus Size Maximum Data Rate (bps)	16-bit; 8-bit 2.5M	16-bit; 8-bit 10M	8-bit 10M	16-bit 10M
Media Supported	Shielded twisted-pair; Thin Ethernet coaxial	Shielded twisted-pair; Thin Ethernet coaxial	Optical fiber	Unshielded twisted-pair
Operating Systems Supported	3+ /3+ Open; NetWare; OS/2 LAN Manager	3+ /3+ Open; NetWare; OS/2 LAN Manager	NetWare	None identified
<b>Pricing/Support</b>				
Price (\$)	45, max. price is 75	99, max. price is 110	1,750, max. price is 1,900	895
Date of First Delivery	None identified	None identified	1989	April 1990
Standard Warranty	2 years	2 years	1 year	90 days
Service Supplied by	None identified	Vendor	Vendor	Vendor
<b>Comments</b>	—	—	TCP/IP support.	Also available in a standard (non-intelligent) version; priced at \$445.00.

Vendor	Frontier Technologies Corp.	Frontier Technologies Corp.	Gandalf Data, Inc.	Gateway Communications, Inc.
<b>Product</b>	<b>802.3/TP-16 Intelligent (AT)</b>	<b>802.3/TP-8 Intelligent (XT)</b>	<b>LANLine/AT</b>	<b>G/EtherTwist AT</b>
<b>Characteristics</b>				
LANs Supported	10BASE-T; Ethernet	10BASE-T; Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	AT (ISA)	PC	AT (ISA); PC	AT (ISA); EISA
Bus Size Maximum Data Rate (bps)	16-bit 10M	8-bit 10M	16-bit 10M	16-bit 10M
Media Supported	Unshielded twisted-pair	Unshielded twisted-pair	Unshielded twisted-pair	Unshielded twisted-pair
Operating Systems Supported	None identified	None identified	3+ /3+ Open; NetWare	3+ /3+ Open; NDIS; NetWare; OS/2 LAN Manager; VINES
<b>Pricing/Support</b>				
Price (\$)	895	695	419	445
Date of First Delivery	April 1990	April 1990	None identified	February 1990
Standard Warranty	90 days	90 days	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Dealer
<b>Comments</b>	Also available in a standard (non-intelligent) version, priced at \$395.00.	Also available in a standard (non-intelligent) version, priced at \$345.00.	Conforms fully to the current 10BASE-T standard.	Supports TCP/IP; 10BASE-T compatible.

Vendor	Gateway Communications, Inc.	Gateway Communications, Inc.	Gateway Communications, Inc.	Gateway Communications, Inc.
Product	G/EtherTwist MC	G/EtherTwist PC	G/Ethernet 16	G/Ethernet 16-bit AT Adapter
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	MCA	AT (ISA); PC	AT (ISA)	AT (ISA)
Bus Size Maximum Data Rate (bps)	16-bit 10M	8-bit 10M	16-bit 10M	16-bit 10M
Media Supported	Unshielded twisted-pair	Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	3+ /3+ Open; NDIS; NetWare; OS/2 LAN Manager; VINES	3+ /3+ Open; NDIS; NetWare; OS/2 LAN Manager; VINES	NDIS; NetWare	3+ /3+ Open; NDIS; NetWare; OS/2 LAN Manager; VINES
<b>Pricing/Support</b>				
Price (\$)	460	370	300	425
Date of First Delivery	June 1990	February 1990	April 1990	November 1988
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Dealer	Dealer	Dealer	Dealer
<b>Comments</b>	Supports TCP/IP; 10BASE-T compatible.	Supports TCP/IP; 10BASE-T compatible.	—	Supports TCP/IP.

Vendor	Gateway Communications, Inc.	Gateway Communications, Inc.	Gateway Communications, Inc.	Gateway Communications, Inc.
Product	G/Ethernet 16-bit MC Adapter	G/Ethernet 8	G/Ethernet 8-bit PC Adapter	G/Ethernet 8-bit WS Adapter
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	MCA	AT (ISA); PC	AT (ISA); PC	AT (ISA); PC
Bus Size Maximum Data Rate (bps)	16-bit 10M	8-bit 10M	8-bit 10M	8-bit 10M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Thin Ethernet coaxial
Operating Systems Supported	3+ /3+ Open; NDIS; NetWare; OS/2 LAN Manager; VINES	NDIS; NetWare	3+ /3+ Open; NDIS; NetWare; OS/2 LAN Manager; VINES	3+ /3+ Open; NDIS; NetWare; OS/2 LAN Manager; VINES
<b>Pricing/Support</b>				
Price (\$)	495	250	370	345
Date of First Delivery	April 1988	April 1990	September 1987	November 1988
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Dealer	Dealer	Dealer	Dealer
<b>Comments</b>	Supports TCP/IP.	—	Supports TCP/IP.	Supports TCP/IP.

Vendor	Gateway Communications, Inc.	Gateway Communications, Inc.	Gateway Communications, Inc.	Gateway Communications, Inc.
Product	G/Ethernet AT-WS Adapter	G/Ethernet MC-WS Adapter	G/Net Adapter	G/Net VS Adapter
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Proprietary baseband, linear bus	Proprietary baseband, linear bus
Microcomputer Bus Supported	AT (ISA); PC	MCA	PC	AT (ISA); PC
Bus Size	16-bit	16-bit	8-bit	8-bit
Maximum Data Rate (bps)	10M	10M	1.43M	7.16M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	RG 62 coaxial; Standard Ethernet coaxial; Thin Ethernet coaxial	RG 62 coaxial; Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	3+ /3+ Open; NDIS; NetWare; OS/2 LAN Manager; VINES	3+ /3+ Open; NDIS; NetWare; OS/2 LAN Manager; VINES	NetWare; PC LAN Program	NetWare; PC LAN Program
<b>Pricing/Support</b>				
Price (\$)	425	475	395	595
Date of First Delivery	November 1988	November 1988	September 1983	March 1989
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Dealer	Dealer	Dealer	Dealer
Comments	Supports TCP/IP.	Supports TCP/IP.	—	—

Vendor	General Technology, Inc.	General Technology, Inc.	General Technology, Inc.	General Technology, Inc.
Product	GTTC16-16	GTTC16-4	GTTC8-4	GTTCMC-4
<b>Characteristics</b>				
LANs Supported	Token-Ring	Token-Ring	Token-Ring	Token-Ring
Microcomputer Bus Supported	AT (ISA)	AT (ISA)	PC	MCA
Bus Size	16-bit	16-bit	8-bit	None identified
Maximum Data Rate (bps)	16M	4M	4M	4M
Media Supported	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair
Operating Systems Supported	NetWare; PC LAN Program	NetWare; PC LAN Program	NetWare; PC LAN Program	NetWare; PC LAN Program
<b>Pricing/Support</b>				
Price (\$)	845	499	399	499
Date of First Delivery	October 1990	March 1990	March 1990	March 1990
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	LLC Option (802.2) included.	802.2 option for LLC-\$70.00 (required for PC LAN Program). PTMF-6Media Filter-\$37.00.	802.2 option for LLC-\$70.00 (required for PC LAN Program); PTMF-6Media Filter-\$37.00.	802.2 option for LLC-\$70.00 (required for PC LAN Program); PTMF-6Media Filter-\$37.00.

Vendor	h-three Systems	h-three Systems	h-three Systems	h-three Systems
Product	MacRing 030DS 16/4	MacRing NB	MacRing NB 16/4	MacRing SE
Characteristics LANs Supported	Token-Ring	Token-Ring	Token-Ring	Token-Ring
Microcomputer Bus Supported	Macintosh 030DS	NuBus	NuBus	SE
Bus Size Maximum Data Rate (bps)	16-bit 16M; 4M	32-bit 4M	32-bit 16M; 4M	16-bit 4M
Media Supported	Shielded twisted-pair; Un- shielded twisted-pair	Shielded twisted-pair	Shielded twisted-pair; Un- shielded twisted-pair	Shielded twisted-pair; Un- shielded twisted-pair
Operating Systems Supported	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	NetWare; VINES
Pricing/Support Price (\$)	995	895	995	795
Date of First Delivery Standard Warranty	January 1991 1 year	June 1990 1 year	January 1991 1 year	October 1989 1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	—	—	—	—

Vendor	h-three Systems	Hayes Microcomputer Products, Inc.	Hayes Microcomputer Products, Inc.	Hayes Microcomputer Products, Inc.
Product	MacRing SE/30	EtherMate 8	EtherMate 8UTP	EtherMate Trio16
Characteristics LANs Supported	Token-Ring	Ethernet; NETBIOS	Ethernet	Ethernet
Microcomputer Bus Supported	Macintosh 030DS; SE/30	AT (ISA); EISA; PC	AT (ISA); EISA; PC	AT (ISA); EISA; PC
Bus Size Maximum Data Rate (bps)	16-bit 4M	8-bit 10M	8-bit 10M	16-bit 10M
Media Supported	Shielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Un- shielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
Operating Systems Supported	NetWare	3+ /3+ Open; NetWare; OS/2 LAN Manager; PC LAN Pro- gram	3+ /3+ Open; NetWare; OS/2 LAN Manager; PC LAN Pro- gram	3+ /3+ Open; Any NetBIOS; Net- Ware; OS/2 LAN Manager; PC LAN Program
Pricing/Support Price (\$)	895	249	329	349
Date of First Delivery Standard Warranty	June 1990 1 year	September 1990 4 years	November 1990 4 years	December 1990 4 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	—	Full compliance with IEEE 802.3; on board boot ROM socket to "install" optional boot ROMs for diskless workstation applications.	Full compliance with IEEE 802.3 10BASE 5 and 10BASE-T.	Services all media on a single board.

Vendor	Hewlett-Packard Co.	Hewlett-Packard Co.	Hewlett-Packard Co.	IMC Networks Corp.
<b>Product</b>	HP ThinLAN Adapter Card 27250A	StarLAN 10	ThinLAN	EtherNic (PC/AT)
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet; Starlan 10	Ethernet; Starlan 10	Ethernet
Microcomputer Bus Supported	AT (ISA); PC	AT (ISA); MCA	IBM PC/XT/AT; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	AT (ISA); PC
Bus Size Maximum Data Rate (bps)	16-bit 10M	16-bit 10M	16-bit 10M	8-bit 10M
Media Supported	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial	Shielded twisted-pair; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	3+ /3+ Open; HP Lan Manager; NDIS; NetWare	3+ /3+ Open; HP LAN Manager; HP OfficeShare; NetWare	3+ /3+ Open; HP LAN Manager; HP OfficeShare; NetWare	NetWare; TCP/IP
<b>Pricing/Support</b>				
Price (\$)	450	495	695	199
Date of First Delivery	September 1987	May 1987	January 1986	July 1990
Standard Warranty	1 year	90 days	90 days	5 years
Service Supplied by	Dealer; vendor	Vendor	Vendor	Dealer; vendor
<b>Comments</b>	—	—	—	Mfr. suggested list price includes jumper-selectable remote boot PROM.

Vendor	IMC Networks Corp.	IMC Networks Corp.	IMC Networks Corp.	IMC Networks Corp.
<b>Product</b>	EtherNic (AT)	PCnic 8bit TP	PCnic TP	PCnic II
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	AT (ISA)	AT (ISA); PC	AT (ISA)	MCA
Bus Size Maximum Data Rate (bps)	16-bit 10M	8-bit 10M	16-bit 10M	16-bit 10M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Unshielded twisted-pair	Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	NetWare; TCP/IP	NetWare; PC-NFS; TCP/IP	NetWare; PC-NFS; TCP/IP	NetWare; PC-NFS; TCP/IP
<b>Pricing/Support</b>				
Price (\$)	249	275	325, max. price is 350	395, - 425.00
Date of First Delivery	October 1990	May 1990	May 1990	June 1988
Standard Warranty	5 years	5 years	5 years	5 years
Service Supplied by	Dealer; vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
<b>Comments</b>	Mfr. suggested list price includes jumper-selectable remote boot PROM.	—	—	All PCnic Family Ethernet LAN products for coaxial cabling support both "thick" and "thin" 50 Ohm coaxial cabling as well as optionally supporting non-standard 75 Ohm (PC/Net, G/Net) and 93 Ohm (Arcnet, IBM 3270) coaxial cabling.

Vendor	IMC Networks Corp.	IMC Networks Corp.	IMC Networks Corp.	IMC Networks Corp.
Product	PCnic II TP	PCnic FO	PCnic 8bit	PCnic II FO
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	MCA	AT (ISA)	AT (ISA); PC	AT (ISA)
Bus Size Maximum Data Rate (bps)	16-bit 10M	16-bit 10M	8-bit 10M	16-bit 10M
Media Supported	Unshielded twisted-pair	Optical fiber	Standard Ethernet coaxial; Thin Ethernet coaxial	Optical fiber
Operating Systems Supported	NetWare; PC-NFS; TCP/IP	NetWare; PC-NFS; TCP/IP	NetWare; PC-NFS; TCP/IP	NetWare; PC-NFS; TCP/IP
<b>Pricing/Support</b>				
Price (\$)	350, max. price is 375	675, max. price is 695	345	695, max. price is 725
Date of First Delivery Standard Warranty	May 1990 5 years	November 1990 5 years	August 1988 5 years	January 1991 5 years
Service Supplied by	Dealer; vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
<b>Comments</b>	—	—	All PCnic Family Ethernet LAN products for coaxial cabling support both "thick" and "thin" 50 Ohm coaxial cabling as well as optionally supporting non-standard 75 Ohm (PC/Net, G/Net) and 93 Ohm (Arcnet, IBM 3270) coaxial cabling.	—
Vendor	IMC Networks Corp.	International Business Machines Corp. (IBM)	International Business Machines Corp. (IBM)	International Business Machines Corp. (IBM)
Product	PCnic	IBM Token Ring Network 16/4 Adapter	IBM Token Ring Network 16/4 Adapter/A	IBM Token Ring Network PC Adapter
<b>Characteristics</b>				
LANs Supported	Ethernet	Token-Ring	Token-Ring	Token-Ring
Microcomputer Bus Supported	AT (ISA)	AT (ISA); EISA; PC	MCA	AT (ISA); PC
Bus Size Maximum Data Rate (bps)	16-bit 10M	8-bit 16M; 4M	16-bit 16M; 4M	8-bit 4M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Optical fiber; Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair
Operating Systems Supported	NetWare; PC-NFS; TCP/IP	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES
<b>Pricing/Support</b>				
Price (\$)	395, - 425.00	921	921	669
Date of First Delivery Standard Warranty	June 1988 5 years	November 1988 1 year	November 1988 1 year	November 1985 1 year
Service Supplied by	Dealer; vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
<b>Comments</b>	All PCnic Family Ethernet LAN products for coaxial cabling support both "thick" and "thin" 50 Ohm coaxial cabling as well as optionally supporting non-standard 75 Ohm (PC/Net, G/Net) and 93 Ohm (Arcnet, IBM 3270) coaxial cabling.	—	—	—

Vendor	International Business Machines Corp. (IBM)	International Communications Equipment	International Communications Equipment	International Communications Equipment
Product	IBM Token Ring Network PC Adapter/A	ICE-1+	ICE-3+	ICE-4+
<b>Characteristics</b>				
LANs Supported	Token-Ring	Arcnet	Arcnet	Arcnet
Microcomputer Bus Supported	MCA	AT (ISA)	AT (ISA)	AT (ISA)
Bus Size Maximum Data Rate (bps)	16-bit 4M	None identified 2.5M	None identified 2.5M	None identified 2.5M
Media Supported	Shielded twisted-pair; Unshielded twisted-pair	RG-62 coaxial	Unshielded twisted-pair	Coaxial; Unshielded twisted-pair
Operating Systems Supported	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	NetWare; VINES	NetWare; VINES	NetWare
<b>Pricing/Support</b>				
Price (\$)	772	179	199	199
Date of First Delivery	October 1985	July 1988	January 1989	January 1989
Standard Warranty	1 year	5 years	5 years	5 years
Service Supplied by	Dealer; vendor	Vendor	Vendor	Vendor
<b>Comments</b>		—	—	—

Vendor	International Communications Equipment	International Communications Equipment	International Communications Equipment	Interphase Corp.
Product	ICE-5	ICE-IE	ICE-IIE	V/Ethernet 3207 Hawk
<b>Characteristics</b>				
LANs Supported	Arcnet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	AT (ISA)	AT (ISA)	AT (ISA)	VMEbus
Bus Size Maximum Data Rate (bps)	None identified 2.5M	None identified 10M	None identified 10M	32-bit 10M
Media Supported	RG-62 coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial
Operating Systems Supported	NetWare	NetWare	NetWare	UNIX
<b>Pricing/Support</b>				
Price (\$)	395	295	495	1,595
Date of First Delivery	January 1989	July 1989	October 1989	April 1987
Standard Warranty	5 years	5 years	5 years	1 year
Service Supplied by	Vendor	Vendor	Vendor	Dealer; vendor
<b>Comments</b>	Arcnet & 5-port active Hub on one card.	—	—	—

Vendor	Interphase Corp.	Interphase Corp.	Interphase Corp.	Interphase Corp.
Product	V/Ethernet 4207 Eagle	V/FDDI 3211 Falcon	V/FDDI 4211 Peregrine	V/Token-Ring 4212 Owl
<b>Characteristics</b>				
LANs Supported	Ethernet	FDDI	FDDI	Token-Ring
Microcomputer Bus Supported	VMEbus	VMEbus	VMEbus	VMEbus
Bus Size Maximum Data Rate (bps)	32-bit 10M	32-bit 100M	32-bit 100M	32-bit 16M
Media Supported	Standard Ethernet coaxial	Optical fiber	Optical fiber; Shielded twisted-pair	Shielded twisted-pair
Operating Systems Supported	UNIX	UNIX	UNIX	UNIX
<b>Pricing/Support</b>				
Price (\$)	3,595	9,000	8,995, max. price is 10,995	3,595
Date of First Delivery	October 1989	June 1988	June 1990	October 1989
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Dealer; vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
Comments	—	—	—	—

Vendor	Invisible Software, Inc.	Invisible Software, Inc.	Invisible Software, Inc.	Invisible Software, Inc.
Product	200	300	300/A	Ethernet
<b>Characteristics</b>				
LANs Supported	Proprietary	Proprietary	Ethernet	Ethernet
Microcomputer Bus Supported	PC	AT (ISA); PC	MCA	PC
Bus Size Maximum Data Rate (bps)	8-bit 1.8M	16-bit; 8-bit 3M	16-bit; 32-bit 10M	8-bit 10M
Media Supported	Unshielded twisted-pair	Unshielded twisted-pair	Thin Ethernet coaxial	Thin Ethernet coaxial
Operating Systems Supported	NetWare	Net/30; NetWare	Net/30; NetWare	Net/30; NetWare
<b>Pricing/Support</b>				
Price (\$)	215	315	399	369
Date of First Delivery	None identified	None identified	None identified	None identified
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Dealer; vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
Comments	Free technical support.	Free technical support.	Free technical support.	Free technical support.

Vendor	Invisible Software, Inc.	Invisible Software, Inc.	JC Information Systems	JC Information Systems
<b>Product</b>	<b>Ethernet 16</b>	<b>Ethernet/A</b>	<b>1405-100</b>	<b>1405-200</b>
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Arcnet	Arcnet
Microcomputer Bus Supported	AT (ISA)	MCA	AT (ISA)	AT (ISA)
Bus Size Maximum Data Rate (bps)	16-bit 10M	16-bit 10M	8-bit 2.5M	8-bit 2.5M
Media Supported	Thin Ethernet coaxial	Thin Ethernet coaxial	Baseband coaxial; Unshielded twisted-pair	Baseband coaxial; Unshielded twisted-pair
Operating Systems Supported	Net/30; NetWare	Net/30; NetWare	CBIS Network O/S; NetWare	CBIS Network O/S; NetWare
<b>Pricing/Support</b>				
Price (\$)	369	469	65	75
Date of First Delivery	None identified	January 1990	February 1986	August 1986
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Dealer; vendor	Dealer; vendor	Dealer	Dealer
<b>Comments</b>	Free technical support.	Free technical support.	Star bus twisted-pair (RJ11).	Star bus twisted-pair (RJ11).

Vendor	JC Information Systems	JC Information Systems	JC Information Systems	Kodiak Technology
<b>Product</b>	<b>1405-300</b>	<b>1416-100</b>	<b>1417-100</b>	<b>Dual-Raven</b>
<b>Characteristics</b>				
LANs Supported	Arcnet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	AT (ISA)	AT (ISA)	AT (ISA)	AT (ISA)
Bus Size Maximum Data Rate (bps)	8-bit 2.5M	16-bit; 8-bit 10M	16-bit; 8-bit 10M	16-bit 10M
Media Supported	Baseband coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	CBIS Network O/S; NetWare	CBIS Network O/S; NetWare	CBIS Network O/S; NetWare	NetWare
<b>Pricing/Support</b>				
Price (\$)	75	120, max. price is 150	120, max. price is 150	699
Date of First Delivery	February 1986	September 1989	September 1989	September 1990
Standard Warranty	1 year	1 year	1 year	5 years
Service Supplied by	Dealer	Dealer	Dealer	Vendor
<b>Comments</b>	Star bus twisted-pair (RJ11).	Uses NE1000 and NE2000 drivers.	Uses NE1000 and NE2000 drivers.	2-channel F-ethernet card.

Vendor	Kodiak Technology	Kodiak Technology	Kodiak Technology	Kodiak Technology
Product	Quad-Raven	Raven-16	Raven-16 UTP	Raven-8
Characteristics LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	AT (ISA)	AT (ISA)	AT (ISA)	AT (ISA); PC
Bus Size Maximum Data Rate (bps)	16-bit 10M	16-bit 10M	16-bit 10M	8-bit 10M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Shielded twisted-pair; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	NetWare	NetWare	NetWare	NetWare
Pricing/Support Price (\$)	1,299	249	299	199
Date of First Delivery Standard Warranty	July 1990 5 years	May 1990 5 years	September 1990 5 years	May 1990 5 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	Multichannel Ethernet card.	64KB on-board memory; CHKnet diagnostic Software supplied; available through Arrow Electronics.	64MB; CHKnet Diagnostic Software supplied.	64KB on-board memory; CHKnet diagnostic software supplied; available through Arrow Electronics.

Vendor	Kodiak Technology	Kodiak Technology	Lancer Research	Lancer Research
Product	Raven-8 UTP	Wild Card	Arc-8S/16S	Ether-8/16
Characteristics LANs Supported	Ethernet	Ethernet	Arcnet	Ethernet
Microcomputer Bus Supported	AT (ISA); PC	AT (ISA)	PC	PC
Bus Size Maximum Data Rate (bps)	8-bit 10M	16-bit 10M	16-bit; 8-bit 2.5M	16-bit; 8-bit 10M
Media Supported	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Thin Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	NetWare	NetWare	NetWare	NetWare
Pricing/Support Price (\$)	249	799	185, max. price is 495	185, max. price is 495
Date of First Delivery Standard Warranty	September 1990 5 years	December 1990 5 years	None identified 1 year	None identified 1 year
Service Supplied by	Vendor	Vendor	Dealer; vendor	Dealer; vendor
Comments	64KB memory; CHKnet Diagnostic Software supplied.	Resides in PC; provides Ethernet connection to PC; inverts twisted-pair to coax & vice versa.	—	—

Vendor	Lanmaster	Lanmaster	Lanmaster	Lanmaster
Product	AMF 230	AMH 220	AMP 240	AMT 210
<b>Characteristics</b>				
LANs Supported	Arcnet	Arcnet	Arcnet	Arcnet
Microcomputer Bus Supported	AT (ISA)	AT (ISA)	MCA	AT (ISA)
Bus Size	8-bit	8-bit	8-bit	8-bit
Maximum Data Rate (bps)	2.5M	2.5M	2.5M	2.5M
Media Supported	Optical fiber	Baseband coaxial	Baseband coaxial	Baseband coaxial
Operating Systems Supported	NetWare; Univation LifeNet, CBIS Network OS; VINES; ViaNet	NetWare; Univation LifeNet, CBIS Network OS; VINES; ViaNet	NetWare; Univation LifeNet, CBIS Network OS; VINES; ViaNet	NetWare; Univation LifeNet, CBIS Network OS; VINES; ViaNet
<b>Pricing/Support</b>				
Price (\$)	995	245	495	195
Date of First Delivery	September 1988	September 1987	September 1987	September 1987
Standard Warranty	2 years	2 years	2 years	2 years
Service Supplied by	Dealer; vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
<b>Comments</b>	Dual mode; work with RX-NET drivers in the I/O mode and enhanced Lanmaster drivers in the memory mapped mode.	Dual mode; work with RX-NET drivers in the I/O mode and enhanced Lanmaster drivers in the memory mapped mode.	Dual mode; work with RX-NET drivers in the I/O mode and enhanced Lanmaster drivers in the memory mapped mode.	Dual mode; work with RX-NET drivers in the I/O mode and enhanced Lanmaster drivers in the memory mapped mode.

Vendor	Lanmaster	Lanmaster	Lanmaster	Lanmaster
Product	AMT 216	ETH - 210 WD	ETH - 216 WD	PS/2 Ethernet Card
<b>Characteristics</b>				
LANs Supported	Arcnet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	AT (ISA)	AT (ISA)	AT (ISA)	MCA
Bus Size	16-bit	8-bit	16-bit	8-bit
Maximum Data Rate (bps)	2.5M	10M	10M	10M
Media Supported	Baseband coaxial	Baseband coaxial	Baseband coaxial	Baseband coaxial
Operating Systems Supported	NetWare; Univation LifeNet, CBIS Network OS; VINES; ViaNet	3+ /3+ Open; NetWare; VINES; Western Digital ViaNet; Sun NFS	3+ /3+ Open; NetWare; VINES; Western Digital ViaNet; Sun NFS	3+ /3+ Open; NFS; NetWare; VINES; ViaNet
<b>Pricing/Support</b>				
Price (\$)	295	299	399	515
Date of First Delivery	September 1987	September 1989	September 1989	September 1988
Standard Warranty	2 years	2 years	2 years	2 years
Service Supplied by	Dealer; vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
<b>Comments</b>	Dual mode; work with RX-NET drivers in the I/O mode and enhanced Lanmaster drivers in the memory mapped mode.	Provide further connectivity by operating with universal protocols such as TCP/IP, which are separately available as a complete package.	Provide further connectivity by operating with universal protocols such as TCP/IP, which are separately available as a complete package.	—

Vendor	LANNET Data Communications, Inc.	LANNET Data Communications, Inc.	LANNET Data Communications, Inc.	LANNET Data Communications, Inc.
Product	LEC-25	LEC-35	LEC-45	LEC-45T
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	AT (ISA); PC	AT (ISA); PC	AT (ISA); PC	AT (ISA); PC
Bus Size	8-bit	8-bit	8-bit	8-bit
Maximum Data Rate (bps)	10M	10M	10M	10M
Media Supported	Optical fiber	Shielded twisted-pair; Standard Ethernet coaxial	Unshielded twisted-pair	Standard Ethernet coaxial; Unshielded twisted-pair
Operating Systems Supported	3+/3+ Open; DECNET; FTP PC/TCP; NDIS; NFS; NetWare; OS/2 LAN Manager; PC LAN Program; PCSA; VINES	3+/3+ Open; DECNET; FTP PC/TCP; NDIS; NFS; NetWare; OS/2 LAN Manager; PC LAN Program; PCSA; VINES	3+/3+ Open; DECNET; FTP PC/TCP; NDIS; NFS; NetWare; OS/2 LAN Manager; PC LAN Program; PCSA; VINES	3+/3+ Open; DECNET; NDIS; NFS; NetWare; OS/2 LAN Manager; PC LAN Program; PC/TCP; PCSA; VINES
<b>Pricing/Support</b>				
Price (\$)	795	395	395	395
Date of First Delivery	March 1990	May 1990	May 1990	August 1990
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Dealer; vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
<b>Comments</b>	Uses synchronous signalling for Ethernet. Compatible with hubs from DEC, Zenith, Lannet, Fiberdata, Chipcom.	Uses synchronous Ethernet signalling.	Uses synchronous Ethernet signalling.	10BASE-T-compatible; includes polarity detection & correction.
Vendor	Lans Plus Canada, Inc.	Lans Plus Canada, Inc.	Lans Plus Canada, Inc.	Lans Plus Canada, Inc.
Product	EtherLAN/16-UTP EL516	EtherLAN/8-UTP EL408	EtherLAN/16 EL216	EtherLAN/8 EL108
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	AT (ISA)	AT (ISA); PC	AT (ISA); PC	AT (ISA); PC
Bus Size	16-bit	8-bit	16-bit	8-bit
Maximum Data Rate (bps)	10M	10M	10M	10M
Media Supported	Unshielded twisted-pair	Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES
<b>Pricing/Support</b>				
Price (\$)	599	399	499	299
Date of First Delivery	None identified	None identified	None identified	None identified
Standard Warranty	Lifetime limited to original end user	Lifetime limited to original end user	Lifetime limited to original end user	Lifetime limited to original end user
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Optional 64K buffer memory (EL564) and boot PROM socket; supports TCP/IP; 10BASE-T compatible.	Optional 32K buffer memory (EL432) and boot PROM socket; supports TCP/IP; 10BASE-T compatible.	Optional 64K buffer memory (EL264); and boot PROM socket; supports TCP/IP.	Optional 32K buffer memory (EL132) and boot PROM socket; supports TCP/IP.

Vendor	Lans Plus Canada, Inc.	Lans Plus Canada, Inc.	Lans Plus Canada, Inc.	Lans Plus Canada, Inc.
Product	EtherLAN/MC EL316	EtherLAN/MCT EL616	EtherRAM/8 ER108	EtherRAM/8-UTP ER408
Characteristics				
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	MCA	MCA	AT (ISA); PC	AT (ISA); PC
Bus Size	16-bit	16-bit	8-bit	8-bit
Maximum Data Rate (bps)	10M	10M	10M	10M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Unshielded twisted-pair	Standard Ethernet coaxial	Unshielded twisted-pair
Operating Systems Supported	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES
Pricing/Support				
Price (\$)	495	595	499	599
Date of First Delivery	None identified	None identified	None identified	None identified
Standard Warranty	5 years	5 years	Lifetime limited to original end user	Lifetime limited to original end user
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	Ethernet 10BASE5 and 10BASE2 Micro Channel version; supports TCP/IP.	Ethernet 10BASE-T Micro Channel version; supports TCP/IP.	Provides 256K of additional DOS RAM optimized for network use; supports TCP/IP.	Provides 256K of additional DOS RAM optimized for network use; supports TCP/IP; 10BASE-T compatible.

Vendor	Lantana Technology	Lantana Technology	Lantana Technology	Lantana Technology
Product	ASTER/1+	ASTER/2+	ASTER/3	CYPRESS/1-16
Characteristics				
LANs Supported	Arcnet	Arcnet	Arcnet	Token-Ring
Microcomputer Bus Supported	PC	MCA	AT (ISA)	PC
Bus Size	8-bit	16-bit	16-bit	8-bit
Maximum Data Rate (bps)	2.5M	2.5M	2.5M	16M; 4M
Media Supported	Broadband coaxial; Shielded twisted-pair; Unshielded twisted-pair	Broadband coaxial; Shielded twisted-pair; Unshielded twisted-pair	Broadband coaxial; Shielded twisted-pair; Unshielded twisted-pair	IBM Type 1; Shielded twisted-pair; Unshielded twisted-pair
Operating Systems Supported	NetWare	NetWare	NetWare	3+/3+ Open; NDIS, IEEE 802.2 option; NetWare; OS/2 LAN Manager; PCLAN Program
Pricing/Support				
Price (\$)	175	475	445	895
Date of First Delivery	November 1990	November 1990	March 1990	November 1990
Standard Warranty	2 years	2 years	2 years	2 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	—	—	—	—

Vendor	Lantana Technology	Lantana Technology	Lantana Technology	Lantana Technology
Product	CYPRESS/2-16	CYPRESS/2-4	CYPRESS/3-16	CYPRESS/3-4
Characteristics LANs Supported	Token-Ring	Token-Ring	Token-Ring	Token-Ring
Microcomputer Bus Supported	MCA	MCA	AT (ISA)	AT (ISA)
Bus Size Maximum Data Rate (bps)	16-bit 16M	16-bit 4M	16-bit 16M	16-bit 4M
Media Supported	IBM Type 1; Shielded twisted-pair; Unshielded twisted-pair	IBM Type 1; Shielded twisted-pair; Unshielded twisted-pair	IBM Type 1; Shielded twisted-pair; Unshielded twisted-pair	IBM Type 1; Shielded twisted-pair; Unshielded twisted-pair
Operating Systems Supported	3+/3+ Open; NDIS; NetWare; OS/2 LAN Manager; PC LAN Program	3+/3+ Open; NDIS, IEEE 802.2 option; NetWare; OS/2 LAN Manager; PC LAN Program	3+/3+ Open; NDIS, IEEE 802.2 option; NetWare; OS/2 LAN Manager; PC LAN Program	3+/3+ Open; NDIS, IEEE 802.2 option; NetWare; OS/2 LAN Manager; PC LAN Program
Pricing/Support Price (\$)	995	695	995	695
Date of First Delivery Standard Warranty	November 1990 2 years	August 1988 2 years	November 1990 2 years	October 1990 2 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	—	—	—	—

Vendor	Lantana Technology	Lantana Technology	Lantana Technology	Longshine Technology
Product	TAMARIX/1	TAMARIX/2	TAMARIX/3	LCS-8634
Characteristics LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	PC	MCA	AT (ISA)	AT (ISA)
Bus Size Maximum Data Rate (bps)	8-bit 10M	16-bit 10M	16-bit 10M	16-bit 10M
Media Supported	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	NetWare; TCP/IP	NetWare; TCP/IP	NetWare; TCP/IP	NetWare; PC LAN Program
Pricing/Support Price (\$)	275	495	595	139
Date of First Delivery Standard Warranty	August 1988 2 years	August 1988 2 years	November 1990 2 years	May 1989 1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	—	—	—	—

Vendor	Longshine Technology	Longshine Technology	Longshine Technology	Longshine Technology
Product	LCS-8830CB	LCS-8830CS	LCS-8830H-C	LCS-8830H-T
<b>Characteristics</b>				
LANs Supported	Arcnet	Arcnet	Arcnet	Arcnet
Microcomputer Bus Supported	AT (ISA)	AT (ISA)	AT (ISA)	AT (ISA)
Bus Size	8-bit	8-bit	16-bit	8-bit
Maximum Data Rate (bps)	1M	1M	1M	1M
Media Supported	Baseband coaxial	Baseband coaxial	Baseband coaxial	Unshielded twisted-pair
Operating Systems Supported	NetWare; PC LAN Program	NetWare; PC LAN Program	NetWare; PC LAN Program	NetWare; PC LAN Program
<b>Pricing/Support</b>				
Price (\$)	61	58	148	176
Date of First Delivery	August 1989	August 1989	August 1989	August 1989
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Arcnet card for bus configuration.	Arcnet card for star configuration.	Arcnet hub card with 4-port active hub and LAN adapter RG-62/U93 ohm coax cable.	Arcnet hub card with 4-port active hub and LAN adapter for unshielded twisted-pair network.

Vendor	Longshine Technology	Longshine Technology	Longshine Technology	Madge Networks, Inc.
Product	LCS-8830T	LCS-8834	LCS-8834/II	SMART 16/4 AT Ringnode
<b>Characteristics</b>				
LANs Supported	Arcnet	Ethernet	Ethernet	Token-Ring
Microcomputer Bus Supported	AT (ISA)	AT (ISA)	MCA	AT (ISA); PC
Bus Size	8-bit	8-bit	8-bit	16-bit
Maximum Data Rate (bps)	1M	10M	10M	4M
Media Supported	Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Shielded twisted-pair
Operating Systems Supported	NetWare; PC LAN Program	NetWare; PC LAN Program	NetWare; PC LAN Program	3+ /3+ Open; NetWare; PC LAN Program; VINES
<b>Pricing/Support</b>				
Price (\$)	67	119	169	995
Date of First Delivery	August 1989	July 1988	November 1989	June 1990
Standard Warranty	1 year	1 year	1 year	5 years
Service Supplied by	Vendor	Vendor	Vendor	Dealer; vendor
<b>Comments</b>	Arcnet adapter card uses 105-ohm twisted-pair wire (unshielded).	—	—	Hardware/software switchable 4M/16M bps ring data rate; senses an 8- or 16-bit slot and automatically adjusts; includes diagnostic software, LAN support software, IPX/SPX protocols; 802.2 (LLC), NETBIOS, LAN Manager NDIS.

Vendor	Madge Networks, Inc.	Madge Networks, Inc.	Madge Networks, Inc.	Madge Networks, Inc.
Product	SMART 16/4 EISA Ringnode	SMART 16/4 MC Ringnode	SMART AT Ringnode	SMART ISA Ringnode
<b>Characteristics</b>				
LANs Supported	Token-Ring	Token-Ring	Token-Ring	Token-Ring
Microcomputer Bus Supported	EISA	MCA	AT (ISA); PC	AT (ISA); PC
Bus Size	32-bit	32-bit	16-bit	8-bit
Maximum Data Rate (bps)	4M	16M; 4M	4M	4M
Media Supported	Shielded twisted-pair	Shielded twisted-pair	Shielded twisted-pair	Shielded twisted-pair
Operating Systems Supported	3+/3+ Open; NetWare; PC LAN Program; VINES	3+/3+ Open; NetWare; PC LAN Program; VINES	3+/3+ Open; NetWare; PC LAN Program; VINES	3+/3+ Open; NetWare; PC LAN Program; VINES
<b>Pricing/Support</b>				
Price (\$)	1,495	995	750	550
Date of First Delivery	July 1990	September 1990	April 1989	April 1989
Standard Warranty	5 years	5 years	5 years	5 years
Service Supplied by	Dealer; vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
<b>Comments</b>	Hardware/software switchable 4M/16M bps ring data rate; includes diagnostic software. LAN support software, IPX/SPX protocols, 802.2 (LLC), NETBIOS, LAN Manager NDIS drivers, and NetWare drivers.	Hardware/software switchable 4M/16M bps ring data rate; senses an 8- or 16-bit slot and automatically adjusts; includes diagnostic software. LAN support software, IPX/SPX protocols, 802.2 (LLC), NETBIOS; LAN Manager NDIS.	128K onboard RAM allows for downloading of network driver software, thereby using as little as 3K of DOS memory; includes diagnostic software, LAN support software, IPX/SPX protocols, 802.2 (LLC), NETBIOSN Manager NDIS.	128K onboard RAM allows for downloading of network driver software, thereby using as little as 3K of DOS memory. Includes diagnostic software, LAN support software, IPX/SPX protocols, 802.2 (LLC), NETBIOSN Manager NDIS.
Vendor	Madge Networks, Inc.	MNC International	MNC International	MNC International
Product	SMART MC Ringnode	QC-9219	QC-9220	QC-9230
<b>Characteristics</b>				
LANs Supported	FDDI; Token-Ring	Arcnet	Arcnet; Token-Ring	Arcnet
Microcomputer Bus Supported	MCA	MCA	LTX-NEC; PC	LTX-NEC
Bus Size	16-bit	16-bit	8-bit	16-bit
Maximum Data Rate (bps)	4M	2.5M	16M; 2.5M	2.5M
Media Supported	Shielded twisted-pair	Optical fiber; Standard Arcnet coaxial; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Standard Arcnet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Unshielded twisted-pair; coaxial
Operating Systems Supported	3+/3+ Open; NetWare; PC LAN Program; VINES	NetWare; OS/2 LAN Server; VINES	NetWare; OS/2 LAN Server; VINES	NetWare; VINES
<b>Pricing/Support</b>				
Price (\$)	750	250, max. price is 400	95	250
Date of First Delivery	November 1988	1986	1987	1989
Standard Warranty	5 years	1 year on enclosure and power supply	1 year	1 year
Service Supplied by	Dealer; vendor	Vendor	Vendor	Vendor
<b>Comments</b>	128K onboard RAM allows for downloading of network driver software, thereby using as little as 3K of DOS memory; includes diagnostic software, LAN support software, IPX/SPX protocols, 802.2 (LLC), NETBIOSN Manger NDIS.	—	—	—

Vendor	MNC International	Moses Computers	Motorola Computer Systems	Multi-Tech Systems, Inc.
Product	QC-9241	ChosenLAN PL200S	MNME-374	AN301CX/16
<b>Characteristics</b>				
LANs Supported	Arcnet	ChosenLAN	Ethernet	Arcnet
Microcomputer Bus Supported	AT (ISA)	AT (ISA); PC	VME	AT (ISA)
Bus Size Maximum Data Rate (bps)	16-bit 2.5M	None identified 3.58M	32-bit 10M	16-bit 2.5M
Media Supported	Optical fiber; Standard Arcnet coaxial; Unshielded twisted- pair <cr> <a5> NetWare; OS/ 2 LAN Server; VINES	Unshielded twisted-pair	Broadband coaxial; Optical fi- ber; Shielded twisted-pair; Stan- dard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Broadband coaxial
Operating Systems Supported		ChosenLAN	SMB server for UNIX	NetWare
	110			
	1989			
	1 year			
<b>Pricing/Support</b>				
Price (\$)	Vendor	179	1,995	299
Date of First Delivery	—	1990	October 1989	None identified
Standard Warranty		1 year	1 year	2 years
Service Supplied by		Vendor	Vendor	None identified
<b>Comments</b>		—	Used only in server configura- tion.	—

Vendor	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.
Product	AN301CX/8/AN302CXB/8	AN301CX/PS	AN301CXB/PS	AN301TP/16
<b>Characteristics</b>				
LANs Supported	Arcnet	Arcnet	Arcnet	Arcnet
Microcomputer Bus Supported	AT (ISA); PC	MCA	MCA	AT (ISA)
Bus Size Maximum Data Rate (bps)	8-bit 2.5M	8-bit 2.5M	8-bit 2.5M	16-bit 2.5M
Media Supported	Broadband coaxial	Broadband coaxial	Broadband coaxial	Unshielded twisted-pair
Operating Systems Supported	NetWare	NetWare	NetWare	NetWare
<b>Pricing/Support</b>				
Price (\$)	189	489	499	299
Date of First Delivery	None identified	January 1990	March 1990	1990
Standard Warranty	2 years	2 years	2 years	2 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	—	—	Bus topology.	—

Vendor	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.
Product	AN301TP/8	EN301CA/16	EN301CA/8	EN301CA/PS
<b>Characteristics</b>				
LANs Supported	Arcnet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	AT (ISA); PC	AT (ISA)	AT (ISA); PC	MCA
Bus Size	8-bit	16-bit	8-bit	16-bit
Maximum Data Rate (bps)	2.5M	10M	10M	10M
Media Supported	Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	NetWare	NetWare	NetWare	NetWare
<b>Pricing/Support</b>				
Price (\$)	189	349	329	489
Date of First Delivery	1990	None identified	None identified	None identified
Standard Warranty	2 years	2 years	2 years	2 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	—	—	—	—

Vendor	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.	Mylex Corp.
Product	EN301TP/16	EN301TP/BR	EN301TP/PS	LN1390
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	AT (ISA)	AT (ISA); PC	MCA	AT (ISA)
Bus Size	16-bit	8-bit	16-bit	None identified
Maximum Data Rate (bps)	10M	10M	10M	10M
Media Supported	Unshielded twisted-pair	Unshielded twisted-pair	Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	NetWare	NetWare	NetWare	NetWare
<b>Pricing/Support</b>				
Price (\$)	349	329	489	390
Date of First Delivery	None identified	None identified	March 1990	January 1990
Standard Warranty	2 years	2 years	2 years	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	—	—	—	—

<b>Vendor</b>	<b>Mylex Corp.</b>	<b>National Semiconductor</b>	<b>National Semiconductor</b>	<b>National Semiconductor</b>
<b>Product</b>	<b>LNE390</b>	<b>EtherNODE 16 NB</b>	<b>EtherNODE 16 SE</b>	<b>EtherNODE 32 SE/30</b>
<b>Characteristics</b>				
LANs Supported	Ethernet	EtherTalk; Ethernet	EtherTalk; Ethernet	EtherTalk; Ethernet
Microcomputer Bus Supported	EISA	NuBus	SE	SE/30
Bus Size	None identified	16-bit	16-bit	32-bit
Maximum Data Rate (bps)	10M	10M	10M	10M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	NetWare	NetWare	NetWare	NetWare
<b>Pricing/Support</b>				
Price (\$)	500	495	445	595
Date of First Delivery	January 1990	October 1990	December 1990	October 1990
Standard Warranty	1 year	5 years	5 years	5 years
Service Supplied by	Vendor	Dealer; vendor	Vendor	Vendor
<b>Comments</b>	—	16-bit Ethernet adapter for NU-BUs; thick & thin Ethernet coaxial support; includes user diagnostic software; auto-sensing feature (automatically senses type of cabling & configures board accordingly).	16-bit Ethernet adapter for slot of Macintosh SE; includes user diagnostic software, thick & thin Ethernet coaxial support.	32-bit Ethernet adapter for the PDS slot of the Macintosh SE/30; thick & thin Ethernet coaxial support; includes user diagnostic software; includes new SONIC Ethernet chip.
<b>Vendor</b>	<b>National Semiconductor</b>	<b>National Semiconductor</b>	<b>National Semiconductor</b>	<b>National Semiconductor</b>
<b>Product</b>	<b>EtherNODE TPA</b>	<b>EtherNODE*08PC</b>	<b>EtherNODE*16AT</b>	<b>EtherNODE*16AT-T</b>
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	AT (ISA); EISA; MCA; NuBus; PC; SE; SE/30	PC	AT (ISA); PC	AT (ISA); PC
Bus Size	16-bit; 32-bit; 8-bit	8-bit	16-bit; 8-bit	16-bit; 8-bit
Maximum Data Rate (bps)	10M	10M	10M	10M
Media Supported	Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Unshielded twisted-pair
Operating Systems Supported	Software independent	NetWare	3+ /3+ Open; FTP PC/TCP; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+ /3+ Open; FTP PC/TCP; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES
<b>Pricing/Support</b>				
Price (\$)	149	295	345	395
Date of First Delivery	January 1991	December 1990	June 1990	December 1990
Standard Warranty	5 years	5 years	5 years	5 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	External device; converts existing thick Ethernet coaxial connectors to unshielded twisted pair connectors; plugs directly to AUI connector or via cable; incl. LED indicators for power & link test; external switches disable SQE test.	Y2 size for laptops; NE1000 compatible; surface mount PCB; user diagnostics included; Boot ROM socket.	Three-quarter length card; surface mount PCB; self-configurable 8- or 16-bit; NE2000 compatible; user diagnostics included; boot ROM socket.	Three-quarter length card; surface mount PCB; self-configurable for 8- or 16-bit slots; NE2000 compatible; software configuration; option for Check-Point upgrade; boot ROM socket.

Vendor	National Semiconductor	Netronix	Network Interface Corp.	Network Interface Corp.
Product	EtherNODE*16ATX	PNA 101/102	10330	10336
Characteristics LANs Supported	Ethernet	Broadband	Ethernet	Ethernet
Microcomputer Bus Supported	AT (ISA); PC	AT (ISA); PC	AT (ISA); PC	AT (ISA); PC
Bus Size Maximum Data Rate (bps)	16-bit; 8-bit 10M	8-bit 2M	8-bit 10M	16-bit 10M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Broadband coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	3+ /3+ Open; FTP PC/TCP; Net- Ware; OS/2 LAN Manager; OS/ 2 LAN Server; PC LAN Pro- gram; VINES	NetWare; PC LAN Program	NetWare; PC LAN Program	NetWare; PC LAN Program
Pricing/Support Price (\$)	375	595	295	495
Date of First Delivery Standard Warranty	December 1990 5 years	June 1987 1 year	December 1990 2 years	December 1990 2 years
Service Supplied by	Vendor	Vendor	Dealer; vendor	Dealer; vendor
Comments	Three-quarter length card; sur- face mount PCB; self- configurable for 8- or 16-bit slots; NE2000 compatible; soft- ware configuration; option for CheckPoint upgrade; boot ROM socket.	Frequency agile broadband adapter.	—	—
Vendor	Network Interface Corp.	Network Interface Corp.	Network Interface Corp.	Network Interface Corp.
Product	10350	10356	PcARC	PcARC - AT
Characteristics LANs Supported	Ethernet	Ethernet	Arcnet	Arcnet
Microcomputer Bus Supported	AT (ISA); PC	AT (ISA); PC	AT (ISA); PC	AT (ISA); PC
Bus Size Maximum Data Rate (bps)	8-bit 10M	16-bit 10M	8-bit 2.5M	16-bit 2.5M
Media Supported	Unshielded twisted-pair	Unshielded twisted-pair	Broadband coaxial; Thin Ether- net coaxial	Broadband coaxial; Thin Ether- net coaxial
Operating Systems Supported	NetWare; PC LAN Program	NetWare; PC LAN Program	NetWare; PC LAN Program; VINES	NetWare; VINES
Pricing/Support Price (\$)	395	595	250	525
Date of First Delivery Standard Warranty	December 1990 2 years	December 1990 2 years	1984 2 years	1990 2 years
Service Supplied by	Dealer; vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
Comments	—	—	—	Internal active hub connctor.

Vendor	Network Interface Corp.	Network Interface Corp.	Network Interface Corp.	Network Interface Corp.
Product	PcARC - AT/20	PcARC - AT/50	PcARC - AT/F2	PcARC/20
Characteristics LANs Supported	Arcnet	Arcnet	Arcnet	Arcnet
Microcomputer Bus Supported	AT (ISA); PC	AT (ISA); PC	AT (ISA); PC	AT (ISA); PC
Bus Size Maximum Data Rate (bps)	16-bit 2.5M	16-bit 2.5M	16-bit 2.5M	8-bit None identified
Media Supported	Broadband coaxial; Thin Ether- net coaxial	Shielded twisted-pair; Un- shielded twisted-pair	Optical fiber	Broadband coaxial; Thin Ether- net coaxial
Operating Systems Supported	NetWare; VINES	NetWare; VINES	NetWare; VINES	NetWare; VINES
Pricing/Support Price (\$)	See comments	575	See comments	295
Date of First Delivery Standard Warranty	None identified 2 years	1990 2 years	1990 2 years	1984 2 years
Service Supplied by	Dealer; vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
Comments	Internal active hub connector; contact vendor for pricing infor- mation.	—	Internal active hub connector; contact vendor for pricing infor- mation.	—

Vendor	Network Interface Corp.	Network Interface Corp.	NetWorth, Inc.	NetWorth, Inc.
Product	PcARC/50	PcARC/F2	EtherNext 16-Bit NIC	EtherNext 8-bit NIC
Characteristics LANs Supported	Arcnet	Arcnet	Ethernet; Starlan	Ethernet; Starlan
Microcomputer Bus Supported	AT (ISA); PC	AT (ISA); PC	AT (ISA); PC	AT (ISA); PC
Bus Size Maximum Data Rate (bps)	8-bit 2.5M	8-bit 2.5M	16-bit 10M	8-bit 10M
Media Supported	Shielded twisted-pair; Un- shielded twisted-pair	Optical fiber	Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
Operating Systems Supported	NetWare; VINES	NetWare; VINES	NetWare; OS/2 LAN Manager	NetWare; OS/2 LAN Manager
Pricing/Support Price (\$)	295	1,495	399	349
Date of First Delivery Standard Warranty	1984 2 years	None identified 2 years	June 1989 1 year	June 1989 1 year
Service Supplied by	Dealer; vendor	Dealer; vendor	Dealer	Dealer
Comments	—	—	EtherNext is a 10BASE-T LAN.	EtherNext is a 10BASE-T LAN.

Vendor	NetWorth, Inc.	NetWorth, Inc.	Novell, Inc.	Novell, Inc.
Product	EtherNext Micro Channel	EtherNext for Macintosh II	EtherPort SE/30L	EtherPort SE/30
Characteristics LANs Supported	Ethernet; Starlan	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	MCA	NuBus	SE/30	SE/30
Bus Size Maximum Data Rate (bps)	16-bit 10M	32-bit 10M	None identified 10M	None identified 10M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Shielded twisted-pair; Thin Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	NetWare; OS/2 LAN Manager	EtherTalk/AppleTalk; NetWare	3+ /3+ Open; AppleTalk, TCP/ IP, DECnet; NetWare; PC LAN Program; TOPS; Tapestry; VINES	3+ /3+ Open; AppleTalk, TCP/ IP, DECnet; NetWare; PC LAN Program; TOPS; Tapestry; VINES
Pricing/Support Price (\$)	449	449	645	595
Date of First Delivery Standard Warranty	November 1989 1 year	March 1990 1 year	1988 1 year	1988 1 year
Service Supplied by	Dealer	Dealer	Dealer; third party; vendor	Dealer; third party; vendor
Comments	EtherNext is a 10BASE-T LAN.	EtherNext is a 10BASE-T LAN.	—	—

Vendor	Novell, Inc.	Novell, Inc.	Novell, Inc.	Novell, Inc.
Product	EtherPort IIL	EtherPort II	EtherPort SEL	EtherPort SE
Characteristics LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	NuBus	NuBus	NuBus	SE
Bus Size Maximum Data Rate (bps)	None identified 10M	None identified 10M	None identified 10M	None identified 10M
Media Supported	Shielded twisted-pair; Thin Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial	Shielded twisted-pair; Thin Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	3+ /3+ Open; AppleTalk, TCP/ IP, DECnet; NetWare; PC LAN Program; TOPS; Tapestry; VINES	3+ /3+ Open; AppleTalk, TCP/ IP, DECnet; NetWare; PC LAN Program; TOPS; Tapestry; VINES	3+ /3+ Open; AppleTalk, TCP/ IP, DECnet; NetWare; PC LAN Program; TOPS; Tapestry; VINES	3+ /3+ Open; AppleTalk, TCP/ IP, DECnet; NetWare; PC LAN Program; TOPS; Tapestry; VINES
Pricing/Support Price (\$)	645	595	645	595
Date of First Delivery Standard Warranty	1988 1 year	1987 1 year	1988 1 year	1987 1 year
Service Supplied by	Dealer; third party; vendor			
Comments	—	—	—	—

Vendor	Novell, Inc.	Novell, Inc.	Novell, Inc.	Novell, Inc.
Product	NE/2	NE/2-32	NE1000	NE2000
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	MCA	MCA	AT (ISA)	AT (ISA)
Bus Size Maximum Data Rate (bps)	16-bit 10M	32-bit 10M	8-bit 10M	16-bit 10M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial			
Operating Systems Supported	NetWare	NetWare	NetWare	NetWare
<b>Pricing/Support</b>				
Price (\$)	495	995	395	495
Date of First Delivery Standard Warranty	March 1990 3 years	December 1989 3 years	March 1990 3 years	March 1990 3 years
Service Supplied by	Third party	Third party	Third party	Third party
Comments	—	—	—	—

Vendor	Novell, Inc.	NTI Group, Inc.	NTI Group, Inc.	NTI Group, Inc.
Product	NE3200	NTI 1001/DP	NTI 1001/DP-T	NTI 1002/DP-16
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	EISA	PC	PC	AT (ISA)
Bus Size Maximum Data Rate (bps)	32-bit 10M	8-bit 10M	8-bit 10M	16-bit 10M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Shielded twisted-pair; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	NetWare	NetWare; PC LAN Program; TCP/IP; Tapestry	NetWare; PC LAN Program; TCP/IP; Tapestry	NetWare; PC LAN Program; TCP/IP; Tapestry
<b>Pricing/Support</b>				
Price (\$)	1,295	400	400	400
Date of First Delivery Standard Warranty	April 1990 3 years	1988 90 days	1989 90 days	1989 90 days
Service Supplied by	Third party	Vendor	Vendor	Vendor
Comments	32-bit EISA Bus Master interface.	Ethernet co-processor; 32K data buffer.	IEEE 802.3 10BASE-T compatible.	16-bit co-processor for 16-bit data transfers; 32K buffer RAM.

Vendor	NTI Group, Inc.	NTI Group, Inc.	Olicom USA	Olicom USA
Product	NTI 1002/DP-16T	NTI 1002/DP-FO	OC-3112 Token-Ring Network PC/AT Adapter	OC-3114 ISA 16/4 Adapter
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Token-Ring	Token-Ring
Microcomputer Bus Supported	AT (ISA)	AT (ISA)	AT (ISA)	MCA
Bus Size Maximum Data Rate (bps)	16-bit 10M	16-bit 10M	16-bit 4M	16-bit; 8-bit 16M; 4M
Media Supported	Shielded twisted-pair; Unshielded twisted-pair	Optical fiber	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair
Operating Systems Supported	NetWare; PC LAN Program; TCP/IP; Tapestry	NetWare; TCP/IP; Tapestry	3+ /3+ Open; NetWare; OS/2 LAN Manager; PC LAN Program	3+ /3+ Open; NetWare; OS/2 LAN Manager; PC LAN Program
<b>Pricing/Support</b>				
Price (\$)	400	550	645	895
Date of First Delivery Standard Warranty	1989 90 days	1990 90 days	April 1990 1 year	April 1990 1 year
Service Supplied by	Vendor	Vendor	Dealer	Dealer
<b>Comments</b>	16-bit Ethernet co-processor featuring 16-bit data transfers, 32Kbytes of RAM, & IEEE 802.3 10BASE-T compatibility.	16-bit Ethernet co-processor; 16-bit data transfers; 32K buffer RAM; fiber optics output.	Fully IBM Token-Ring Network compatible and meets the IEEE 802.5 standard requirements; can be mixed freely with IBM adapters on a Token-Ring network; the Olicom adapters transfer data at 460K/sec. versus 360K/sec. with IBM adapters.	IEEE standards 802.5 & 802.2; on-board 128K of memory; supports over 260 nodes & has a data transfer speed of 1845K versus IBM at 685K; mix freely with IBM adapters.
Vendor	Olicom USA	Olicom USA	Olicom USA	Olicom USA
Product	OC-3120 Token-Ring Network PC/XT Adapter	OC-3126 Token-Ring Network PC/MC Adapter	OC-3128 MC 16/4 Adapter	OC-3132 EISA 16/4 Adapter
<b>Characteristics</b>				
LANs Supported	Token-Ring	Token-Ring	Token-Ring	Token-Ring
Microcomputer Bus Supported	PC	MCA	MCA	EISA
Bus Size Maximum Data Rate (bps)	8-bit 4M	16-bit 4M	16-bit 16M; 4M	16-bit 16M; 4M
Media Supported	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair
Operating Systems Supported	3+ /3+ Open; NetWare; OS/2 LAN Manager; PC LAN Program	3+ /3+ Open; NetWare; OS/2 LAN Manager; PC LAN Program	3+ /3+ Open; NetWare	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program
<b>Pricing/Support</b>				
Price (\$)	645	925	925	950
Date of First Delivery Standard Warranty	April 1990 1 year	April 1990 1 year	April 1990 1 year	April 1990 1 year
Service Supplied by	Dealer	Dealer	Dealer	Dealer
<b>Comments</b>	Fully IBM Token-Ring Network compatible & meets the IEEE 802.5 standard requirements; can be mixed freely with IBM adapters in a Token-Ring Network. Olicom Adapters transfer data at 460K/sec. versus IBM at 360K/sec.	Fully IBM Token-Ring Network compatible & meets the IEEE 802.5 standard requirements; can be mixed freely with IBM adapters. Has been designed as bus master delivering 460K/sec. versus 340K/sec. for IBM adapters.	IEEE standards 802.5 & 802.2; on-board memory of 128K; mix freely with IBM Adapters; data transfer rate of 1845K versus 685K for IBM; supports over 260 nodes.	IEEE standards 802.5 & 802.2; on board 128K of memory; mix freely with IBM Adapters; data transfer at 1845K versus IBM at 685K; over 260 nodes.

Vendor	Optical Data Systems, Inc.			
Product	ODS 272	ODS 273	ODS 472	ODS 872-EISA
Characteristics LANs Supported	Ethernet	Ethernet	10BASE-T; Ethernet	Token-Ring
Microcomputer Bus Supported	AT (ISA); PC	AT (ISA); PC	AT (ISA); PC	EISA
Bus Size Maximum Data Rate (bps)	8-bit 10M	8-bit 10M	8-bit 10M	32-bit 16M
Media Supported	Standard Ethernet coaxial; Un- shielded twisted-pair	Optical fiber	Standard Ethernet coaxial; Un- shielded twisted-pair	Shielded twisted-pair
Operating Systems Supported	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES
Pricing/Support Price (\$)	495	1,095	425	940
Date of First Delivery Standard Warranty	January 1990 1 year	January 1990 1 year	None identified 1 year	October 1990 1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	—	—	—	—

Vendor	Optical Data Systems, Inc.	Optical Data Systems, Inc.	Optical Data Systems, Inc.	Performance Technology
Product	ODS 872-ISA	ODS 872-MC	ODS 873-ISA, MC, EISA	RIM 1A
Characteristics LANs Supported	Token-Ring	Token-Ring	Token-Ring	Arcnet; Ethernet
Microcomputer Bus Supported	AT (ISA); PC	MCA	AT (ISA); EISA; MCA; PC	AT
Bus Size Maximum Data Rate (bps)	16-bit; 8-bit 16M	16-bit 16M	16-bit; 32-bit; 8-bit 16M	16-bit; 8-bit 2.5M
Media Supported	Shielded twisted-pair	Shielded twisted-pair	Optical fiber	Shielded twisted-pair; Thin Ethernet coaxial; Unshielded twisted-pair
Operating Systems Supported	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	10Net; 3+ /3+ Open; NetWare; PC LAN Program; PowerLan; VINES
Pricing/Support Price (\$)	849	895	1,195	169, max. price is 595
Date of First Delivery Standard Warranty	October 1990 1 year	October 1990 1 year	October 1990 1 year	1987 90 days
Service Supplied by	Vendor	Vendor	Vendor	None identified
Comments	—	—	—	—

Vendor	Performance Technology	Performance Technology	Performance Technology	Performance Technology
<b>Product</b>	<b>RIM II</b>	<b>RIM III</b>	<b>WD8003</b>	<b>WD8013</b>
<b>Characteristics</b>				
LANs Supported	Arcnet; Ethernet	Arcnet; Ethernet	Arcnet; Ethernet	Arcnet; Ethernet
Microcomputer Bus Supported	AT	AT	AT	AT
Bus Size Maximum Data Rate (bps)	16-bit; 8-bit 2.5M	16-bit; 8-bit 2.5M	16-bit; 8-bit 2.5M	16-bit; 8-bit 2.5M
Media Supported	Shielded twisted-pair; Thin Ethernet coaxial; Unshielded twisted-pair			
Operating Systems Supported	10Net; 3+/3+ Open; NetWare; PC LAN Program; PowerLan; VINES			
<b>Pricing/Support</b>				
Price (\$)	169, max. price is 595			
Date of First Delivery	1987	1987	1987	1987
Standard Warranty	90 days	90 days	90 days	90 days
Service Supplied by	None identified	None identified	None identified	None identified
<b>Comments</b>	—	—	—	—

Vendor	Plexcom, Inc.	Plexcom, Inc.	Proteon, Inc.	Proteon, Inc.
<b>Product</b>	<b>8082-16</b>	<b>8082-8</b>	<b>ProNET 4/16 p1390</b>	<b>ProNET 4/16 p1890</b>
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Token-Ring	Token-Ring
Microcomputer Bus Supported	AT (ISA)	PC	AT (ISA); PC	MCA
Bus Size Maximum Data Rate (bps)	16-bit 10M	8-bit 10M	16-bit 16M; 4M	16-bit 16M; 4M
Media Supported	Standard Ethernet coaxial; Un- shielded twisted-pair	Standard Ethernet coaxial; Un- shielded twisted-pair	Shielded twisted-pair; Un- shielded twisted-pair	Shielded twisted-pair; Un- shielded twisted-pair; requires external UTP media filter
Operating Systems Supported	NetWare; VINES	NetWare; VINES	NetWare; OS/2 LAN Manager; VINES	IBM Networking Software; Net- Ware; OS/2 LAN Manager; VINES
<b>Pricing/Support</b>				
Price (\$)	499	349	895	850
Date of First Delivery	May 1990	January 1990	February 1990	October 1990
Standard Warranty	90 days	90 days	1 year	Lifetime
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Supports XNS, DECnet, TCP/ IP.	Supports XNS, DECnet, TCP/ IP	Bus Master technology maxi- mizes the network's data trans- fer capability, preventing RAM Crash or CPU utilization drain.	Features Proteon's bus master implementing for exceptional data transfer capability.

Vendor	Proteon, Inc.	Proteon, Inc.	Proteon, Inc.	Proteon, Inc.
Product	ProNET 4/16 p1990	ProNET4 p1342	ProNET4 p1346 BusMaster	ProNET4 p1347 BusMaster
<b>Characteristics</b>				
LANs Supported	Token-Ring	Token-Ring	Token-Ring	Token-Ring
Microcomputer Bus Supported	EISA	AT (ISA); PC	AT (ISA)	AT (ISA)
Bus Size Maximum Data Rate (bps)	32-bit 16M; 4M	8-bit 4M	16-bit 4M	16-bit 4M
Media Supported	Shielded twisted-pair; Un-shielded twisted-pair; on-board UTP media filter	Shielded twisted-pair; Un-shielded twisted-pair	Shielded twisted-pair; Un-shielded twisted-pair	Standard Ethernet coaxial; Un-shielded twisted-pair
Operating Systems Supported	IBM Networking Software; NetWare; OS/2 LAN Manager; VINES	NetWare; OS/2 LAN Manager	FTP PC/TCP; IBM Networking Software; NetWare; OS/2 LAN Manager; VINES	FTP PC/TCP; IBM Networking Software; NetWare; OS/2 LAN Manager; VINES
<b>Pricing/Support</b>				
Price (\$)	1,195	495	550	650
Date of First Delivery	February 1990	May 1986	July 1989	July 1989
Standard Warranty	Lifetime	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	None identified
<b>Comments</b>	On-board UTP media filter.	Features on-board UTP media filter for UTP lobe connections; workstation NIC.	Features on-board UTP media filter and is upgradable to accommodate file server network connections; workstation NIC.	On-board UTP media filter; file server NIC.

Vendor	Proteon, Inc.	PureData Ltd.	PureData Ltd.	PureData Ltd.
Product	ProNET4 p1840 BusMaster	PDI507	PDI508Plus	PDI508Plus-F
<b>Characteristics</b>				
LANs Supported	Token-Ring	Arcnet	Arcnet	Arcnet
Microcomputer Bus Supported	MCA	AT (ISA); PC	AT (ISA); PC	AT (ISA); PC
Bus Size Maximum Data Rate (bps)	16-bit 4M	16-bit 2.5M	8-bit 2.5M	8-bit 2.5M
Media Supported	Shielded twisted-pair; Un-shielded twisted-pair	Broadband coaxial; Shielded twisted-pair; Unshielded twisted-pair	Broadband coaxial	Optical fiber
Operating Systems Supported	FTP PC/TCP; IBM Networking Software; NetWare; OS/2 LAN Manager; VINES	3+ /3+ Open; Any NetBIOS; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+ /3+ Open; Any NetBIOS; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES
<b>Pricing/Support</b>				
Price (\$)	750	199	265	595
Date of First Delivery	May 1988	June 1989	March 1988	March 1988
Standard Warranty	1 year	5 years	5 years	5 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Features Proteon bus master implementation for data transfer capabilities in MicroChannel bus architecture; external UTP media filter is required for UTP lobe connections.	Arcnet interface card with coax and UTP options in bus or star wiring, for a 4-in-1 solution; LEDs monitor system and network activity.	Software-configurable Arcnet workstation card; LEDs monitor network and system activity.	Software configurable Arcnet workstation card; LEDs monitor network and system activity.

Vendor	PureData Ltd.	PureData Ltd.	PureData Ltd.	PureData Ltd.
<b>Product</b>	PDI508Plus-T	PDI516Plus	PDI516Plus-F	PDI516Plus-T
<b>Characteristics</b>				
LANs Supported	Arcnet	Arcnet	Arcnet	Arcnet
Microcomputer Bus Supported	AT (ISA)	AT (ISA)	AT (ISA)	AT (ISA)
Bus Size Maximum Data Rate (bps)	8-bit 2.5M	16-bit 2.5M	16-bit 2.5M	16-bit 2.5M
Media Supported	Unshielded twisted-pair	Baseband coaxial	Optical fiber	Unshielded twisted-pair
Operating Systems Supported	3+ /3+ Open; Any NetBIOS; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+ /3+ Open; CBIS; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	NetWare; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; PC-NFS; VINES
<b>Pricing/Support</b>				
Price (\$)	450	450	995	450
Date of First Delivery	March 1989	March 1989	March 1989	June 1988
Standard Warranty	5 years	5 years	5 years	5 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Software configurable Arcnet workstation card; LEDs monitor network and system activity.	Software configurable Arcnet fileserver and workstation card; LEDs monitor network and system activity.	Software configurable Arcnet fileserver and workstation card with auto-configurable drives; LEDs monitor system and network activity.	High-performance, software configurable Arcnet file server and workstation card; LEDs monitor network and system activity.
Vendor	PureData Ltd.	PureData Ltd.	PureData Ltd.	PureData Ltd.
<b>Product</b>	PDI8023	PDI8023-16	PDI8023-16T	PDI8023-16T1
<b>Characteristics</b>				
LANs Supported	10BASE-T; Ethernet	10BASE-T; Ethernet	10BASE-T; Ethernet	10BASE-T; Ethernet
Microcomputer Bus Supported	AT (ISA)	AT (ISA); EISA	AT (ISA); EISA	AT (ISA); EISA
Bus Size Maximum Data Rate (bps)	8-bit 10M	16-bit 10M	16-bit 10M	16-bit 10M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	None identified
Operating Systems Supported	3+ /3+ Open; NDIS; NETBIOS; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+ /3+ Open; Any NetBIOS; NDIS; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; TCP/IP; VINES	3+ /3+ Open; Any NetBIOS; NDIS; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; TCP/IP; VINES	3+ /3+ Open; NDIS; NETBIOS; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; TCP/IP; VINES
<b>Pricing/Support</b>				
Price (\$)	295	375	495	395
Date of First Delivery	October 1989	October 1989	June 1990	None identified
Standard Warranty	5 years	5 years	5 years	5 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Software-configurable Ethernet workstation card with auto-configurable drivers; supports all three wiring types with optional 10BASE-T module.	Software configurable Ethernet fileserver and workstation card with auto-configuring drivers; supports all three wiring types with optional 10BASE-T module.	Software configurable Ethernet fileserver workstation card with auto-configuring drivers; supports all three wiring types and 10BASE-T.	Software configurable Ethernet fileserver and workstation card with auto-configuring drivers; supports 10BASE-T wiring.

<b>Vendor</b>	PureData Ltd.	PureData Ltd.	PureData Ltd.	PureData Ltd.
<b>Product</b>	PDI8023-T	PDI8023-T1	PDI8025	PDI8025-16-4/16
<b>Characteristics</b>				
LANs Supported	10BASE-T; Ethernet	10BASE-T; Ethernet	Token-Ring	Token-Ring
Microcomputer Bus Supported	AT (ISA); PC	AT (ISA); PC	AT (ISA)	AT (ISA)
Bus Size Maximum Data Rate (bps)	8-bit 10M	8-bit 10M	16-bit 4M	16-bit 16M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Unshielded twisted-pair	IBM Type 1,2,3,9	IBM Type 1,2,3,9
Operating Systems Supported	3+ /3+ Open; Any NetBIOS; CBIS; NetWare; OS/2 LAN Manager; OS/2 LANServer; PC LAN Program; TCP/IP; VINES	3+ /3+ Open; Any NetBIOS; NDIS; NetWare; OS/2 LAN Manager; OS/2 LANServer; PC LAN Program; TCP/IP; VINES	NetWare; PC LAN Program; VINES	NetWare; PC LAN Program; VINES
<b>Pricing/Support</b>				
Price (\$)	395	345	695	See comments
Date of First Delivery Standard Warranty	June 1990 5 years	None identified 5 years	March 1989 5 years	December 1990 5 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Software configurable Ethernet workstation card with auto-configuring drivers; supports all three wiring types and 10BASE-T.	Software configurable Ethernet workstation card with auto-configuring drivers; supports 10BASE-T wiring.	Token-ring bus master adapter for AT and 386 fileservers and workstation; LEDs monitor network and system activity; monitoring facility assists in troubleshooting.	High-performance, software-configurable, Token-Ring adapter for AT, 386 fileservers & wkstn.; LEDs monitor network & system activity; comprehensive monitoring facilities; built-in media filter for Type 3 cable; contact vendor for pricing.
<b>Vendor</b>	PureData Ltd.	PureData Ltd.	PureData Ltd.	PureData Ltd.
<b>Product</b>	PDI8025-4/16	PDT508	PDT8023	PDuC508Plus
<b>Characteristics</b>				
LANs Supported	Token-Ring	Arcnet	10BASE-T; Ethernet	Arcnet
Microcomputer Bus Supported	AT (ISA); PC	Toshiba Laptop	Toshiba Laptop	MCA
Bus Size Maximum Data Rate (bps)	16-bit 10M	8-bit 2.5M	8-bit 10M	8-bit 2.5M
Media Supported	IBM Type 1,2,3,9	Broadband coaxial	Thin Ethernet coaxial	Broadband coaxial
Operating Systems Supported	NetWare; PC LAN Program; VINES	3+ /3+ Open; Any NetBIOS; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	NetWare; Network OS; PC LAN Program; VINES	3+ /3+ Open; Any NetBIOS; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES
<b>Pricing/Support</b>				
Price (\$)	See comments	495	595	450
Date of First Delivery Standard Warranty	December 1990 5 years	September 1987 5 years	October 1989 5 years	September 1988 5 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Contact vendor for pricing information.	High performance Arcnet interface card to Toshiba T1XXX, T31XX and T5100.	Software configuration Ethernet workstation card with auto-configuring drivers; supports all three wiring types with optional 10BASE-T module; supports the Toshiba T1XXX, T3100, and T5100.	Software configurable Micro Channel Arcnet fileserver and workstation card, with auto-configurable drivers; LEDs monitor network and system activity.

Vendor	PureData Ltd.	PureData Ltd.	PureData Ltd.	PureData Ltd.
Product	PDuC508Plus-F	PDuC8023	PDuC8023-T	PDuC8025
<b>Characteristics</b>				
LANs Supported	Arcnet	Ethernet	10BASE-T; Ethernet	Token-Ring
Microcomputer Bus Supported	MCA	MCA	MCA	MCA
Bus Size	8-bit	16-bit	16-bit	16-bit
Maximum Data Rate (bps)	2.5M	10M	10M	4M
Media Supported	Optical fiber	Thin Ethernet coaxial	Unshielded twisted-pair	IBM Type 1,2,3,9
Operating Systems Supported	3+ /3+ Open; Any NetBIOS; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+ /3+ Open; Any NetBIOS; NDIS; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; TCP/IP; VINES	3+ /3+ Open; Any NetBIOS; NDIS; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; TCP/IP; VINES	NetWare; PC LAN Program; VINES
<b>Pricing/Support</b>				
Price (\$)	995	445	475	695
Date of First Delivery	September 1988	June 1990	November 1990	December 1989
Standard Warranty	5 years	5 years	5 years	5 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Software configurable Micro Channel Arcnet fileserver and workstation card with auto-configurable drivers; LEDs monitor and system activity.	Software configurable Ethernet card for Micro Channel fileserver and workstations with auto-configuring drivers.	Software configurable Ethernet card for Micro Channel fileserver and workstations with auto-configuring drivers; supports 10BASE-T.	High-perform., soft.-config., Token-Ring adapter for Microchannel fileserver/ wkstn.; LEDs monitor ntwk./ system activity; comprehensive monitoring facilities aid in troubleshooting; built-in media filter for Type 3.
Vendor	PureData Ltd.	Quantum Software Systems, Ltd.	Racal InterLan	Racal InterLan
Product	PDuC8025-4/16	QNX Networking Board	ES3210	NI6510
<b>Characteristics</b>				
LANs Supported	Token-Ring	Arcnet; Proprietary	Ethernet	Ethernet
Microcomputer Bus Supported	MCA	AT (ISA)	EISA	AT (ISA)
Bus Size	16-bit	None identified	32-bit	16-bit
Maximum Data Rate (bps)	16M	2.5M	10M	10M
Media Supported	IBM Type 1,2,3,9	Modified baseband	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
Operating Systems Supported	NetWare; PC LAN Program; VINES	QNX	NetWare; OS/2 LAN Manager; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; VINES
<b>Pricing/Support</b>				
Price (\$)	See comments	295	995	375
Date of First Delivery	December 1990	None identified	November 1989	September 1989
Standard Warranty	5 years	1 year	Lifetime	Lifetime
Service Supplied by	Vendor	Vendor	Dealer; vendor	Vendor
<b>Comments</b>	Software-configurable Token-Ring bus master adapter for Microchannel fileserver & wkstn.; LEDs monitor network & system activity; built-in media filter; contact vendor for pricing information.	—	Includes diagnostics, Netware 386 SUR, NDIS LAN Manager OS/2 server.	Includes diagnostics, NetWare 286 WS/SUR & MacUAP, NetWare 386 ODI/WS & Server, NDIS DOS, NDIS OS/2, PC/TCP, DECnet 2.1/2.3/2.0; STREAMS drivers available.

Vendor	Racal InterLan	Racal InterLan	Racal InterLan	Racal InterLan
<b>Product</b>	NI9210	NIA310	NP621-286	NP621-386
<b>Characteristics</b>				
LANs Supported	10BASE-T; Ethernet	10BASE-T; AppleTalk; Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	MCA	NuBus	AT (ISA)	AT (ISA)
Bus Size Maximum Data Rate (bps)	16-bit 10M	32-bit 10M	16-bit 10M	16-bit 10M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
Operating Systems Supported	3+ /3+ Open; NetWare; OS/2 LAN Manager; VINES	A/UX 2.0; AppleTalk; Macintosh Finder 6.X; NCSA Telnet	SCO Xenix/286	SCO Xenix/386
<b>Pricing/Support</b>				
Price (\$)	495	495	890	1,090
Date of First Delivery	January 1987	November 1988	February 1988	April 1988
Standard Warranty	Lifetime	Lifetime	90 days	90 days
Service Supplied by	Dealer; vendor	Vendor	Dealer; vendor	Dealer; vendor
<b>Comments</b>	Includes diagnostics, NetWare 286 WS/SUR & MacUAP, NetWare 386 SUR, NDIS DOS, NDIS OS/2, PC/TCP, PC-NFS, 3+, DECnet 2.1/3.0.	Includes AppleTalk Phase I/II, NCSA Telnet, Etherscope (protocol analyzer), & pocket monitor.	TCP/IP and Xenix-Net networking for SCO Xenix/286.	TCP/IP and Xenix-Net networking for SCO Xenix/386.

Vendor	Racal InterLan	Racal InterLan	Racal InterLan	Racal InterLan
<b>Product</b>	NP622A	NP622I	NP622S	PK-NI5210-JTR, PK-NI6510-JTR, PK-ES3210-JTR
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	AT (ISA); EISA	AT (ISA)	AT (ISA)	AT (ISA); EISA
Bus Size Maximum Data Rate (bps)	16-bit 10M	16-bit 10M	16-bit 10M	16-bit; 32-bit 10M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
Operating Systems Supported	AT&T UNIX System V 3.2	ISC UNIX	SCO Open Desktop; SCO UNIX	AT&T UNIX; ISC UNIX; SCO Xenix
<b>Pricing/Support</b>				
Price (\$)	1,090	1,090	1,090	295-995
Date of First Delivery	October 1987	December 1987	October 1990	April 1988
Standard Warranty	90 days	90 days	90 days	1 year
Service Supplied by	Dealer; vendor	Vendor	Dealer; vendor	Dealer; vendor
<b>Comments</b>	TCP/IP networking for AT&T UNIX System V 3.2.	TCP/IP networking for ISC UNIX.	TCP/IP for SCO UNIX and Open Desktop.	—

Vendor	Racore Computer Products, Inc.			
Product	M 8110	M 8111	M 8112	M 8113
<b>Characteristics</b>				
LANs Supported	Token-Ring	Token-Ring	Token-Ring	Token-Ring
Microcomputer Bus Supported	AT (ISA)	MCA	PC	AT (ISA)
Bus Size	16-bit	16-bit	8-bit	16-bit
Maximum Data Rate (bps)	4M	4M	4M	16M
Media Supported	Shielded twisted-pair; Unshielded twisted-pair			
Operating Systems Supported	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program
<b>Pricing/Support</b>				
Price (\$)	569	569	469	845
Date of First Delivery	January 1987	January 1989	April 1988; January 1989	October 1990
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	—	—	—	—

Vendor	Racore Computer Products, Inc.	Racore Computer Products, Inc.	Samsung Informations Systems America, Inc.	Sitka Corp.
Product	M 8114	M 8115	SE2100	FlashCard
<b>Characteristics</b>				
LANs Supported	Token-Ring	Token-Ring	Ethernet	AppleTalk
Microcomputer Bus Supported	MCA	PC	AT (ISA)	AT (ISA); EISA; PC
Bus Size	16-bit	8-bit	16-bit	8-bit
Maximum Data Rate (bps)	16M	16M	10M	770K
Media Supported	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial	Shielded twisted-pair; Unshielded twisted-pair
Operating Systems Supported	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program	NetWare	AppleShare; TOPS
<b>Pricing/Support</b>				
Price (\$)	845	745	245	239
Date of First Delivery	October 1990	October 1990	May 1990	September 1986
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Dealer; third party; vendor	Dealer; vendor
Comments	—	—	Memory-mapped; 16KB shared memory transfers; has both BNC female or 15-pin D-shell connectors; rear mount switches for addressing and LED display indicators; Novell-certified remote boot PROM; supports 802.3.	—

Vendor	Sitka Corp.	Sitka Corp.	Solid Technologies	Solid Technologies
Product	FlashCard MC	FlashCard Toshiba	E1000-16	E1000-8
Characteristics				
LANs Supported	AppleTalk	AppleTalk	Ethernet	Ethernet
Microcomputer Bus Supported	MCA	Toshiba Laptop	AT (ISA)	AT (ISA); PC
Bus Size	8-bit	8-bit	16-bit	8-bit
Maximum Data Rate (bps)	770K	770K	10M	10M
Media Supported	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	AppleShare; TOPS	AppleShare; TOPS	NetWare; PC LAN Program; Solid LAN OS	NetWare; PC LAN Program; Solid LAN OS
Pricing/Support Price (\$)	329	329	399	399
Date of First Delivery	April 1990	June 1990	None identified	None identified
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Dealer; vendor	Dealer; vendor	Vendor	Vendor
Comments	—	—	Includes operating system and cable; free technical support.	Includes operating system, T-connection, and cable; free technical support.

Vendor	Solid Technologies	Solid Technologies	Solid Technologies	Solid Technologies
Product	E1000-M	F200	F300	F300-M
Characteristics				
LANs Supported	Ethernet	Arcnet	Arcnet	Arcnet
Microcomputer Bus Supported	MCA	AT (ISA); PC	AT (ISA); PC	MCA
Bus Size	16-bit	8-bit	16-bit	16-bit
Maximum Data Rate (bps)	10M	1.8M	3M	3M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair
Operating Systems Supported	NetWare; PC LAN Program; Solid LAN OS	NetWare; PC LAN Program; Solid LAN OS	NetWare; PC LAN Program; Solid LAN OS	NetWare; PC LAN Program; Solid LAN OS
Pricing/Support Price (\$)	499	249	349	499
Date of First Delivery	None identified	None identified	None identified	None identified
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	Includes operating system, T-connection, and cable; free technical support.	Includes operating system and cable; free technical support.	Includes operating system and cable; free technical support.	Includes operating system and cable; free technical support.

Vendor	Standard Microsystems Corp.	Standard Microsystems Corp.	Standard Microsystems Corp.	Standard Microsystems Corp.
Product	ARCNET-LC100	ARCNET-PC130	ARCNET-PC130E	ARCNET-PC270E
<b>Characteristics</b>				
LANs Supported	Arcnet	Arcnet	Arcnet	Arcnet
Microcomputer Bus Supported	All laptop PCs	AT (ISA)	AT (ISA)	AT (ISA)
Bus Size	None identified	8-bit	8-bit	8-bit
Maximum Data Rate (bps)	2.5M	2.5M	2.5M	2.5M
Media Supported	RG-62/U coaxial; Unshielded twisted-pair	RG-62/U coaxial	RG-62/U coaxial	Unshielded twisted-pair
Operating Systems Supported	NetWare	LAN Manager; NetWare; PC LAN Program; Tapestry; VINES	LAN Manager; NetWare; PC LAN Program; Tapestry; VINES	LAN Manager; NetWare; PC LAN Program; Tapestry; VINES
<b>Pricing/Support</b>				
Price (\$)	595	245	295	295
Date of First Delivery	December 1989	1989	1989	1989
Standard Warranty	2 years unlimited	2 years unlimited	2 years unlimited	2 years unlimited
Service Supplied by	Dealer; third party; vendor	Dealer; third party; vendor	Dealer; third party; vendor	Dealer; third party; vendor
<b>Comments</b>	Provides parallel port connection for laptop PCs; features external diagnostic LEDs node ID, media and topology switches, NetWare drivers.	Half-slot, surface-mount technology board designed for star topology.	Half-slot, surface-mount technology board designed for star topology or bus topology; features external diagnostic LEDs and node ID switches.	Half-slot, surface-mount technology board designed for star or daisy-chain topology; features external diagnostic LEDs and node ID switches.
Vendor	Standard Microsystems Corp.	Standard Microsystems Corp.	Standard Microsystems Corp.	Standard Microsystems Corp.
Product	ARCNET-PC330	ARCNET-PC550FS	ARCNET-PC550WS	ARCNET-PS110
<b>Characteristics</b>				
LANs Supported	Arcnet	Arcnet	Arcnet	Arcnet
Microcomputer Bus Supported	AT (ISA)	AT (ISA)	AT (ISA)	MCA
Bus Size	8-bit	16-bit	16-bit	16-bit
Maximum Data Rate (bps)	2.5M	2.5M	2.5M	2.5M
Media Supported	Optical fiber	Unshielded twisted-pair	Unshielded twisted-pair	RG-62/U coaxial
Operating Systems Supported	LAN Manager; NetWare; PC LAN Program; Tapestry; VINES	NetWare	NetWare	LAN Manager; NetWare; PC LAN Program; Tapestry; VINES
<b>Pricing/Support</b>				
Price (\$)	525	695	495	595
Date of First Delivery	1989	1989	1989	1987
Standard Warranty	2 years unlimited	2 years unlimited	2 years unlimited	2 years unlimited
Service Supplied by	Dealer; third party; vendor	Dealer; third party; vendor	Dealer; third party; vendor	Dealer; third party; vendor
<b>Comments</b>	Half-slot board designed for star networks; features external diagnostic LEDs and mode ID switches.	File server board designed for star or daisy-chain networks; features nodal priority (patented); 16-bit wide data bus; dual-ported RAM and high-speed interface.	Workstation board designed for star or daisy-chain networks; features 16-bit wide data bus; dual-ported RAM and high-speed interface.	Surface-mount technology board designed for star topology, features drivers for NetWare

Vendor	Standard Microsystems Corp.	Standard Microsystems Corp.	Standard Microsystems Corp.	Standard Microsystems Corp.
Product	ARCNET-PS210	ARCNET-PS500FS	ARCNET-PS500WS	ARCNET-T100
<b>Characteristics</b>				
LANs Supported	Arcnet	Arcnet	Arcnet	Arcnet
Microcomputer Bus Supported	MCA	AT (ISA)	AT (ISA)	Toshiba laptop
Bus Size	16-bit	16-bit	16-bit	None identified
Maximum Data Rate (bps)	2.5M	2.5M	2.5M	2.5M
Media Supported	RG-62/U coaxial	RG-62/U coaxial	RG-62/U coaxial	RG-62/U coaxial
Operating Systems Supported	LAN Manager; NetWare; PC LAN Program; Tapestry; VINES	NetWare	NetWare	LAN Manager; NetWare; PC LAN Program; Tapestry; VINES
<b>Pricing/Support</b>				
Price (\$)	595	695	495	595
Date of First Delivery	1989	1988	1988	1989
Standard Warranty	2 years unlimited	2 years unlimited	2 years unlimited	2 years unlimited
Service Supplied by	Dealer; third party; vendor	Dealer; third party; vendor	Dealer; third party; vendor	Dealer; third party; vendor
<b>Comments</b>	Surface-mount technology board designed for star topology, features drivers for NetWare.	File server board designed for star or bus networks; features nodal priority (patented); 16-bit wide data bus; dual-ported RAM and high-speed interface.	Workstation board designed for star or bus networks features a 16-bit wide data bus; dual-ported RAM and high-speed interface; drivers for NetWare.	Includes power switch.

Vendor	Standard Microsystems Corp.	Standard Microsystems Corp.	Standard Microsystems Corp.	Standard Microsystems Corp.
Product	ARCNET-T250	Arcnet EISA 3200	NB210	NB250
<b>Characteristics</b>				
LANs Supported	Arcnet	Arcnet	Arcnet	Arcnet
Microcomputer Bus Supported	Toshiba laptop	EISA	NuBus	NuBus
Bus Size	None identified	16-bit	16-bit	16-bit
Maximum Data Rate (bps)	2.5M	2.5M	2.5M	2.5M
Media Supported	Unshielded twisted-pair	Baseband coaxial	Baseband coaxial	Baseband coaxial
Operating Systems Supported	LAN Manager; NetWare; PC LAN Program; Tapestry; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; PC LAN Program; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES
<b>Pricing/Support</b>				
Price (\$)	595	995	495	495
Date of First Delivery	1989	None identified	None identified	None identified
Standard Warranty	2 years unlimited	90 days	90 days	90 days
Service Supplied by	Dealer; third party; vendor	Dealer	Dealer	Dealer
<b>Comments</b>	Includes power switch.	—	—	—

Vendor	Standard Microsystems Corp.	Standard Microsystems Corp.	Standard Microsystems Corp.	Standard Microsystems Corp.
Product	SE100	SE250	SMC3008	SMC3008 TP
<b>Characteristics</b>				
LANs Supported	Arcnet	Arcnet	Ethernet	Ethernet
Microcomputer Bus Supported	SE	SE	AT (ISA); PC	AT (ISA); EISA; PC
Bus Size	16-bit	16-bit	8-bit	8-bit
Maximum Data Rate (bps)	2.5M	2.5M	10M	10M
Media Supported	Baseband coaxial	Baseband coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Unshielded twisted-pair
Operating Systems Supported	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES
<b>Pricing/Support</b>				
Price (\$)	495	495	295	325
Date of First Delivery	None identified	None identified	September 1990	September 1990
Standard Warranty	90 days	90 days	90 days	90 days
Service Supplied by	Dealer	Dealer	Dealer	Dealer
Comments	—	—	—	—

Vendor	Standard Microsystems Corp.	Standard Microsystems Corp.	Standard Microsystems Corp.	Standard Microsystems Corp.
Product	SMC3016	SMC3016 TP	SMC3016 TP/MC	SMC3016/MC
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	AT (ISA); EISA	AT (ISA); EISA	MCA	MCA
Bus Size	16-bit	16-bit	16-bit	16-bit
Maximum Data Rate (bps)	10M	10M	10M	10M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Unshielded twisted-pair	Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES
<b>Pricing/Support</b>				
Price (\$)	395	395	495	450
Date of First Delivery	September 1990	September 1990	September 1990	September 1990
Standard Warranty	90 days	90 days	90 days	90 days
Service Supplied by	Dealer	Dealer	Dealer	Dealer
Comments	—	—	—	—

Vendor	TeleVideo Systems, Inc.	TeleVideo Systems, Inc.	TeleVideo Systems, Inc.	Thirdware Computer Products
<b>Product</b>	TE100	TE200	TE300	ARC-160ZS/B
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	Arcnet
Microcomputer Bus Supported	AT (ISA)	AT (ISA)	EISA	AT (ISA); EISA
Bus Size Maximum Data Rate (bps)	8-bit 10M	16-bit 10M	32-bit 10M	16-bit 2.5M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	RG 62 coaxial
Operating Systems Supported	NetWare	NetWare	NetWare	NetWare; RX-Net
<b>Pricing/Support</b>				
Price (\$)	283	385	573	219
Date of First Delivery	December 1990	December 1990	January 1991	1990
Standard Warranty	1 year	1 year	1 year	5 years
Service Supplied by	Vendor	Vendor	Vendor	None identified
<b>Comments</b>	—	—	—	16-bit Arcnet card based on the SMC 90C66 single chip solution.

Vendor	Thirdware Computer Products	Thirdware Computer Products	Thirdware Computer Products	Thomas-Conrad Corp.
<b>Product</b>	ARC-800S/B/TW	ETN-1000	ETN-2000	TC3042 100Mbps TCNS Adapter/XT
<b>Characteristics</b>				
LANs Supported	Arcnet	Ethernet	Ethernet	100M Token-Passing (TCNS)
Microcomputer Bus Supported	AT (ISA); EISA; PC	AT (ISA); EISA; PC	AT (ISA); EISA	AT (ISA)
Bus Size Maximum Data Rate (bps)	8-bit 2.5M	8-bit 10M	16-bit 10M	16-bit 100M
Media Supported	RG 62 coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial	LANtastic; Standard Ethernet coaxial; TCP/IP; Thin Ethernet coaxial	Shielded twisted-pair; Unshielded twisted-pair
Operating Systems Supported	NetWare; RX-Net	LANtastic; NetWare; TCP/IP	None identified	3+ /3+ Open; NetWare; OS/2 LAN Manager; PC LAN Program
<b>Pricing/Support</b>				
Price (\$)	179	199	299	995
Date of First Delivery	1989	1989	1989	September 1990
Standard Warranty	5 years	5 years	5 years	2 years
Service Supplied by	None identified	None identified	None identified	Vendor
<b>Comments</b>	8-bit Arcnet network interface card based on SMC 90C65 chip set single chip solution.	Fully NE-1000 compatible, uses standard drivers.	Fully Novell NE-2000 compatible.	—

Vendor	Thomas-Conrad Corp.	Thomas-Conrad Corp.	Thomas-Conrad Corp.	Thomas-Conrad Corp.
Product	TC3045 100Mbps TCNS Adapter/AT	TC3047 100Mbps TCNS Adapter/EISA	TC4035 Token-Ring Adapter/AT	TC4045 16/4 Token Ring Adapter/AT
<b>Characteristics</b>				
LANs Supported	100M Token-Passing (TCNS)	100M Token-Passing (TCNS)	Token-Ring	Token-Ring
Microcomputer Bus Supported	AT (ISA)	EISA	AT (ISA); EISA; PC	AT (ISA); EISA; PC
Bus Size	16-bit	32-bit	16-bit	16-bit
Maximum Data Rate (bps)	100M	100M	4M	4M
Media Supported	Optical fiber	Optical fiber	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair
Operating Systems Supported	LANtastic; NetWare; OS/2 LAN Manager; PowerLan; VINES	LANtastic; NetWare; PowerLan; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program
<b>Pricing/Support</b>				
Price (\$)	1,495	1,725	595	849
Date of First Delivery	September 1990	September 1990	January 1990	September 1990
Standard Warranty	2 years	2 years	2 years	2 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	—	—	—	Toll-free technical support.

Vendor	Thomas-Conrad Corp.	Thomas-Conrad Corp.	Thomas-Conrad Corp.	Thomas-Conrad Corp.
Product	TC4046 16/4 Token Ring Adapter/MC	TC6046-ARC-Card/MC	TC6142 ARC-Card/CE	TC6145 ARC-Card/AT
<b>Characteristics</b>				
LANs Supported	Token-Ring	Arcnet	Arcnet	Arcnet
Microcomputer Bus Supported	MCA	MCA	AT (ISA)	AT (ISA)
Bus Size	16-bit	16-bit	8-bit	8-bit
Maximum Data Rate (bps)	4M	2.5M	2.5M	2.5M
Media Supported	Shielded twisted-pair; Unshielded twisted-pair	Optical fiber; Standard Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Standard Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Standard Ethernet coaxial; Unshielded twisted-pair
Operating Systems Supported	3+ /3+ Open; NetWare; OS/2 LAN Manager; PC LAN Program	LANtastic; NetWare; OS/2 LAN Manager; PowerLan; VINES	AppleTalk; NetWare	LANtastic; NetWare; OS/2 LAN Manager; PowerLan; VINES
<b>Pricing/Support</b>				
Price (\$)	875	395, max. price is 595	199, max. price is 395	379, max. price is 550
Date of First Delivery	September 1990	December 1987	1985	September 1990
Standard Warranty	2 years	2 years	2 years	2 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	—	—	—	—

Vendor	Thomas-Conrad Corp.	Thomas-Conrad Corp.	Thomas-Conrad Corp.	3Com Corp.
Product	TC6842 ARC-Card/NB	TC6843 ARC-Card/SE	TC6844 ARC-Card/SE30	EtherLink 16 3C507
<b>Characteristics</b>				
LANs Supported	AppleTalk; Arcnet	AppleTalk; Arcnet	AppleTalk; Arcnet	Ethernet
Microcomputer Bus Supported	NuBus	SE	SE/30	AT (ISA); EISA
Bus Size	32-bit	16-bit	32-bit	16-bit
Maximum Data Rate (bps)	2.5M	2.5M	2.5M	10M
Media Supported	Optical fiber; Standard Ethernet coaxial	Optical fiber; Standard Ethernet coaxial	Optical fiber; Standard Ethernet coaxial	AUI; Thin Ethernet coaxial
Operating Systems Supported	AppleTalk; NetWare	AppleTalk; NetWare	AppleTalk; NetWare	3+ /3+ Open; NetWare; OS/2 LAN Manager; VINES
<b>Pricing/Support</b>				
Price (\$)	495, max. price is 895	445, max. price is 845	495, max. price is 895	445
Date of First Delivery	May 1990	May 1990	May 1990	1990
Standard Warranty	2 years	2 years	2 years	Lifetime
Service Supplied by	Vendor	Vendor	Vendor	Dealer; vendor
Comments	—	—	—	—

Vendor	3Com Corp.	3Com Corp.	3Com Corp.	3Com Corp.
Product	EtherLink II 3C503	EtherLink II-TP 3C503-TP	EtherLink Plus 3C505B	EtherLink/MC 3C523
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	AT (ISA); EISA; PC	AT (ISA); EISA; PC	AT (ISA); EISA; PC	MCA
Bus Size	8-bit	8-bit	16-bit; 8-bit	16-bit
Maximum Data Rate (bps)	10M	10M	10M	10M
Media Supported	AUI; Thin Ethernet coaxial	AUI; Shielded twisted-pair; Unshielded twisted-pair	AUI; Thin Ethernet coaxial	AUI; Thin Ethernet coaxial
Operating Systems Supported	3+ /3+ Open; NetWare; OS/2 LAN Manager; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; VINES	3+ /3+ Open; NetWare; OS/2 LAN Server; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; VINES
<b>Pricing/Support</b>				
Price (\$)	295	445	895	425
Date of First Delivery	1986	1990	1985	1987
Standard Warranty	Lifetime	Lifetime	Lifetime	Lifetime
Service Supplied by	Dealer; vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
Comments	—	Compatible also with SynOptics LattisNet (pre-standard 10BASE-T) and AT&T StarLAN 10.	Features 80186 processor and 82586 coprocessor on the board. Includes 256KB RAM for downloadable protocols and packet buffering.	—

<b>Vendor</b>	3Com Corp.	3Com Corp.	3Com Corp.	3Com Corp.
<b>Product</b>	EtherLink/MC-TP 3C523-TP	EtherLink/NB 3C543	EtherLink/SE 3C563	TokenLink 3C603
<b>Characteristics LANs Supported</b>	Ethernet	Ethernet	Ethernet	Token-Ring
<b>Microcomputer Bus Supported</b>	MCA	NuBus	SE	AT (ISA); EISA; PC
<b>Bus Size Maximum Data Rate (bps)</b>	16-bit 10M	32-bit 10M	32-bit 10M	16-bit; 8-bit 4M
<b>Media Supported</b>	AUI; Shielded twisted-pair; Unshielded twisted-pair	AUI; Thin Ethernet coaxial	AUI; Thin Ethernet coaxial	Shielded twisted-pair; Unshielded twisted-pair
<b>Operating Systems Supported</b>	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; VINES	3+/3+ Open; AppleShare; NetWare; OS/2 LAN Manager; VINES	3+/3+ Open; AppleShare; NetWare; OS/2 LAN Manager; VINES	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program
<b>Pricing/Support Price (\$)</b>	495	595	495	595
<b>Date of First Delivery Standard Warranty</b>	1990 Lifetime	July 1988 Lifetime	1989 Lifetime	1987 Lifetime
<b>Service Supplied by</b>	Dealer; vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
<b>Comments</b>	Compatible also with SynOptics LattisNet (pre-standard 10BASE-T), and AT&T StarLAN 10.	Ethernet/NB diver is written to Apple's Ethernet application interface; any application written to the Ethernalk API is compatible.	—	Features on board type 3 media filter.
<b>Vendor</b>	Tiara Computer Systems, Inc.	Tiara Computer Systems, Inc.	Tiara Computer Systems, Inc.	Tiara Computer Systems, Inc.
<b>Product</b>	LanCard/A* AT	LanCard/A* AT TP	LanCard/A* MC	LanCard/A* PC
<b>Characteristics LANs Supported</b>	Arcnet	Arcnet	Arcnet	Arcnet
<b>Microcomputer Bus Supported</b>	PC	PC	MCA	PC
<b>Bus Size Maximum Data Rate (bps)</b>	16-bit 2.5M	16-bit 2.5M	8-bit 2.5M	8-bit 2.5M
<b>Media Supported</b>	Baseband coaxial	Baseband coaxial; Unshielded twisted-pair	Baseband coaxial	Baseband coaxial
<b>Operating Systems Supported</b>	NetWare; OS/2 Requestor	NetWare; OS/2 Requestor	NetWare; OS/2 Requestor	NetWare; OS/2 Requestor
<b>Pricing/Support Price (\$)</b>	375	385	495	150
<b>Date of First Delivery Standard Warranty</b>	April 1989 Lifetime	April 1990 Lifetime	November 1987 Lifetime	September 1985 Lifetime
<b>Service Supplied by</b>	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	—	—	—	—

Vendor	Tiara Computer Systems, Inc.	Tiara Computer Systems, Inc.	Tiara Computer Systems, Inc.	Tiara Computer Systems, Inc.
Product	LanCard/A* PC TP	LanCard/A*AT H12	LanCard/A*MC H12	LanCard/A*PC H12
<b>Characteristics</b>				
LANs Supported	Arcnet	Arcnet	Arcnet	Arcnet
Microcomputer Bus Supported	PC	PC	MCA	PC
Bus Size	8-bit	16-bit	8-bit	8-bit
Maximum Data Rate (bps)	2.5M	2.5M	2.5M	2.5M
Media Supported	Baseband coaxial; Unshielded twisted-pair	Broadband coaxial	Baseband coaxial	Baseband coaxial
Operating Systems Supported	NetWare; OS/2 Requestor	NetWare; OS/2 Requestor	NetWare; OS/2 Requestor	NetWare; OS/2 Requestor
<b>Pricing/Support</b>				
Price (\$)	245	425	695	325
Date of First Delivery	April 1990	1990	1990	1990
Standard Warranty	Lifetime	Lifetime	Lifetime	Lifetime
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	—	—	—	—

Vendor	Tiara Computer Systems, Inc.	Tiara Computer Systems, Inc.	Tiara Computer Systems, Inc.	Tiara Computer Systems, Inc.
Product	LanCard/E* 1000	LanCard/E* AT	LanCard/E* MC	LanCard/E* PC 10BT
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	AT (ISA); PC	AT (ISA); PC	PC	AT (ISA); PC
Bus Size	8-bit	16-bit	16-bit	8-bit
Maximum Data Rate (bps)	10M	10M	10M	10M
Media Supported	Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Unshielded twisted-pair
Operating Systems Supported	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+ /3+ Open; Decnet-DOS; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; Sun PC NFS; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES
<b>Pricing/Support</b>				
Price (\$)	275	425	445	395
Date of First Delivery	1990	April 1988	September 1988	April 1990
Standard Warranty	Lifetime	Lifetime	Lifetime	Lifetime
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	—	—	—	—

Vendor	Tiara Computer Systems, Inc.	Tiara Computer Systems, Inc.	Tiara Computer Systems, Inc.	Tiara Computer Systems, Inc.
Product	LanCard/E* STAR8	LanCard/E*2000	LanCard/E*AT LTP	LanCard/E*MC LTP
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	AT (ISA); PC	AT (ISA); PC	PC	MCA
Bus Size	8-bit	16-bit	16-bit	16-bit
Maximum Data Rate (bps)	10M	10M	10M	10M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	NetWare	3+/3+ Open; Decnet-DOS; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; Sun PC NFS; VINES	3+/3+ Open; Decnet-DOS; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; Sun PC NFS; VINES
<b>Pricing/Support</b>				
Price (\$)	285	350	595	595
Date of First Delivery	November 1989	1990	1990	1990
Standard Warranty	Lifetime	Lifetime	Lifetime	Lifetime
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	—	—	—	—

Vendor	Tiara Computer Systems, Inc.	Tiara Computer Systems, Inc.	Tiara Computer Systems, Inc.	Top Microsystems
Product	LanCard/E*PC LTP	LanCard/T*AT	LanCard/T*PC	TA-10
<b>Characteristics</b>				
LANs Supported	Ethernet	NETBIOS; Token-Ring	NETBIOS; Token-Ring	Arcnet; Ethernet
Microcomputer Bus Supported	AT (ISA); PC	AT (ISA)	AT (ISA)	AT (ISA)
Bus Size	8-bit	16-bit	8-bit	None identified
Maximum Data Rate (bps)	10M	4M	4M	1M; 16M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
Operating Systems Supported	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	NetWare; PC LAN Program	NetWare; PC LAN Program	NetWare; VINES
<b>Pricing/Support</b>				
Price (\$)	395	795	595	295-695
Date of First Delivery	1990	1990	1990	June 1989
Standard Warranty	Lifetime	2 years	2 years	None identified
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	—	—	—	—

Vendor	Top Microsystems	Top Microsystems	Top Microsystems	Top Microsystems
Product	TA-20	TA-30	TA-40	TA-50
Characteristics LANs Supported	Arcnet; Ethernet	Arcnet; Ethernet	Arcnet; Ethernet	Arcnet; Ethernet
Microcomputer Bus Supported	AT (ISA)	AT (ISA)	AT (ISA)	AT (ISA)
Bus Size Maximum Data Rate (bps)	None identified 1M; 16M	None identified 1M; 16M	None identified 1M; 16M	None identified 1M; 16M
Media Supported	Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
Operating Systems Supported	NetWare; VINES	NetWare; VINES	NetWare; VINES	NetWare; VINES
Pricing/Support Price (\$)	295-695	295-695	295-695	295-695
Date of First Delivery Standard Warranty	June 1989 None identified	June 1989 None identified	June 1989 None identified	June 1989 None identified
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	—	—	—	—

Vendor	Top Microsystems	Top Microsystems	Top Microsystems	Torus Systems, Inc.
Product	TA-60	TE-1000	TE-2000	Ethernet Plus
Characteristics LANs Supported	Arcnet; Ethernet	Arcnet; Ethernet	Arcnet; Ethernet	Ethernet
Microcomputer Bus Supported	AT (ISA)	AT (ISA)	AT	AT (ISA); PC
Bus Size Maximum Data Rate (bps)	None identified 1M; 16M	None identified 1M; 16M	None identified 1M; 16M	8-bit 10M
Media Supported	Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	NetWare; VINES	NetWare; VINES	NetWare; VINES	Tapestry
Pricing/Support Price (\$)	295-695	295-695	295-695	395
Date of First Delivery Standard Warranty	June 1989 None identified	June 1989 None identified	June 1989 None identified	None identified None identified
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	—	—	—	—

**Local Area Network  
Products:  
Comparison Columns  
Network Interface Cards**

Vendor	Torus Systems, Inc.	Toshiba America Information Systems, Inc.	Tri-Data Corp.	Tri-Data Corp.
Product	Ethernet Plus MCA	Toshiba LAN Card for Ethernet	LanWay TR 16/4	LanWay E-10T
Characteristics LANs Supported	Ethernet	Ethernet	Token-Ring	Ethernet
Microcomputer Bus Supported	MCA	Toshiba Laptop	NuBus; SE/30	NuBus; SE/30
Bus Size Maximum Data Rate (bps)	8-bit 10M	None identified 10M	32-bit 16M	32-bit 10M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair; requires external transceiver	Shielded twisted-pair	Thin Ethernet coaxial
Operating Systems Supported	Tapestry	3+/3+ Open; NetWare	None identified	None identified
Pricing/Support Price (\$)	425	699	895	895
Date of First Delivery Standard Warranty	None identified None identified	None identified 1 year	August 1990 120 days	November 1990 120 days
Service Supplied by	Vendor	None identified	Vendor	Vendor
Comments	—	Designed for use with Toshiba's portable PC and desktop PC exclusively.	—	—

Vendor	Tri-Data Corp.	TRW	Ungermann-Bass, Inc.	Ungermann-Bass, Inc.
Product	LanWay PC TR 16/4	PC2001	3270 NIUpc	Access/MC
Characteristics LANs Supported	Token-Ring	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	AT (ISA); EISA; MCA	AT (ISA); PC	AT (ISA)	MCA
Bus Size Maximum Data Rate (bps)	16-bit; 32-bit 16M	16-bit; 8-bit 10M	16-bit 10M	16-bit 10M
Media Supported	Shielded twisted-pair	Broadband coaxial; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Broadband coaxial; Standard Ethernet coaxial	Standard Ethernet coaxial; Unshielded twisted-pair
Operating Systems Supported	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server	NetWare; PC LAN Program; TCP/IP; Tapestry	NDIS; NetWare; OS/2 LAN Manager	NDIS; NetWare; OS/2 LAN Manager
Pricing/Support Price (\$)	895	670	995	545
Date of First Delivery Standard Warranty	February 1991 120 days	November 1987 90 days	January 1987 90 days	December 1990 90 days
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	—	28K of PC RAM.	80186 processor with 256K RAM.	—

Vendor	Ungermann-Bass, Inc.	Ungermann-Bass, Inc.	Ungermann-Bass, Inc.	Ungermann-Bass, Inc.
<b>Product</b>	Access/PC-16	Access/PC-8	NIUpc/EOTP	NIUps
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	AT (ISA)	PC	AT (ISA)	MCA
Bus Size Maximum Data Rate (bps)	16-bit 10M	8-bit 10M	16-bit 10M	16-bit 10M
Media Supported	Standard Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Unshielded twisted-pair	Unshielded twisted-pair	Broadband coaxial; Standard Ethernet coaxial
Operating Systems Supported	NDIS; NetWare; OS/2 LAN Manager	NDIS; NetWare; OS/2 LAN Manager	NDIS; NetWare; OS/2 LAN Manager	NDIS; NetWare; OS/2 LAN Manager
<b>Pricing/Support</b>				
Price (\$)	545	395	1,095	1,095
Date of First Delivery Standard Warranty	December 1990 90 days	September 1990 90 days	July 1990 90 days	January 1989 90 days
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	—	—	80186 processor with 512K RAM.	80186 processor with 512K RAM.

Vendor	Ungermann-Bass, Inc.	Ungermann-Bass, Inc.	Ungermann-Bass, Inc.	Univation Inc.
<b>Product</b>	NIUps/EOTP	NIUps/TR	Personal NIU/TR	Lifelink Ethernet Card
<b>Characteristics</b>				
LANs Supported	Ethernet	Token-Ring	Token-Ring	Ethernet
Microcomputer Bus Supported	MCA	MCA	AT (ISA)	AT (ISA)
Bus Size Maximum Data Rate (bps)	16-bit 10M	16-bit 4M	16-bit 4M	None identified 10M
Media Supported	Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	Standard Ethernet coaxial
Operating Systems Supported	NDIS; NetWare; OS/2 LAN Manager	NetWare; OS/2 LAN Manager	NetWare; OS/2 LAN Manager	NetWare; TCP/IP
<b>Pricing/Support</b>				
Price (\$)	1,095	1,095	695	395
Date of First Delivery Standard Warranty	July 1990 90 days	April 1989 90 days	January 1988 90 days	January 1987 1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	—	80186 processor with 512K RAM.	80186 processor with 256K RAM.	Integrates Novell's Advanced Netware and TCP/IP.

Vendor	Univation Inc.	US Sage	Wang Laboratories, Inc.	Wang Laboratories, Inc.
<b>Product</b>	<b>MAC/DOS 286sx</b>	<b>MainLAN Ethernet</b>	<b>8023-10/PC2</b>	<b>8023-MC</b>
<b>Characteristics</b>				
LANs Supported	AppleTalk; Arcnet; DECnet; Ethernet; LANtastic; Starlan; Token-Ring	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	SE	AT (ISA); EISA; MCA; PC; PS/1	AT (ISA); EISA	MCA
Bus Size Maximum Data Rate (bps)	None identified 1M	16-bit; 8-bit 10M	16-bit 10M	16-bit 10M
Media Supported	Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	3+ /3+ Open; NetWare; PC LAN Program; TOPS	MainLAN; NetWare	3+ /3+ Open; NetWare; VINES	3+ /3+ Open; NetWare; VINES
<b>Pricing/Support</b>				
Price (\$)	1,595	199, max. price is 249	895	495
Date of First Delivery	January 1989	October 1990	April 1988	August 1989
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	MS-DOS co-processor card for the Macintosh computer; 1M on-board memory; parallel port; serial port; support for Apple's FDHD Superdrive.	\$199 for 8-bit version; \$249 for 16-bit version.	384K on board memory.	—

Vendor	Wang Laboratories, Inc.	Wang Laboratories, Inc.	Wang Laboratories, Inc.	Wang Laboratories, Inc.
<b>Product</b>	<b>8023-PC2/A</b>	<b>8023-PC2/TP</b>	<b>8025-PC2/16</b>	<b>8025-PC2/A</b>
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Token-Ring	Token-Ring
Microcomputer Bus Supported	AT (ISA)	AT (ISA)	AT (ISA); EISA	AT (ISA); EISA
Bus Size Maximum Data Rate (bps)	16-bit 10M	16-bit 10M	16-bit 16M	16-bit 4M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair	Shielded twisted-pair
Operating Systems Supported	3+ /3+ Open; NetWare	3+ /3+ Open; NetWare; VINES	3+ /3+ Open; NetWare; VINES	3+ /3+ Open; NetWare; VINES
<b>Pricing/Support</b>				
Price (\$)	345	445	945	595
Date of First Delivery	April 1988	June 1990	June 1990	December 1988
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	—	—	—	—

Vendor	Watlan, Inc.	Watlan, Inc.	Watlan, Inc.	Western Digital Corp.
Product	Watstar/A2	Watstar/E10	Watstar/p10	EtherCard Plus 16
Characteristics				
LANs Supported	Arcnet	Ethernet	ProNET-10; Token-Ring	Ethernet
Microcomputer Bus Supported	AT (ISA); MCA; PC	AT (ISA); MCA; PC	AT (ISA); MCA; PC	AT (ISA); EISA; PC
Bus Size	16-bit; 8-bit	16-bit; 8-bit	16-bit; 8-bit	16-bit
Maximum Data Rate (bps)	2.5M	10M	10M	10M
Media Supported	RG 62 coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Microwave Links; Optical fiber; Shielded twisted-pair; Twinax; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	Watstar/A2	Watstar/pc	Watstar/pc	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; UNIX/Zenix; VINES
Pricing/Support				
Price (\$)	2,250	4,995	4,995	349
Date of First Delivery	None identified	None identified	None identified	September 1989
Standard Warranty	1 year	1 year	1 year	5 years
Service Supplied by	Third party; vendor	Third party; vendor	None identified	Dealer; vendor
Comments	Intended for small workgroups (up to 30 nodes); bridges at Watstar server enable integration of these networks to systems with up to 40,000 nodes; includes network services and utilities.	Intended for multi-purpose Ethernet systems; bridges at Watstar servers provide connectivity to large-scale systems; includes network services and utilities.	Includes utilities and security functions; supports high capacity(4GB) network servers and over 200,000 user IDs; bridged to other Watstar LANS via Watstar servers; services include account manager, diagnostics, E-mail.	—
Vendor	Western Digital Corp.	Western Digital Corp.	Western Digital Corp.	Western Digital Corp.
Product	EtherCard Plus/A	EtherCard Plus TP	EtherCard Plus 10T/A	EtherCard Plus 10T
Characteristics				
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	MCA	AT (ISA); PC	MCA	AT (ISA); PC
Bus Size	16-bit	8-bit	16-bit	8-bit
Maximum Data Rate (bps)	10M	10M	10M	10M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
Operating Systems Supported	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; UNIX/Zenix; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; UNIX/Zenix; VINES	3+ /3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES
Pricing/Support				
Price (\$)	399	499	399	349
Date of First Delivery	June 1988	June 1987	February 1990	February 1990
Standard Warranty	5 years	5 years	5 years	1 year
Service Supplied by	Dealer; vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
Comments	—	SynOptics LattisNet compatible.	—	—

Vendor	Western Digital Corp.	Western Digital Corp.	Western Digital Corp.	Western Digital Corp.
Product	EtherCard Plus	TokenCard	TokenCard WS	TokenCard Master
Characteristics LANs Supported	Ethernet	Token-Ring	Token-Ring	Token-Ring
Microcomputer Bus Supported	AT (ISA); PC	AT (ISA); PC	AT (ISA); PC	AT (ISA); EISA
Bus Size Maximum Data Rate (bps)	8-bit 10M	8-bit 4M	8-bit 4M	16-bit 4M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair
Operating Systems Supported	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; UNIX/Zenix; VINES	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; VINES
Pricing/Support Price (\$)	249	599	499	649
Date of First Delivery Standard Warranty	June 1987 5 years	March 1989 5 years	March 1989 5 years	March 1989 5 years
Service Supplied by	Dealer; vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
Comments	With ROM socket.	With 128K of RAM.	For workstations with RAM sockets.	For 16-bit AT bus with 128K of RAM.

Vendor	Xinetron	Xinetron	Xinetron	Xinetron
Product	Xi-211	Xi-212	Xi-221	Xi-222
Characteristics LANs Supported	Arcnet	Arcnet	Arcnet	Arcnet
Microcomputer Bus Supported	AT (ISA); PC	PC	AT (ISA)	AT (ISA)
Bus Size Maximum Data Rate (bps)	8-bit 2.5M	8-bit 2.5M	16-bit 2.5M	16-bit 2.5M
Media Supported	Baseband coaxial	Shielded twisted-pair	Baseband coaxial	Shielded twisted-pair
Operating Systems Supported	CBIS; LANtastic; NetWare; OS/2 LAN Manager; OS/2 LAN Server; VINES	CBIS; LANtastic; NetWare; OS/2 LAN Manager; OS/2 LAN Server; VINES	CBIS; LANtastic; NetWare; OS/2 LAN Manager; OS/2 LAN Server; VINES	CBIS; LANtastic; NetWare; OS/2 LAN Manager; OS/2 LAN Server; VINES
Pricing/Support Price (\$)	79	79	119	119
Date of First Delivery Standard Warranty	February 1987 3 years	May 1988 3 years	May 1987 3 years	May 1988 3 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	Novell boot ROM included; Bus or Star topology; Turbo driver support.	Novell boot ROM included; Bus or Star topology.	Novell boot ROM included; Bus or Star topology.	Novell boot ROM included; Bus or Star topology.

Vendor	Xinetron	Xinetron	Xinetron	Xinetron
Product	Xi-301	Xi-321	Xi-401	Xi-421
Characteristics LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	PC	AT (ISA)	PC	AT (ISA)
Bus Size Maximum Data Rate (bps)	8-bit 10M	16-bit 10M	8-bit 10M	16-bit 10M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Unshielded twisted-pair	Unshielded twisted-pair
Operating Systems Supported	NetWare; VINES	NetWare; VINES	NetWare	NetWare
Pricing/Support Price (\$)	139	165	189	229
Date of First Delivery Standard Warranty	March 1987 3 years	March 1987 3 years	None identified 3 years	None identified 3 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	Novell boot ROM included; supports TCP/IP, UNIX; Novell NE-1000 compatible.	Novell boot ROM included; supports TCP/IP, UNIX; Novell NE-2000 compatible.	10 Base-T compliant; supports TCP/IP, UNIX.	10 Base-T compliant; supports TCP/IP, UNIX.
Vendor	Xircom	Xircom	Xircom	Xylogics, Inc.
Product	PAO2B6/PAO2BT	PEIOB2/PEIOBT/PEIOBX	PTO4B3/PTO4BT	CV3890/CV4890
Characteristics LANs Supported	Arcnet	Ethernet	Token-Ring	FDDI
Microcomputer Bus Supported	AT (ISA); EISA; MCA; PC	AT (ISA); EISA; MCA; PC	AT (ISA); EISA; MCA; PC	VME
Bus Size Maximum Data Rate (bps)	8-bit 2.5M	8-bit 10M	8-bit 4M	32-bit 100M
Media Supported	Thin Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	Optical fiber
Operating Systems Supported	LANtastic; NetWare	3+ /3+ Open; LANtastic; NetWare; OS/2 LAN Manager; OS/2 LAN Server® LAN Program; VINES	3+ /3+ Open; LANtastic; NetWare; OS/2 LAN Manager; OS/2 LAN Server® LAN Program; VINES	UNIX
Pricing/Support Price (\$)	395	595	845	See comments
Date of First Delivery Standard Warranty	April 1989 1 year	April 1989 1 year	October 1989 1 year	October 1990 1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	External adapters that allow PCs to connect to LAN without using any internal slots; connects externally through parallel port of PC.	External adapters that allow PCs to connect to a LAN without using any internal slots; connects externally through parallel port of PC.	External adapters that allow PCs to connect to a LAN without using any internal slots; connects externally through parallel port of PC.	High performance FDDI controller for VMEbus systems. CV3890 Supports a single attachment to an FDDI network. CV4890 provides dual attachment for fault-tolerant networks; contact vendor for pricing information.

**Local Area Network  
Products:  
Comparison Columns  
Network Interface Cards**

Vendor	YamaTech Connectivity Solutions	YamaTech Connectivity Solutions	YamaTech Connectivity Solutions	YamaTech Connectivity Solutions
Product	Turbo Arcom 8-bit	Turbo Arcom 16-bit	Turbo Arcom MicroChannel PS	Turbo Ethercom 16-bit
Characteristics				
LANs Supported	Arcnet	Arcnet	Arcnet	Ethernet; Starlan
Microcomputer Bus Supported	AT (ISA)	AT (ISA)	MCA	AT
Bus Size Maximum Data Rate (bps)	16-bit 2.5M	16-bit 2.5M	16-bit 2.5M	16-bit 10M
Media Supported	Optical fiber; RG-62 coaxial; Shielded twisted-pair	Optical fiber; RG-62 coaxial; Shielded twisted-pair	Optical fiber; RG-62 coaxial; Shielded twisted-pair	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
Operating Systems Supported	NetWare; VINES	NetWare; VINES	NetWare; VINES	NetWare; PC LAN Program; Tapestry; VINES
Pricing/Support Price (\$)	See comments	See comments	See comments	See comments
Date of First Delivery Standard Warranty	March 1985 1 year	March 1985 1 year	March 1985 1 year	January 1989 1 year
Service Supplied by	Third party	Third party	Third party	Third party
Comments	Contact vendor for pricing information.	Contact vendor for pricing information.	Contact vendor for pricing information.	Compatibility through specially designed modules with the latest 10BASE-T draft standard; contact vendor for pricing information.
Vendor	YamaTech Connectivity Solutions	YamaTech Connectivity Solutions	YamaTech Connectivity Solutions	YamaTech Connectivity Solutions
Product	Turbo Ethercom Apple Macintosh	Turbo Ethercom 8-bit	Turbo Ethercom MicroChannel PS	Turbo Token Ring 8-bit
Characteristics				
LANs Supported	Ethernet; Starlan	Ethernet; Starlan	Ethernet; Starlan	Token-Ring
Microcomputer Bus Supported	SE	AT	MCA	AT
Bus Size Maximum Data Rate (bps)	8-bit 10M	8-bit 10M	16-bit; 8-bit 10M	16-bit 16M; 4M
Media Supported	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Unshielded twisted-pair
Operating Systems Supported	NetWare; PC LAN Program; Tapestry; VINES			
Pricing/Support Price (\$)	See comments	See comments	See comments	See comments
Date of First Delivery Standard Warranty	January 1989 1 year	January 1989 1 year	January 1989 1 year	June 1990 1 year
Service Supplied by	Third party	Third party	Third party	Third party
Comments	Compatibility through specially designed modules with the latest 10BASE-T draft standard; contact vendor for pricing information.	Compatibility through specially designed modules with the latest 10BASE-T draft standard; contact vendor for pricing information.	Compatibility through specially designed modules with the latest 10BASE-T draft standard; contact vendor for pricing information.	Also supported will be operating systems such as LAN Manager, OS/2, and UNIX; contact vendor for pricing information.

<b>Vendor</b>	<b>YamaTech Connectivity Solutions</b>	<b>YamaTech Connectivity Solutions</b>	<b>Zenith Electronics Corp.</b>	<b>Zenith Electronics Corp.</b>
<b>Product</b>	<b>Turbo Token Ring 16-bit</b>	<b>Turbo Token Ring MicroChannel PS</b>	<b>LAN10E-AT</b>	<b>LAN10E-EBT</b>
<b>Characteristics</b>				
LANs Supported	Token-Ring	Token-Ring	Ethernet	Ethernet
Microcomputer Bus Supported	AT	MCA	AT (ISA)	PC
Bus Size	16-bit	16-bit	16-bit	8-bit
Maximum Data Rate (bps)	16M; 4M	10M; 4M	10M	10M
Media Supported	Optical fiber; Shielded twisted-pair; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial
Operating Systems Supported	NetWare; PC LAN Program; Tapestry; VINES	NetWare; PC LAN Program; Tapestry; VINES	3+ /3+ Open; Any NetBIOS; NetWare; OS/2 LAN Manager	NetWare
<b>Pricing/Support</b>				
Price (\$)	See comments	See comments	399	495
Date of First Delivery	June 1990	June 1990	None identified	None identified
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Third party	Third party	Vendor	Vendor
<b>Comments</b>	Also supported will be operating systems such as LAN Manager, OS/2, and UNIX; contact vendor for pricing information.	Also supported will be operating systems such as LAN Manager, OS/2, and UNIX; contact vendor for pricing information.	Other operating system software supported; SUN NFS, DECnet-DOS.	For use in Diskless Workstations.
<b>Vendor</b>	<b>Zenith Electronics Corp.</b>	<b>Zenith Electronics Corp.</b>	<b>Zenith Electronics Corp.</b>	<b>Zenith Electronics Corp.</b>
<b>Product</b>	<b>LAN10E-MC</b>	<b>LAN10E-XT</b>	<b>LAN10FPC</b>	<b>LAN10TMC</b>
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	MCA	PC	PC	MCA
Bus Size	16-bit	8-bit	8-bit	16-bit
Maximum Data Rate (bps)	10M	10M	10M	10M
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Optical fiber	Standard Ethernet coaxial; Unshielded twisted-pair
Operating Systems Supported	3+ /3+ Open; Any NetBIOS; NetWare; OS/2 LAN Manager	3+ /3+ Open; Any NetBIOS; NetWare; OS/2 LAN Manager	3+ /3+ Open; Any NetBIOS; NetWare; OS/2 LAN Manager	3+ /3+ Open; Any NetBIOS; NetWare; OS/2 LAN Manager
<b>Pricing/Support</b>				
Price (\$)	495	299	895	495
Date of First Delivery	None identified	None identified	None identified	None identified
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Other operating system software supported; SUN NFS, DECnet-DOS.	Other operating system software supported; SUN NES, DECnet-DOS.	Other operating system software supported; SUN NFS, DECnet-DOS.	Operating system software supported SUN NFS, DECnet-DOS; 802.3 10Base-T.

**Local Area Network  
Products:  
Comparison Columns  
Network Interface Cards**

Vendor	Zenith Electronics Corp.	Zenith Electronics Corp.	Zenith Electronics Corp.	Zenith Electronics Corp.
Product	LAN10TPC	LAN4000AT	LAN4000C	LAN4000MC
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Microcomputer Bus Supported	PC	AT (ISA)	PC	MCA
Bus Size	8-bit	16-bit	8-bit	16-bit
Maximum Data Rate (bps)	10M	4M	4M	4M
Media Supported	Standard Ethernet coaxial; Un-shielded twisted-pair	Broadband coaxial	Broadband coaxial	Broadband coaxial
Operating Systems Supported	3+/3+ Open; Any NetBIOS; NetWare; OS/2 LAN Manager	Decnet-DOS; NetWare; TCP/IP	Decnet-DOS; NetWare; TCP/IP	Decnet-DOS; NetWare; TCP/IP
<b>Pricing/Support</b>				
Price (\$)	395	995	895	995
Date of First Delivery	None identified	None identified	None identified	None identified
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Operating systems software supported includes SUN NFS, DECnet-DOS; 802.3 10 BASE-T.	—	—	—

Vendor	Zenith Electronics Corp.	Zenith Electronics Corp.	Zenith Electronics Corp.	Zenith Electronics Corp.
Product	LAN4TR-AT	LAN4TR-PC	LAN4TR-S	LAN500C
<b>Characteristics</b>				
LANs Supported	Token-Ring	Token-Ring	Token-Ring	Ethernet
Microcomputer Bus Supported	AT (ISA)	PC	PC	PC
Bus Size	16-bit	8-bit	8-bit	8-bit
Maximum Data Rate (bps)	4M	4M	4M	500K
Media Supported	Shielded twisted-pair; Un-shielded twisted-pair	Shielded twisted-pair; Un-shielded twisted-pair	Shielded twisted-pair; Un-shielded twisted-pair	Broadband coaxial
Operating Systems Supported	3+/3+ Open; NetWare; OS/2 LAN Manager; PC LAN Program; TCP/IP	3+/3+ Open; NetWare; OS/2 LAN Manager; OS/2 LAN Server; PC LAN Program; TCP/IP	3+/3+ Open; NetWare; OS/2 LAN Manager; PC LAN Program; TCP/IP	NetWare; TCP/IP
<b>Pricing/Support</b>				
Price (\$)	649	499	599	695
Date of First Delivery	None identified	None identified	None identified	None identified
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	—	—	For use in network servers.	—

Vendor	Zenith Electronics Corp.	Zytec Systems	Zytec Systems	Zytec Systems
Product	LAN500MC	815 Custom	816 Arcnet	817 Ethernet
<b>Characteristics</b>				
LANs Supported	Ethernet	Proprietary	Arcnet	Ethernet
Microcomputer Bus Supported	MCA	AT (ISA); EISA; PC	AT (ISA); EISA; PC	AT (ISA); EISA; PC
Bus Size	16-bit	8-bit	16-bit; 8-bit	16-bit
Maximum Data Rate (bps)	500K	1M	2.5M	10M
Media Supported	Broadband coaxial	Unshielded twisted-pair	Broadband coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
Operating Systems Supported	Decnet-DOS; NetWare; TCP/IP	3+ /3+ Open; Any NetBIOS; NetWare; PC LAN Program; VINES	3+ /3+ Open; Any NetBIOS O/S; NetWare; PC LAN Program; VINES	3+ /3+ Open; Any NetBIOS O/S; NetWare; PC LAN Program; VINES
<b>Pricing/Support</b>				
Price (\$)	895	199	299	349
Date of First Delivery	None identified	1988	Third Quarter, 1990	First Quarter, 1991
Standard Warranty	1 year	Lifetime limited to original end user	Lifetime limited to original end user	Lifetime limited to original end user
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	—	Starter kit (2 boards, accessories, and free trial/pc 250-user operating system) sells for \$399.00.	Starter kit (2 boards, accessories, and free trial/pc 250-user NetBIOS operating system) sells for \$599.00.	10 BASE-T compliant; starter kit (2 boards, accessories, and free trial/pc 250-user NETBIOS operating system) sells for \$699.00.

## Wiring Centers Comparison Column Entry Descriptions

Wiring centers are hubs that provide basic connectivity functions. Most wiring centers include concentrators, host modules, retiming modules, multistation access units (MAUs), and repeaters.

**Vendor and Model.** This entry lists the manufacturer and exact model number or name of each device.

### Characteristics

**Type of Device.** Generally, the basic types of devices in a wiring center are hub/concentrators, multistation access units (MAUs), and multiport repeaters. A *concentrator* connects circuits that are not all in use at once to a smaller group of circuits. A multistation access unit (MAU) acts as the hub in a token-ring network. When MAUs are linked together, they form a ring, which makes faults easier to

isolate and repair. A *multiport repeater* transparently links users on diverse Ethernet segments.

**LANs Supported.** Vendors selected Ethernet, Starlan, Arcnet, AppleTalk, Token-Ring, or other. *Ethernet* is a baseband carrier sense, multiple access with collision detection (CSMA/CD) network that uses a linear bus topology and operates at 10M bps. *Starlan* uses a star topology with central hubs and operates at 1M or 10M bps. *Arcnet* is a baseband LAN that uses a ring or bus topology, runs at 2.5M bps, and also uses a token-passing access method. *AppleTalk* supports bus, star, or ring topologies, depending on the network interface card used. *Token-Ring* refers to a LAN designed with a ring topology, running at speeds of 4M or 16M bps, using the token-passing technique.

**Media Supported.** The various types of media supported by wiring centers include standard Ethernet coaxial, thin Ethernet coaxial, broadband coaxial, shielded twisted pair, unshielded twisted pair, optical fiber, and other. *Standard Ethernet coaxial cable* can serve as the backbone medium for LANs, primarily in enterprise-wide installations. *Thin Ethernet coaxial cable* is used mainly in office environments. *Broadband coaxial cable* can carry many signals at a time, each signal occupying a different frequency band on the cable. *Shielded twisted pair* refers to two insulated wires twisted together and covered with an outer sheath. *Unshielded twisted pair* refers to two insulated wires twisted together without outer protection. *Optical fiber*, which transmits digital signals as pulses of light, comes in single-mode and multimode arrangements, providing varying bandwidths and transmission speeds.

**Number of Connections Supported.** This entry enabled vendors to indicate the highest number

of connections supported by their wiring centers.

### Intelligent Features.

Some of the features programmed into equipment include *network management reporting*, *disabling malfunctioning nodes*, and *automatically wrapping the ring on a cable fault*. In this space, vendors could also insert any other intelligent features incorporated into their products.

### Pricing/Support

**Price.** The basic price of the unit, excluding any options, is noted here.

### Date of First Delivery.

This entry lists the date when the vendor first delivered the product to market.

**Standard Warranty.** Vendors indicated the length of the warranties offered with their products.

**Service Supplied by.** The vendor usually offers service on an on-site or factory repair/return basis. In some cases, a dealer of third party provides service.

**Comments.** In this space, vendors listed special characteristics of their products, such as additional capabilities, features, or software not covered in the column.

Vendor	Allied Telesis Inc.	Allied Telesis Inc.	Allied Telesis Inc.	Allied Telesis Inc.
Product	CentreCOM AT-3008T	CentreCOM AT-3000 Series	CentreCOM AT-1600	CentreCOM AT-5000
<b>Characteristics</b>				
Type of Device	Multiport repeater	Multiport repeater	MAU	Hub/concentrator
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Media Supported	Standard Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
Number of Connections Supported	9	9	16	16
Intelligent Features	Disables malfunctioning nodes	Disables malfunctioning nodes	None identified	Disables malfunctioning nodes
<b>Pricing/Support</b>				
Price (\$)	See comments	845	660	1,540
Date of First Delivery	December 1990	October 1989	July 1988	March 1989
Standard Warranty	1 year	1 year	1 year; 2 years	1 year on enclosure and power
Service Supplied by	Dealer; vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
<b>Comments</b>	Contact vendor for pricing information; 8 ports supporting unshielded twisted pair, one AUI for external transceiver.	Family of multiport repeaters, ranging from 2 to 9 ports supporting all IEEE 802.3 media; entry-level price.	Modular expansion; entry-level price.	Modular expansion; entry-level price.

Vendor	Allied Telesis Inc.	Andrew Corp.	Andrew Corp.	Andrew Corp.
Product	CentreCOM AT-810	MAU 8224	MAU 8228	MAU 8229
<b>Characteristics</b>				
Type of Device	MAU	MAU	MAU	MAU
LANs Supported	Ethernet	Token-Ring	Token-Ring	Token-Ring
Media Supported	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Unshielded twisted-pair
Number of Connections Supported	8	4	8	8
Intelligent Features	None identified	None identified	None identified	Automatically wraps ring on cable fault
<b>Pricing/Support</b>				
Price (\$)	945	395	595	1,495
Date of First Delivery	March 1990	April 1988	April 1988	September 1990
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Dealer; vendor	Vendor	Vendor	Vendor
<b>Comments</b>				

**Local Area Network  
Products:  
Comparison Columns  
Wiring Centers**

Vendor	Andrew Corp.	Andrew Corp.	Andrew Corp.	Andrew Corp.
Product	MAU 9224	MAU 9228	MAUi/8504	MAUi/8508
<b>Characteristics</b> Type of Device	MAU	MAU	MAU	MAU
LANs Supported	Token-Ring	Token-Ring	Token-Ring	Token-Ring
Media Supported	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair
Number of Connections Supported	4	8	4	8
Intelligent Features	None identified	None identified	Automatically wraps ring on cable fault; Disables malfunctioning nodes; Reports network management data	Automatically wraps ring on cable fault; Disables malfunctioning nodes; Reports network management data
<b>Pricing/Support</b> Price (\$)	595	795	695	895
Date of First Delivery	April 1988	None identified	September 1990	September 1990
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Extends token-ring lobe distances up to 1000 feet on UTP and 2000 feet on STP.			8-port satellite MAU.

Vendor	Andrew Corp.	Andrew Corp.	Artel Communications Corp.	Artisoft, Inc.
Product	MAUi/8516	MAUi/8600	EXL (Ethernet Accelerator)	LANtastic Hub
<b>Characteristics</b> Type of Device	MAU	MAU	Hub/concentrator	Hub/concentrator; multiport repeater
LANs Supported	Token-Ring	Token-Ring	Ethernet; FiberWay	LANtastic
Media Supported	Shielded twisted-pair; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Unshielded twisted-pair	Optical fiber; Standard Ethernet coaxial	Shielded twisted-pair; Unshielded twisted-pair
Number of Connections Supported	16	16	8	None identified
Intelligent Features	Automatically wraps ring on cable fault; Disables malfunctioning nodes; Reports network management data	Automatically wraps ring on cable fault; Disables malfunctioning nodes; Provides in-band and out of band network mgmt; Reports network management data	Automatically wraps ring on cable fault; Disables malfunctioning nodes; Reports network management data	None identified
<b>Pricing/Support</b> Price (\$)	1,295	3,595	12,900	495
Date of First Delivery	September 1990	October 1990	January 1988	June 1988
Standard Warranty	1 year	1 year	30 days	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	16-port intelligent satellite MAU.		Provides direct connection for up to eight 802.3 Ethernet devices to the FiberWay fiber optic backbone network.	

<b>Vendor</b>	AT&T	AT&T	BICC Data Networks, Inc.	BICC Data Networks, Inc.
<b>Product</b>	Starlan 10 Network Fiber Hub	Starlan Network Hub Unit	1125 Multiport ThinNet Repeater	1126 Fiber Optic Multiport Repeater
<b>Characteristics</b>				
Type of Device	Hub/concentrator	Hub/concentrator	Multiport repeater	Multiport repeater
LANs Supported	Starlan	Starlan	Ethernet	Ethernet
Media Supported	Optical fiber	Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
Number of Connections Supported	8	11	8	8
Intelligent Features	None identified	None identified	Automatic partitioning of faulty segments	Automatic partitioning of faulty segments
<b>Pricing/Support</b>				
Price (\$)	2,395	625	2,195	3,995
Date of First Delivery	None identified	None identified	None identified	None identified
Standard Warranty	None identified	None identified	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>			Provides six BNC ports for thin Ethernet connection and two AUJ ports for connection to other media full implementation of IEEE 802.3 repeater specification supports maximum network size.	Provides seven fiber optic ports and one AUJ port for connection to other media, fiber optic ports can be SMA or ST type connectors, full implementation of IEEE 802.3 repeater specification supports max network size.
<b>Vendor</b>	BICC Data Networks, Inc.	BICC Data Networks, Inc.	Cabletron Systems, Inc.	Cabletron Systems, Inc.
<b>Product</b>	EtherConnect System/10	EtherConnect System/4	MMAC Series	MRX
<b>Characteristics</b>				
Type of Device	Hub/concentrator	Hub/concentrator	Hub/concentrator; multiport repeater	Hub/concentrator; multiport repeater
LANs Supported	Ethernet	Ethernet	Ethernet; FDDI; Token-Ring	Ethernet
Media Supported	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
Number of Connections Supported	80	80	51, maximum 171	14
Intelligent Features	Disables malfunctioning nodes; Reports network management data	Disables malfunctioning nodes; Reports network management data	Automatically wraps ring on cable fault; Disables malfunctioning nodes; Reports network management data	Control & monitor via local/remote network mgmt.; Disables malfunctioning nodes; Reports network management data
<b>Pricing/Support</b>				
Price (\$)	3,335	2,540	150, max. price is 600	1,400
Date of First Delivery	March 1989	March 1990	June 1988	None identified
Standard Warranty	1 year	1 year	90 days	90 days
Service Supplied by	Vendor	Vendor	Third party; vendor	Third party; vendor
<b>Comments</b>	Supports all standard Ethernet media, including 10-Base-T unshielded twisted-pair, optional network management provides comprehensive monitoring and control capabilities, optional dual power supply and repeater logic on each media line card.	Supports all standard Ethernet media, including 10Base-T unshielded twisted-pair, optional network management provide comprehensive monitoring and control capabilities, repeater login on each media line card.	Control & monitor via local/remote management. Price shown is per port.	

Vendor	Cabletron Systems, Inc.	Cabletron Systems, Inc.	Chipcom Corp.	Chipcom Corp.
Product	MRXi	MiniMMAC	ONline System Concentrator	ORnet Star Coupler
<b>Characteristics</b>				
Type of Device	Hub/concentrator; multiport repeater	Hub/concentrator; multiport repeater	Hub/concentrator	Hub/concentrator
LANs Supported	Ethernet	Ethernet	Ethernet; FDDI; Token-Ring	Ethernet
Media Supported	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Unshielded twisted-pair	Optical fiber
Number of Connections Supported	14	13	128; 64	14; 8
Intelligent Features	Control & monitor via local/remote network mgmt.; Disables malfunctioning nodes; Reports network management data	Control & monitor via local/remote network mgmt.; Disables malfunctioning nodes; Reports network management data	Disables malfunctioning nodes; Reports network management data; fault-tolerance-link, power supply; tri channel arch. supp. up to 3 logical networks	See comments
<b>Pricing/Support</b>				
Price (\$)	2,200	995	4,450	4,150, max. price is 5,950
Date of First Delivery	None identified	January 1990	May 1990	May 1988
Standard Warranty	90 days	90 days	1 year	1 year
Service Supplied by	Third party; vendor	Third party; vendor	Vendor	Vendor
<b>Comments</b>		Includes repeater and power supply.	Online Fiber Module-\$1,800 (4 ports); Online Twisted Pair Module-\$1,600 (8 ports); Online Ethernet Network Mgt Module-\$1,950.	2 km point-to-point distance; no repeaters required; full internal diagnostics; IEEE 802.3/Ethernet V2.0; link redundancy; optional backup power supply.
Vendor	Codenoll Technology Corp.	Codenoll Technology Corp.	Codenoll Technology Corp.	Codenoll Technology Corp.
Product	CodeNet-4300 MultiStar	CodeStar 2004	CodeStar 2007	CodeStar 2008
<b>Characteristics</b>				
Type of Device	Multiport repeater	Hub/concentrator	Hub/concentrator	Hub/concentrator
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Media Supported	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair; plastic optical fiber	Optical fiber	Optical fiber	Optical fiber
Number of Connections Supported	15	4	7	8
Intelligent Features	Disables malfunctioning nodes; reconnects node when fault is cleared	None identified	None identified	None identified
<b>Pricing/Support</b>				
Price (\$)	1,295	1,295	1,195	2,495
Date of First Delivery	January 1989	January 1985	January 1987	January 1985
Standard Warranty	90 days	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Modular multiport repeater that provides a flexible, central platform for multi-segment, multi-media Ethernet networks; can be configured with up to 15 modules of any type and in any combination and is expand. to allow direct connec. of up to 45 segments.	Passive star couplers which provide a means for implementing a fiber optic Ethernet network in a passive configuration; CodeStars containing either 4, 8, or 16 ports are available for use with 50/125 um, 62.5/125 um, or 100/140 um fiber.	Passive fiber optic star coupler which provides a means for implementing a fiber optic Ethernet network in a passive configuration; supports a max distance of 500 m to end nodes over 100/140 um fiber.	Passive star couplers which provide a means for implementing a fiber optic Ethernet network in a passive configuration; CodeStars containing either 4, 8, or 16 ports are available for use with 50/125 um, 62.5/125 um, or 100/140 um fiber.

Vendor	Codenoll Technology Corp.	Codenoll Technology Corp.	Codenoll Technology Corp.	Commtext Inc.
<b>Product</b>	CodeStar 2016	CodeStar 2019	CodeStar 2032	Cx-80 Access Unit
<b>Characteristics</b>				
Type of Device	Hub/concentrator	Hub/concentrator	Hub/concentrator	Hub/concentrator
LANs Supported	Ethernet	Ethernet	Ethernet	Proprietary
Media Supported	Optical fiber	Optical fiber	Optical fiber	Unshielded twisted-pair
Number of Connections Supported	16	19	32	64
Intelligent Features	None identified	None identified	None identified	Disables malfunctioning nodes; Reports network management data
<b>Pricing/Support</b>				
Price (\$)	4,395	2,195	8,495	See comments
Date of First Delivery	January 1985	January 1987	January 1985	1990
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Passive star couplers which provide a means for implementing a fiber optic Ethernet network in a passive configuration; CodeStar containing either 4, 8, or 16 ports are available for use with 50/125 um, 62.5/125 um or 100/140 um fiber.	Passive fiber optic star coupler which provides a means for implementing a fiber optic Ethernet network is a passive configuration; supports a maximum distance of 500 m to end nodes over 100/140 um fiber.	Passive star couplers which provide a means for implementing a fiber optic Ethernet network in a passive configuration; CodeStars containing either 4, 8, or 16 ports are available for use with 50/125 um, 62.5/125 um, or 100/140 um fiber.	Contact vendor for pricing information; central controller for commtext star topology multimedia LAN; allows connected PCs to access Novell LAN data, ISDN networks, and full motion video/audio resources.

Vendor	Datapoint Corp.	Datatec Industries	Datatec Industries	Datatec Industries
<b>Product</b>	9497	Autoshunt 16	Autoshunt 32	Autoshunt 64
<b>Characteristics</b>				
Type of Device	Hub/concentrator	Hub/concentrator	Hub/concentrator	Hub/concentrator
LANs Supported	Arcnet	IBM SDLC Store Loop	IBM SDLC Store Loop	IBM SDLC Store Loop
Media Supported	Optical fiber; Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair	Shielded twisted-pair	Shielded twisted-pair
Number of Connections Supported	None identified	16	32	64, maximum 128
Intelligent Features	Disables malfunctioning nodes; Reports network management data	Automatically wraps ring on cable fault; Disables malfunctioning nodes; Reports network management data	Automatically wraps ring on cable fault; Disables malfunctioning nodes; Reports network management data	Automatically wraps ring on cable fault; Disables malfunctioning nodes; Reports network management data
<b>Pricing/Support</b>				
Price (\$)	See comments	2,100	5,185	6,205
Date of First Delivery	January 1985	None identified	None identified	None identified
Standard Warranty	30 days	1 year	1 year	1 year
Service Supplied by	Third party	Third party; vendor	Third party; vendor	Third party; vendor
<b>Comments</b>	Contact vendor for pricing information.	Quantity discounts available.	Quantity discounts available.	Quantity discounts available.

Vendor	Datatec Industries	Datatec Industries	David Systems	David Systems
<b>Product</b>	<b>Autoshunt 8</b>	<b>Token Ring MAU Model 8</b>	<b>BNC-MAU</b>	<b>ExpressNet 12-Slot Concentrator</b>
<b>Characteristics</b>				
Type of Device	Hub/concentrator	MAU	MAU	Hub/concentrator
LANs Supported	IBM SDLC Store Loop	Token-Ring	Ethernet	Ethernet
Media Supported	Shielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Unshielded twisted-pair
Number of Connections Supported	8	8	1	132
Intelligent Features	Automatically wraps ring on cable fault; Disables malfunctioning nodes; Reports network management data	Disables malfunctioning nodes; Reports network management data	Disables malfunctioning nodes	Built-in diagnostics; Disables malfunctioning nodes; Reports network management data
<b>Pricing/Support</b>				
Price (\$)	1,150	795	495	1,500
Date of First Delivery	None identified	None identified	October 1990	May 1990
Standard Warranty	1 year	1 year	2 years	2 years
Service Supplied by	Third party; vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Quantity discounts available.			Price covers concentrator; requires plug in modules to operate; fully loaded unit (132 10Base-T ports) approx \$156 per port.

Vendor	David Systems	David Systems	David Systems	David Systems
<b>Product</b>	<b>ExpressNet 5-Slot Concentrator</b>	<b>ExpressNet Hub</b>	<b>TP-MAU</b>	<b>VolksNet Hub</b>
<b>Characteristics</b>				
Type of Device	Hub/concentrator	Hub/concentrator	MAU	Hub/concentrator
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Media Supported	Unshielded twisted-pair	Unshielded twisted-pair	Standard Ethernet coaxial; Unshielded twisted-pair	Unshielded twisted-pair
Number of Connections Supported	48	12	1	12
Intelligent Features	Built-in diagnostics; Disables malfunctioning nodes; Reports network management data	Built-in diagnostics; Disables malfunctioning nodes; Reports network management data	Disables malfunctioning nodes	Disables malfunctioning nodes; Reports network management data
<b>Pricing/Support</b>				
Price (\$)	1,200	1,795	149	1,199
Date of First Delivery	April 1990	December 1989	December 1989	February 1990
Standard Warranty	2 years	2 years	2 years	2 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Price covers concentrator; requires plug-in modules to operate; fully loaded unit (48 10Base-T Ports) approx. \$189.50 per port.			

Vendor	Digital Communications Associates, Inc.	Digital Communications Associates, Inc.	Digital Communications Associates, Inc.	Digital Equipment Corp.
<b>Product</b>	<b>10M Fiber Hub</b>	<b>10M Twisted Pair Concentrator</b>	<b>1M Fiber Hub M 250</b>	<b>DEMPR/DECRepeater 350</b>
<b>Characteristics</b>				
Type of Device	Hub/concentrator	Hub/concentrator	Hub/concentrator	Multiport repeater
LANs Supported	Starlan	Ethernet; Starlan	Fiber Optic; Starlan	Ethernet
Media Supported	Optical fiber	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber	Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
Number of Connections Supported	8	None identified	8	None identified
Intelligent Features	None identified	Disables malfunctioning nodes; Link status; jabber and collision detection; Reports network management data	None identified	Disables malfunctioning nodes
<b>Pricing/Support</b>				
Price (\$)	2,595	2,200	1,995	2,200, max. price is 2,900
Date of First Delivery	June 1989	July 1990	June 1988	None identified
Standard Warranty	1 year	1 year	1 year	90 days
Service Supplied by	Vendor	Dealer; vendor	Dealer; vendor	Vendor
<b>Comments</b>		Allows connectivity to twisted pair, coax, and fiber optic media on one network.		

Vendor	Fibermux Corp.	Gandalf Data, Inc.	Gateway Communications, Inc.	General Technology, Inc.
<b>Product</b>	<b>FX6600</b>	<b>Access Hub</b>	<b>G/EtherTwist Hub</b>	<b>GT16A-SMAU</b>
<b>Characteristics</b>				
Type of Device	MAU; hub/concentrator; multiport repeater	Hub/concentrator	Hub/concentrator	MAU
LANs Supported	Apollo Domain; AppleTalk; Ethernet; Starlan; Token-Ring	Ethernet	Ethernet	Token-Ring
Media Supported	Apollo Domain Coax; Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Unshielded twisted-pair	Shielded twisted-pair
Number of Connections Supported	100	120	11	8
Intelligent Features	Automatically wraps ring on cable fault; Disables malfunctioning nodes; Operates on Unix or DOS platforms; Reports network management data; Supports SNMP management	Reports network management data	Detects network collisions; Disables malfunctioning nodes	Automatically wraps ring on cable fault; Indicates which ring segment failed via LEDs
<b>Pricing/Support</b>				
Price (\$)	158, max. price is 415	1,295	1,995, max. price is 3,195	699, max. price is 1,499
Date of First Delivery	March 1990	None identified	February 1990	November 1988
Standard Warranty	1 year	None identified	1 year	1 year
Service Supplied by	Vendor	Vendor	Dealer	Vendor
<b>Comments</b>	Price shown is per port; supports up to four Ethernets and 10 token rings in the same hub; 2-, 4-, and 10-slot versions are available; networking management is optional.	Set of three products: Access Hub12 is a 12 port 10Base-T compliant Hub; Access Hub48 is a wiring center for up to 48 devices, allowing a mix of coax, twisted pair & fiber wiring; & Access Hub120 is a wiring center for connectivity for 120 devices.	10BASE-T compatible.	For 4M or 16M bps token-ring networks.

Vendor	General Technology, Inc.	General Technology, Inc.	General Technology, Inc.	General Technology, Inc.
Product	GT16B(L)	GT16N-SMAU	GT4A-SMAU	GT4R-SMAU
Characteristics				
Type of Device	MAU	MAU	MAU	MAU
LANs Supported	Token-Ring	Token-Ring	Token-Ring	Token-Ring
Media Supported	Shielded twisted-pair	Optical fiber; Shielded twisted-pair	Unshielded twisted-pair	Unshielded twisted-pair
Number of Connections Supported	None identified	31	8	8
Intelligent Features	(L) Option provides Line Powered Lobe LED	Automatically wraps ring on cable fault; Disables malfunctioning nodes; Provides real-time graphic displays of network; Provides trouble tickets and reports	Automatically wraps ring on cable fault; Indicates which ring cable is defective; Indicates which ring segment failed via LEDs	Automatically wraps ring on cable fault; Extended range-up to 1025 feet per lobe/ring; Indicates which ring segment failed via LEDs
Pricing/Support				
Price (\$)	465, max. price is 485	1,099, max. price is 1,899	495	625
Date of First Delivery	September 1990	September 1990	November 1988	November 1988
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	Start-up MAU for small user.	Smart-View (Copyright) Network Management Software is supplied with unit; demo disk is available for review; includes built-in fiber optic ring ports.	For 4M bps token-ring networks.	For 4M bps token-ring networks.

Vendor	IMC Networks Corp.	IMC Networks Corp.	International Business Machines Corp. (IBM)	Interphase Corp.
Product	PCnic Basket	TP MAU	8228 Multistation Access Unit	fiberHub 800 FDDI Concentrator
Characteristics				
Type of Device	Multiport repeater	MAU	MAU	Hub/concentrator
LANs Supported	Ethernet	Ethernet	Token-Ring	FDDI
Media Supported	75 Ohm & 93 Ohm coaxial; Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	AUI; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair
Number of Connections Supported	1, maximum 10	None identified	8	8
Intelligent Features	Disables malfunctioning nodes; functions as repeater	LEDs indicating link integrity, transmit, receive	Automatically wraps ring on cable fault; Disables malfunctioning nodes; Reports network management data	Automatically wraps ring on cable fault; Disables malfunctioning nodes; Reports network management data
Pricing/Support				
Price (\$)	995	See comments	748	20,000
Date of First Delivery	October 1989	Fourth Quarter, 1990	1985	1991
Standard Warranty	2 years	2 years	None identified	1 year
Service Supplied by	Dealer; vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
Comments	Optionally supports 75 Ohm (PC/Net, G/Net) and 93 Ohm (ARCnet, IBM 3270) coaxial cabling when used in conjunction with PCnic family of coaxial network interface cards; all cabling impedances may be mixed in a single Basket.	Contact vendor for pricing information.		Price shown is base.

Vendor	Lancast/Casat Technology	Lancast/Casat Technology	Lanmaster	Lanmaster
<b>Product</b>	<b>ENT-4360</b>	<b>ETP-4380</b>	<b>LMA-1600</b>	<b>LMA-400</b>
<b>Characteristics</b>				
Type of Device	Hub/concentrator	Hub/concentrator; multiport repeater	Hub/concentrator	Hub/concentrator
LANs Supported	Ethernet	Ethernet	Arcnet	Arcnet
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Unshielded twisted-pair	Baseband coaxial; Optical fiber; Unshielded twisted-pair	Baseband coaxial; Optical fiber; Unshielded twisted-pair
Number of Connections Supported	13	11	16	4
Intelligent Features	None identified	None identified	Disables malfunctioning nodes; Reports network management data	Disables malfunctioning nodes; Reports network management data
<b>Pricing/Support</b>				
Price (\$)	1,495	1,595	895	395
Date of First Delivery	None identified	None identified	September 1988	September 1988
Standard Warranty	3 years	3 years	2 years	2 years
Service Supplied by	Vendor	Vendor	Dealer; vendor	Dealer; vendor
<b>Comments</b>	LED functionality as follows: AUI, transmit, receive, load, partition, collision system; power, SQE UTP ports; transmit, receive, power, partition, collision.	LED functionality as follows: AUI; transmit, receive, power, partition & collision system; power, jam, first in first out & AMU lock up. UTP ports; transmit, receive, link, partition, collision.		Lanmaster active hubs are custom configured with a combination of coax and twisted-pair ports; includes in-line surge protection.
Vendor	Lanmaster	LANNET Data Communications, Inc.	LANNET Data Communications, Inc.	LANNET Data Communications, Inc.
<b>Product</b>	<b>LMA-800</b>	<b>LER-A</b>	<b>LER-B</b>	<b>LET-18</b>
<b>Characteristics</b>				
Type of Device	Hub/concentrator	Multiport repeater	Multiport repeater	Hub/concentrator
LANs Supported	Arcnet	Ethernet	Ethernet	AppleTalk; Ethernet; Token-Ring
Media Supported	Baseband coaxial; Optical fiber; Unshielded twisted-pair	Standard Ethernet coaxial	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
Number of Connections Supported	8	2	11	72
Intelligent Features	Disables malfunctioning nodes; Reports network management data	Disables malfunctioning nodes; diagnostics	Disables malfunctioning nodes; diagnostics	Auto learning of hubs & modules; Automatically wraps ring on cable fault; Disables malfunctioning nodes; Reports network management data; Video image of hub
<b>Pricing/Support</b>				
Price (\$)	495	1,195	2,495	2,000
Date of First Delivery	September 1988	July 1990	November 1990	October 1988
Standard Warranty	2 years	1 year	1 year	1 year
Service Supplied by	Dealer; vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
<b>Comments</b>	Lanmaster active hubs are custom configured with a combination of coax and twisted-pair ports.			Modular 18-slot enclosure.

Vendor	LANNET Data Communications, Inc.	LANNET Data Communications, Inc.	Lantana Technology	Lantana Technology
<b>Product</b>	LET-3	LET-36	Aster/H4A-C	Aster/H4A-TP
<b>Characteristics</b>				
Type of Device	Hub/concentrator	Hub/concentrator	Hub/concentrator	Hub/concentrator
LANs Supported	AppleTalk; Ethernet; Token-Ring	AppleTalk; Ethernet; FDDI; Token-Ring	Arcnet	Arcnet
Media Supported	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Broadband coaxial	Shielded twisted-pair; Unshielded twisted-pair
Number of Connections Supported	12	18, maximum 36	4	4
Intelligent Features	Auto learning of hubs & modules; Automatically wraps ring on cable fault; Disables malfunctioning nodes; Reports network management data; Video image of hub	Automatically wraps ring on cable fault; Disables malfunctioning nodes; Reports network management data; Video image of hub; auto-learning of hubs, modules, ports	None identified	None identified
<b>Pricing/Support</b>				
Price (\$)	900	See comments	195	195
Date of First Delivery	January 1990	August 1990	August 1988	November 1990
Standard Warranty	1 year	1 year	2 years	2 years
Service Supplied by	Dealer; vendor	Vendor	Vendor	Vendor
<b>Comments</b>		Contact vendor for pricing information; supports multiple LANs; 36 half-size slots or 18 full-size slots.	Active hub.	Active hub.

Vendor	Lantana Technology	Lantana Technology	Lantana Technology	Lantana Technology
<b>Product</b>	Aster/H8A	Cypress/M8228	Cypress/M8228D	Tamarix/R1125
<b>Characteristics</b>				
Type of Device	Hub/concentrator	MAU	MAU	Multiport repeater
LANs Supported	Arcnet	Token-Ring	Token-Ring	Ethernet
Media Supported	Broadband coaxial; Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	IBM Type 1	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
Number of Connections Supported	4	8	8	8
Intelligent Features	None identified	None identified	None identified	None identified
<b>Pricing/Support</b>				
Price (\$)	595	595.00	695	2,695
Date of First Delivery	August 1988	June 1990	June 1990	August 1988
Standard Warranty	2 years	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Expandable to 20 connections.			

Vendor	Madge Networks, Inc.	Madge Networks, Inc.	Netcor, Inc.	Netcor, Inc.
Product	8-station Ringhub	Local Ringhub	NC-208	NC-208F
<b>Characteristics</b>				
Type of Device	Hub/concentrator	Hub/concentrator	Multiport repeater	Multiport repeater
LANs Supported	Token-Ring	Token-Ring	None identified	Ethernet
Media Supported	Shielded twisted-pair	Shielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
Number of Connections Supported	8	4	10	None identified
Intelligent Features	None identified	None identified	Disables malfunctioning nodes	Automatically wraps ring on cable fault
<b>Pricing/Support</b>				
Price (\$)	715	450	2,495	3,995
Date of First Delivery	None identified	None identified	May 1990	September 1990
Standard Warranty	5 years	5 years	1 year	1 year
Service Supplied by	Dealer; vendor	Dealer; vendor	Vendor	Vendor
<b>Comments</b>	Passive unit; eliminates the need to install a power supply on an uninterruptable power supply in each wiring closet; built-in reset button.	Connects to an existing cable outlet of an MAU; up to 3 local ringhubs can be daisy-chained to add up to 10 nodes to a single MAU connection; can also function as a standalone unit.		

Vendor	Netcor, Inc.	Netcor, Inc.	Netcor, Inc.	Netcor, Inc.
Product	NC-500	NC-500B (2)	NC-500B (4)	NC-500F
<b>Characteristics</b>				
Type of Device	Multiport repeater	Multiport repeater	Multiport repeater	Multiport repeater
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Media Supported	Standard Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Optical fiber; Standard Ethernet coaxial
Number of Connections Supported	4	2	4	4
Intelligent Features	Disables malfunctioning nodes	Disables malfunctioning nodes	Disables malfunctioning nodes	Disables malfunctioning nodes
<b>Pricing/Support</b>				
Price (\$)	1,450	990	1,650	1,950
Date of First Delivery	June 1989	September 1989	September 1989	June 1989
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>				

Vendor	Netcor, Inc.	Netcor, Inc.	NetWorth, Inc.	NetWorth, Inc.
Product	NC-500FB	NC-80	EtherNext Series 4000 Department Command Center	EtherNext Series 4000 Network Command Center
<b>Characteristics</b>				
Type of Device	Multiport repeater	MAU	Hub/concentrator	Hub/concentrator
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet; Starlan
Media Supported	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
Number of Connections Supported	4	8	1024	1024
Intelligent Features	Disables malfunctioning nodes	LEDs monitor & diagnose collisions; data transmit and receive	Automatic paging; Automatically wraps ring on cable fault; Disables malfunctioning nodes; On board statistical display; Reports network management data	Automatic paging; Automatically wraps ring on cable fault; Disables malfunctioning nodes; On board statistical display; Reports network management data
<b>Pricing/Support</b>				
Price (\$)	2,150	900	995	1,295
Date of First Delivery	September 1989	March 1983	November 1990	November 1990
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Dealer	Dealer
<b>Comments</b>		Return to factory or 800 number technical support.	10Base-T LAN system; the department command center is a three-slot chassis that houses 10Base-T Host modules and network management modules.	10Base-T LAN system; the network command center is a six-slot chassis that houses 10Base-T host modules and network management modules.

Vendor	NetWorth, Inc.	Nevada Western	Niwot Networks	Olicom USA
Product	EtherNext Workgroup Hubs	NEV*LAN4	LARC/MM	OC-3625 Multistation Access Unit
<b>Characteristics</b>				
Type of Device	Hub/concentrator	MAU	Link	MAU
LANs Supported	10BASE-T; Ethernet	Token-Ring	Arcnet	Token-Ring
Media Supported	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	Optical fiber	Shielded twisted-pair; Unshielded twisted-pair
Number of Connections Supported	1024	16	2	8
Intelligent Features	Automatically wraps ring on cable fault; Disables malfunctioning nodes; Reports network management data	LEDs	None identified	Reset while network active
<b>Pricing/Support</b>				
Price (\$)	1,995, max. price is 2,395	1,000	1,495	925
Date of First Delivery	June 1989	April 1989	September 1990	April 1990
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Dealer	Vendor	Vendor	Dealer
<b>Comments</b>	Ethernext is a 10Base-T LAN.	Supports shielded twisted-pair cabling with data connectors, unshielded twisted-pair with RJ11 or RJ45 jacks.	Long haul Arcnet Link, can connect ARCnet node up to 6k (3.75 miles, twice as far as previously possible); input either coax or twisted-pair, output 62.5/125 or 50/125 fiber optic cable; lightning and EMI (electromagnetic interference) protection.	Can be used in network to connect IBM & compatibles; certified to be IBM compatible & meets IEEE 802.5 standard requirements; can be mixed freely with IBM & other IBM wire concentrators & can be daisy-chained to create larger networks.

Vendor	Olicom USA	Optical Data Systems, Inc.	Optical Data Systems, Inc.	Optical Data Systems, Inc.
<b>Product</b>	<b>OC-3630 Dual Station Access Unit</b>	<b>ODS 1041</b>	<b>ODS 240</b>	<b>ODS 251</b>
<b>Characteristics</b>				
Type of Device	DAU	Hub/concentrator	Hub/concentrator	Multiport repeater
LANs Supported	Token-Ring	FDDI	Ethernet	Ethernet
Media Supported	Shielded twisted-pair; Unshielded twisted-pair	Optical fiber	Optical fiber	Optical fiber; Standard Ethernet coaxial
Number of Connections Supported	2	18	16	16
Intelligent Features	No external power supply required	Automatically wraps ring on cable fault; Disables malfunctioning nodes; Reports network management data; redundant power	Reports network management data; SNMP agent	Reports network management data; SNMP agent; network control module
<b>Pricing/Support</b>				
Price (\$)	450	See comments	6,900	2,695
Date of First Delivery	April 1990	Second Quarter, 1991	January 1989	May 1989
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Dealer	Vendor	Vendor	Vendor
<b>Comments</b>	Used to connect IBM or compatibles to the network; can be daisy-chained; expands number of workstations without changing topology of the main ring and requires no re-wiring of the network.	Contact vendor for pricing information; single mode to multi-mode FDDI optic converter available now.	Tempest 16-port Ethernet star.	Collision avert feature.

Vendor	Optical Data Systems, Inc.	Optical Data Systems, Inc.	Optical Data Systems, Inc.	Optical Data Systems, Inc.
<b>Product</b>	<b>ODS 290/293</b>	<b>ODS 291</b>	<b>ODS 461</b>	<b>ODS 8228</b>
<b>Characteristics</b>				
Type of Device	Hub/concentrator	Hub/concentrator	Hub/concentrator	MAU
LANs Supported	Ethernet; FDDI; Token-Ring	Ethernet	Ethernet	Token-Ring
Media Supported	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair
Number of Connections Supported	96	48	16	8
Intelligent Features	Automatically wraps ring on cable fault; Disables malfunctioning nodes; Reports network management data; SNMP agent; load sharing; redundant power	Disables malfunctioning nodes; Reports network management data; SNMP agent; network management card	Disables malfunctioning nodes; Reports network management data; SNMP agent	Insertion LEDs
<b>Pricing/Support</b>				
Price (\$)	4,595	3,995	3,495	795
Date of First Delivery	May 1990	May 1990	August 1990	August 1990
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	ODS 293 multi-segment chassis; 12 slot chassis; full bandwidth bridge card; collision avert feature; FOIRL-support.	5 slot chassis; collision avert feature; FOIRL support.	10Base-T compatible.	Passive MAU.

Vendor	Optical Data Systems, Inc.	Optical Data Systems, Inc.	Plexcom, Inc.	Proteon, Inc.
<b>Product</b>	ODS 841	ODS 861	Plexnet Multi-Media LAN Concentrator	Series 70 Intelligent Wire Center
<b>Characteristics</b>				
Type of Device	MAU	MAU	MAU; hub/concentrator; modular system; multiport repeater	MAU
LANs Supported	Token-Ring	Token-Ring	AppleTalk; Ethernet; FDDI; Token-Ring	ProNET-10; Token-Ring
Media Supported	Optical fiber	Optical fiber; Shielded twisted-pair; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Unshielded twisted-pair
Number of Connections Supported	16	16	See comments	8
Intelligent Features	Automatically wraps ring on cable fault; Disables malfunctioning nodes; Reports network management data; internal NetView Reporting option; internal bridge option	Automatically wraps ring on cable fault; Disables malfunctioning nodes; Reports network management data; available w/ NetView Reporting option	Automatically wraps ring on cable fault; Disables malfunctioning nodes; Opt. SNMP network management; Reports network management data	Disables malfunctioning nodes; Reports network management data
<b>Pricing/Support</b>				
Price (\$)	4,995	3,995	80, max price is 150	1,295
Date of First Delivery	June 1990	August 1990	March 1988	None identified
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Out-of-Band Management option; In-Band SNMP Management option.	Out-of-Band Management available; In-Band SNMP Management available.	196 connections (Ethernet); 168 (Token-Ring); 224 (AppleTalk); prices shown per port.	Out-band management isolates faults to isolate & correct faults even when network is down, speeding recovery time.

Vendor	Proteon, Inc.	PureData Ltd.	PureData Ltd.	PureData Ltd.
<b>Product</b>	Series 70 WorkGroup Wire Center	PDC 504A	PDC 504A-F	PDC 504A-T
<b>Characteristics</b>				
Type of Device	MAU	Hub/concentrator	Hub/concentrator	Hub/concentrator
LANs Supported	Token-Ring	Arcnet	Arcnet	Arcnet
Media Supported	Unshielded twisted-pair	Broadband coaxial	Optical fiber	Unshielded twisted-pair
Number of Connections Supported	4	4	4	4
Intelligent Features	Automatically wraps ring on cable fault; Disables malfunctioning nodes; Reports network management data	Diagnostic LEDs	Diagnostic LEDs	Diagnostic LEDs
<b>Pricing/Support</b>				
Price (\$)	495	395	2,250	450
Date of First Delivery	None identified	October 1986	October 1986	October 1986
Standard Warranty	1 year	5 years	5 years	5 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Expands a Series 70 Wire Center's networking support from 8 to 32 workstations.	4-port active hub; front panel-mounted activity LEDs and writable/erasable ID pads for each node connection; 110/220 V options.	4-port active hub; front panel-mounted activity LEDs and writable/erasable ID pads for each node connection; 110/220 V options.	4-port active hub; front panel-mounted activity LEDs and writable/erasable ID pads for each node connection; 110/220 V options.

Vendor	PureData Ltd.	PureData Ltd.	PureData Ltd.	PureData Ltd.
Product	PDC 504P	PDC 508A	PDC 508A-T	PDC 520A
<b>Characteristics</b>				
Type of Device	Hub/concentrator	Hub/concentrator	Hub/concentrator	Hub/concentrator
LANs Supported	Arcnet	Arcnet	Arcnet	Arcnet
Media Supported	Broadband coaxial	Broadband coaxial	Unshielded twisted-pair	Broadband coaxial
Number of Connections Supported	4	8	8	20
Intelligent Features	None identified	Diagnostic LEDs	Diagnostic LEDs	Diagnostic LEDs
<b>Pricing/Support</b>				
Price (\$)	75	495	495	1,099
Date of First Delivery	October 1986	October 1986	October 1986	September 1987
Standard Warranty	5 years	5 years	5 years	5 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	4-port passive hub with coax cable connectors; includes 93ohm terminator.	8-port active hub; front panel-mounted activity LEDs and writable/erasable ID pads for each node connection; 110/220 V options.	8-port active hub; front panel-mounted activity LEDs and writable/erasable ID pads for each node connection; 110/220 V options.	20-port active hub; front panel-mounted activity LEDs and writable/erasable ID pads for each node connection; designed to fit industry-standard 19" racks, comes equipped with handles and works as a shelf for 4- and 8-port hubs; 120/240 V options.

Vendor	PureData Ltd.	PureData Ltd.	PureData Ltd.	PureData Ltd.
Product	PDC 520A-T	PDC 8025A	PDC 8025P	PDC 8025P-T16
<b>Characteristics</b>				
Type of Device	Hub/concentrator	MAU	MAU	MAU
LANs Supported	Arcnet	Token-Ring	Token-Ring	Token-Ring
Media Supported	Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	Shielded twisted-pair; Unshielded twisted-pair	Unshielded twisted-pair
Number of Connections Supported	20	8	8	16
Intelligent Features	Diagnostic LEDs	Automatically wraps ring on cable fault; Diagnostic LEDs; Disables malfunctioning nodes	Automatically wraps ring on cable fault; Diagnostic LEDs; Disables malfunctioning nodes	Automatically wraps ring on cable fault; Diagnostic LEDs; Disables malfunctioning nodes
<b>Pricing/Support</b>				
Price (\$)	1,099	795	695	995
Date of First Delivery	September 1987	September 1987	December 1989	December 1989
Standard Warranty	5 years	5 years	5 years	5 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	20-port active hub; front panel mounted activity LEDs and writable/erasable ID pads for each node connection designed to fit industry-standard 19" racks; comes equipped with handles and works as a shelf for a 4 and 8 port hubs; 120/240 volt options.	8-port active MAU with IBM data connectors fully compatible with the IBM 8228 and comes equipped with LEDs for each port connection.	8-port passive MAU with IBM data connectors; fully compatible with the IBM 8228 and comes equipped with LEDs for each port connection; 1.75" high, using only one industry-standard 19" rack unit.	16-port passive MAU for UTP type 3 wiring; fully compatible with the IBM 8228 and comes equipped with LEDs for each port connection 1.75" high using only one industry-standard 19" rack unit; has switchable RJ11 receptacles for connecting nodes.

Vendor	Racal InterLan	Racal InterLan	Ship Star Assoc.	Standard Microsystems Corp.
<b>Product</b>	INX5000-12C/F	INX5000-3C/F	HR 8023	4-Port Active Hub for Fiber Optic
<b>Characteristics</b>				
Type of Device	Hub/concentrator	Network terminal server	Head end remodulator	Hub/concentrator
LANs Supported	Ethernet	Ethernet	Ethernet	Arcnet
Media Supported	Optical fiber; Shielded twisted-pair; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial; async ports	Broadband coaxial	Optical fiber
Number of Connections Supported	156	None identified	2	4
Intelligent Features	Disables malfunctioning nodes; Dual LAT/TCP protocol support; Print and macro servers supported; Reports network management data	Reports network management data	Reports network management data	None identified
<b>Pricing/Support</b>				
Price (\$)	210	240	3,815, max. price is 4,045	1,295
Date of First Delivery	December 1990	December 1990	June 1989	None identified
Standard Warranty	1 year	1 year	1 year	90 days
Service Supplied by	Dealer; third party; vendor	Dealer; third party; vendor	Vendor	Dealer
<b>Comments</b>	Modular chassis for providing twisted pair Ethernet and dual protocol terminal service; 12-slot and 3-slot chassis are available; price listed is per port.	Price listed is per port.	Meets IEEE 802.3 - 10Broad36 Standard.	

Vendor	Standard Microsystems Corp.	Standard Microsystems Corp.	Standard Microsystems Corp.	Standard Microsystems Corp.
<b>Product</b>	Coax Active Hub-03	Coax Intelligent Hub	Coax Internal 4 Port Hub	SMC3508
<b>Characteristics</b>				
Type of Device	Hub/concentrator	Hub/concentrator	Hub/concentrator	Hub/concentrator
LANs Supported	Arcnet	Arcnet	Arcnet	Ethernet
Media Supported	Baseband coaxial	Baseband coaxial	Baseband coaxial	Thin Ethernet coaxial
Number of Connections Supported	8	8	4	8
Intelligent Features	None identified	Reports network management data	None identified	Reports network management data
<b>Pricing/Support</b>				
Price (\$)	549	749	295	2,395, max. price is 2,950
Date of First Delivery	None identified	None identified	None identified	None identified
Standard Warranty	90 days	90 days	90 days	90 days
Service Supplied by	Dealer	Dealer	Dealer	Dealer
<b>Comments</b>				Price varies depending on connector selected for 9th port (interconnect port) 4 models available: AUI, BNC, RJ-45, Fiber ST.

Vendor	Standard Microsystems Corp.	Standard Microsystems Corp.	Standard Microsystems Corp.	Standard Microsystems Corp.
<b>Product</b>	SMC3508 TP	SMC3508F	Twisted Pair Active Hub-03	Twisted Pair Intelligent Hub
<b>Characteristics</b>				
Type of Device	Hub/concentrator	Hub/concentrator	Hub/concentrator	Hub/concentrator
LANs Supported	Ethernet	Ethernet	Arcnet	Arcnet
Media Supported	Unshielded twisted-pair	Optical fiber	Unshielded twisted-pair	Unshielded twisted-pair
Number of Connections Supported	8	8	8	8
Intelligent Features	Reports network management data	Reports network management data	None identified	Reports network management data
<b>Pricing/Support</b>				
Price (\$)	1,195, max. price is 1,750	3,395, max. price is 3,950	695	895
Date of First Delivery	None identified	None identified	None identified	None identified
Standard Warranty	90 days	90 days	90 days	90 days
Service Supplied by	Dealer	Dealer	Dealer	Dealer
<b>Comments</b>	Price varies depending on connector selected for 9th part (interconnect port) 4 models available; AUI, BNC, RJ-45, Fiber ST.			

Vendor	Standard Microsystems Corp.	Standard Microsystems Corp.	Star-Tek, Inc.	Star-Tek, Inc.
<b>Product</b>	Twisted Pair Internal 4 Port Hub	Type 1/Type 2 Active Hub	820-1	820-2
<b>Characteristics</b>				
Type of Device	Hub/concentrator	Hub/concentrator	Multiport repeater	Multiport repeater
LANs Supported	Arcnet	Arcnet	Token-Ring	Token-Ring
Media Supported	Unshielded twisted-pair	Shielded twisted-pair	Optical fiber; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair
Number of Connections Supported	4	8	None identified	None identified
Intelligent Features	None identified	None identified	None identified	None identified
<b>Pricing/Support</b>				
Price (\$)	345	950	1,100	1,100
Date of First Delivery	None identified	None identified	January 1990	January 1990
Standard Warranty	90 days	90 days	1 year	1 year
Service Supplied by	Dealer	Dealer	Vendor	Vendor
<b>Comments</b>				

<b>Vendor</b>	Star-Tek, Inc.	Star-Tek, Inc.	Star-Tek, Inc.	SynOptics Communications, Inc.
<b>Product</b>	828-5	828-6	828-7	10BASE-T Area Concentrator 2310-02
<b>Characteristics</b>				
Type of Device	MAU	MAU	MAU	Hub/concentrator
LANs Supported	Token-Ring	Token-Ring	Token-Ring	Ethernet
Media Supported	Shielded twisted-pair	Unshielded twisted-pair	Unshielded twisted-pair	Standard Ethernet coaxial; Unshielded twisted-pair
Number of Connections Supported	8	8	8	36
Intelligent Features	None identified	Automatically wraps ring on cable fault; Disables malfunctioning nodes; Reports network management data	Automatically wraps ring on cable fault; Disables malfunctioning nodes; Reports network management data	Automatically wraps ring on cable fault; Disables malfunctioning nodes; Logs network statistics; Reports network management data
<b>Pricing/Support</b>				
Price (\$)	1,297	1,227	2,200	See comments
Date of First Delivery	November 1989	September 1989	September 1990	October 1990
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Dealer; third party; vendor
<b>Comments</b>		Supports 16M or 4M on UTP-100 meters/lobe.	Active MAU with retiming for 16M or 4M-supports 100 meters/lobe.	Contact vendor for pricing information.
<b>Vendor</b>	SynOptics Communications, Inc.	SynOptics Communications, Inc.	SynOptics Communications, Inc.	3Com Corp.
<b>Product</b>	10BASE-T Area Concentrator 2310-01	Department Concentrator 3030	Premises Concentrator 3000	Multiconnect
<b>Characteristics</b>				
Type of Device	Hub/concentrator	Hub/concentrator; multiport repeater	Hub/concentrator; multiport repeater	Multiport repeater
LANs Supported	Ethernet	Ethernet; FDDI; Token-Ring	Ethernet; FDDI; Token-Ring	Ethernet
Media Supported	Standard Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
Number of Connections Supported	36	36	132	45
Intelligent Features	Automatically wraps ring on cable fault; Disables malfunctioning nodes; Logs network statistics; Reports network management data	Automatically wraps ring on cable fault; Disables malfunctioning nodes; Reports network management data	Automatically wraps ring on cable fault; Disables malfunctioning nodes; Logs network statistics; Reports network management data	Disables malfunctioning nodes
<b>Pricing/Support</b>				
Price (\$)	347	See comments	350	1,295.00
Date of First Delivery	October 1990	May 1989	May 1989	August 1987
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Dealer; third party; vendor	Dealer; third party; vendor	Third party; vendor	Dealer
<b>Comments</b>	Price includes network management; price shown is per port.	Contact vendor for pricing information.	Price shown is per port.	15 module slots; can accommodate a mix of thin Ethernet, thick, 10BASE-T, plus Starlan10 of Lattisnet; 10BASE-T module is \$595.

Vendor	Transition Engineering	Ungermann-Bass, Inc.	Wang Laboratories, Inc.	Wang Laboratories, Inc.
<b>Product</b>	H-10BT-12	Access/One	8023-ADPTR	8023-Hubbox
<b>Characteristics</b>				
Type of Device	Multiport repeater	Intelligent hub	MAU	Hub/concentrator
LANs Supported	Ethernet	AppleTalk; Ethernet; FDDI; Token-Ring	Ethernet	Ethernet
Media Supported	Unshielded twisted-pair	Broadband coaxial; Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Broadband coaxial; Standard Ethernet coaxial	Optical fiber; Standard Ethernet coaxial; Unshielded twisted-pair
Number of Connections Supported	12	220	8	18
Intelligent Features	Disables malfunctioning nodes	Automatically wraps ring on cable fault; Disables malfunctioning nodes; Power Supply; Reports network management data; Temperature	None identified	None identified
<b>Pricing/Support</b>				
Price (\$)	1,299	200, max. price is 350	3,500	1,725
Date of First Delivery	October 1990	None identified	November 1990	November 1990
Standard Warranty	1 year	90 days	90 days	90 days
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	12 UTP and 1 AUI connection.	Price shown is per connection.		Price shown is for 6 nodes.

Vendor	Wang Laboratories, Inc.	Wang Laboratories, Inc.	Wang Laboratories, Inc.	Xinetron
<b>Product</b>	8023-MPR	8023-REPTR-AUI	8023-Repeater-M	Xi-10T2
<b>Characteristics</b>				
Type of Device	Multiport repeater	Multiport repeater	Multiport repeater	Hub/concentrator
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Thin Ethernet coaxial; Unshielded twisted-pair
Number of Connections Supported	None identified	2	None identified	None identified
Intelligent Features	None identified	None identified	None identified	None identified
<b>Pricing/Support</b>				
Price (\$)	3,000	1,600	2,900	149
Date of First Delivery	November 1990	November 1990	November 1990	October 1990
Standard Warranty	90 days	90 days	90 days	3 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>				Links 10Base-T twisted-pair to thin coaxial cabling on Ethernet networks.

Vendor	Xinetron	Xinetron	Xinetron	Xinetron
Product	Xi-10T8	Xi-2T2	Xi-2T4/2A4	Xi-2T8/2A8
<b>Characteristics</b>				
Type of Device	Hub/concentrator	Hub/concentrator	Hub/concentrator	Hub/concentrator
LANs Supported	Ethernet	Arcnet	Arcnet	Arcnet
Media Supported	Unshielded twisted-pair	Baseband coaxial; Shielded twisted-pair	Baseband coaxial; Shielded twisted-pair	Baseband coaxial; Shielded twisted-pair
Number of Connections Supported	8	2	4	8
Intelligent Features	Diagnostic LEDs	None identified	Diagnostic LEDs	Diagnostic LEDs
<b>Pricing/Support</b>				
Price (\$)	349	99	99	229
Date of First Delivery	October 1990	April 1989	March 1988	January 1988
Standard Warranty	3 years	3 years	3 years	3 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>		Links twisted-pair to coaxial cabling or Arcnet networks.		
<b>Vendor</b>	<b>Zenith Electronics Corp.</b>	<b>Zenith Electronics Corp.</b>	<b>Zytec Systems</b>	
Product	Enterprise Exchange C18	Enterprise Exchange C3	815 Custom Hub	
<b>Characteristics</b>				
Type of Device	Hub/concentrator	Hub/concentrator	Hub/concentrator; multiport repeater	
LANs Supported	Ethernet; Token-Ring	Ethernet	Proprietary	
Media Supported	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Unshielded twisted-pair	
Number of Connections Supported	72	12	250	
Intelligent Features	Opt. redundant operation mode; Reports network management data; auto part. of netwk upon detec. of cable shorts	Automatically wraps ring on cable fault; Opt. redundant operation mode; Reports network management data; auto part. of netwk upon detec. of cable shorts	Disables malfunctioning nodes	
<b>Pricing/Support</b>				
Price (\$)	2,190	990	499	
Date of First Delivery	None identified	None identified	1989	
Standard Warranty	1 year	1 year	Lifetime limited to original	
Service Supplied by	Vendor	Vendor	Vendor	
<b>Comments</b>	Modular network hub supports up to 18 separate modules. Ethernet (including 10 BaseT) and Token-Ring interface modules are available, along with repeater and transceiver modules.	Modular network hub supports up to 3 separate modules. Ethernet (including 10BaseT) and Token-Ring interface modules are available, along with repeater and transceiver modules.		

## Diskless Workstations Comparison Column Entry Descriptions

Diskless workstations are designed for use on a local area network. They differ from conventional PCs in that they contain no disk drives; they are dependent on a network file server for data storage. Our survey form provided each vendor with a number of possible choices for each parameter listed. There was also space to write in a specific answer when the proper choices for that vendor were not listed.

**Vendor and Model.** This entry lists the manufacturer and exact model number or name of each device.

### **Characteristics**

**Processor.** The processor controls the basic functions of the workstation. The most popular processors in use today are the

Intel 80286 and 80386; some newer machines use the 80486. Also available are Intel's older 80186 or 8088, Motorola's 68000 and 68020, and NEC's V20 and V40.

### **Minimum Memory, Bytes.**

This entry indicates the amount of random access memory resident in the workstation.

### **Number of Expansion**

**Slots.** Like conventional PCs, most diskless workstations offer expansion slots for the attachment of interface boards and peripherals. A network interface card usually must be installed in one of the expansion slots in order for the workstation to operate over the network.

### **Network Interface Card Included.**

An answer here indicates that the workstation is supplied with a network interface card. The most common network interface cards are Ethernet, Arcnet, and token-ring. Many vendors offer a choice of more than one interface card.

**Network Interface Card Required (third party).** An answer here indicates that the workstation is *not* supplied with a network interface card; that card must be obtained from a third party.

**Monitor Included.** A yes answer here indicates that the standard package includes a monitor. Many diskless workstations do not come with a monitor; the user must supply one.

**Video Card Included.** Although many diskless workstations do not include a monitor, most will include a video card to support a monitor. Video card options include CGA (Color Graphics Adapter), EGA (Enhanced Graphics Adapter), HGA (Hercules Graphics Adapter), VGA

(Video Graphics Array), and monochrome.

**Keyboard Included.** Most (but not all) diskless workstations include a keyboard as part of the standard package.

### **Pricing/Support**

**Price (\$).** For many buyers, the main attraction of diskless workstations is their low price.

### **Date of First Delivery.**

This entry tells how long the product has been commercially available.

**Standard Warranty.** Warranties offered differ from vendor to vendor. Many offer one-year warranties; some offer less.

**Service Supplied by.** Increasingly, many products are serviced by the dealer or via a third-party service arrangement.

**Comments.** This entry includes space for any features, functions, or products not covered by the entries above.

Vendor	Advanced Digital Corp.	American Mitac Corp.	American Mitac Corp.	American Research Corp.
Product	Personal Network Station & Powerlite	MI212	MI316S	LAN station 286
Characteristics				
Processor	80286; 80386; 8088	80286	80386SX	80286
Minimum Memory (bytes)	1M	1M	1M	1M
No. Expansion Slots Included	4	2	2	2
Network Interface Card Included	No	No	No	Arcnet; Ethernet
Network Interface Card Required	Arcnet; Ethernet	No; optional	No; optional	No
Monitor Included	No	No	No	Yes
Video Card Included	VGA	None identified	None identified	VGA
Keyboard Included	Yes	Yes	Yes	Yes
Pricing/Support				
Price (\$)	1,600	1,295	1,645	1,585
Date of First Delivery	1988	None identified	None identified	None identified
Standard Warranty	1 year	1 year	1 year	None identified
Service Supplied By	Dealer; vendor	Third party	Third party	None identified
Comments		Bell Atlantic service 1 yr onsite.	Bell Atlantic service 1 yr onsite.	

Vendor	AST Research Inc.	Bethel Computer	Cubix Corp.	Cubix Corp.
Product	Bravo/286 1	286-12 D	ComBridge/ComCube Systems	QL1000 Series
Characteristics				
Processor	80286	80286; 80386; 8088	80286; 80386	NEC V40
Minimum Memory (bytes)	512K	640K	1M	640K
No. Expansion Slots Included	4	4	2	None identified
Network Interface Card Included	No	Arcnet; Ethernet	Arcnet; Ethernet; Token-Ring	Bus Interface included
Network Interface Card Required	Yes	Optional	No	No
Monitor Included	No	Yes	No	No
Video Card Included	None identified	CGA; EGA; VGA; monochrome	CGA	Monochrome
Keyboard Included	Yes	Yes	No	No
Pricing/Support				
Price (\$)	995	475	9,995, max. price is 24,995	645, max. price is 1,695
Date of First Delivery	December 1988	None identified	November 1990	1987
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied By	Dealer; vendor	Vendor	Vendor	Vendor
Comments			Dedicated asynec communications systems for LANs featuring 16 dial-in and dial-out lines.	Built-in terminal emulations.

Vendor	Cubix Corp.	Cubix Corp.	Daedalus Group	Datamedia Corp.
Product	QL2000 Series	QL3000 Series	EL-286	NETmate/SX16 386/16-00
<b>Characteristics</b>				
Processor	80286	80386	80286	80386SX
Minimum Memory (bytes)	1M	1M	512K	2M
No. Expansion Slots Included	None identified	None identified	1	3
Network Interface Card Included	Bus Interface included	Bus Interface included	Arcnet; Ethernet; Token-Ring	No
Network Interface Card Required	No	No	No	Ethernet
Monitor Included	No	No	No	No
Video Card Included	VGA	VGA	CGA; EGA; Monochrome; VGA	VGA
Keyboard Included	No	No	Yes	Yes
<b>Pricing/Support</b>				
Price (\$)	1,295, max. price is 2,100	1,795, max. price is 2,595	995	2,295
Date of First Delivery	1988	November 1990	None identified	June 1989
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied By	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>		Optional on-board SCST controller.	Small desk footprint - 2" in height x 13" wide x 10" deep. fanless design insures quiet operation; detached keyboard conforms to DIN specifications.	

Vendor	Datamedia Corp.	Datamedia Corp.	Datamedia Corp.	Datapoint Corp.
Product	NETmate/dx25 386/25-00	NETmate/dx33 386/33-00	NETmate/dx425 486/25-00	722X
<b>Characteristics</b>				
Processor	80386	80386	80486	80386
Minimum Memory (bytes)	2M	None identified	4M	2M
No. Expansion Slots Included	3	3	3	2
Network Interface Card Included	No	No	No	Ethernet
Network Interface Card Required	Ethernet	Ethernet	Ethernet	No
Monitor Included	No	No	No	No
Video Card Included	VGA	VGA	VGA	Monochrome; VGA
Keyboard Included	Yes	Yes	Yes	Yes
<b>Pricing/Support</b>				
Price (\$)	3,995	5,195	7,695	See comments
Date of First Delivery	August 1990	August 1990	August 1990	June 1989
Standard Warranty	1 year	1 year	1 year	30 days
Service Supplied By	Vendor	Vendor	Vendor	Third party
<b>Comments</b>				80386-based systems available in 16MHz or 25MHz and can be upgraded to 8MB or 16MB of memory; standard with Arcnet interface card; supports 2 serial ports, 1 parallel printer port, 1 PS/2 compatible mouse port; contact vendor for pricing info.

Vendor	Digital Equipment Corp.	DTK Computer, Inc.	DTK Computer, Inc.	Earth Computer Technologies
<b>Product</b>	VT1300 DECwindows Terminal	TECH-1260B	TECH-1260V	Earthstation IIIa
<b>Characteristics</b>				
Processor	VT1300	80286	80286	80386
Minimum Memory (bytes)	2M	1M	1M	1M
No. Expansion Slots Included	2	5	5	0
Network Interface Card Included	Ethernet	No	No	Arcnet
Network Interface Card Required	No	None identified	None identified	No
Monitor Included	Yes	No	No	No
Video Card Included	Monochrome; VGA	Monochrome	Monochrome	VGA
Keyboard Included	Yes	None identified	None identified	Yes
<b>Pricing/Support</b>				
Price (\$)	See comments	625	525	1,890
Date of First Delivery	None identified	None identified	None identified	None identified
Standard Warranty	90 days	1 year	1 year	1 year
Service Supplied By	Vendor	Dealer	Dealer	Vendor
<b>Comments</b>	Contact vendor for pricing information.	Built-in FDD/HDD.	Built-in FDD.	Price shown is base.

Vendor	Earth Computer Technologies	Earth Computer Technologies	Earth Computer Technologies	Earth Computer Technologies
<b>Product</b>	Earthstation IIIe	Earthstation IIIt	Earthstation IIa	Earthstation IIe
<b>Characteristics</b>				
Processor	80386	80386	NEC V40	80286
Minimum Memory (bytes)	1M	1M	1M	1M
No. Expansion Slots Included	0	0	0	0
Network Interface Card Included	Ethernet	Token-Ring	Arcnet	Ethernet
Network Interface Card Required	No	No	No	No
Monitor Included	No	No	No	No
Video Card Included	VGA	VGA	CGA	VGA
Keyboard Included	Yes	Yes	Yes	Yes
<b>Pricing/Support</b>				
Price (\$)	1,990	2,190	945	1,295
Date of First Delivery	None identified	None identified	None identified	None identified
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied By	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Price shown is base.			

Vendor	Earth Computer Technologies	EXZEL Corp.	International Communications Equipment	JC Information Systems
<b>Product</b>	<b>Earthstation le</b>	<b>EasyNetwork Workstation</b>	<b>Triton-SX</b>	<b>5180-400</b>
<b>Characteristics</b>				
Processor	NECV40	80286	80286; 80386	80286
Minimum Memory (bytes)	768K	1M	1M	512K
No. Expansion Slots Included	0	3	2	5
Network Interface Card Included	Ethernet	Arcnet; Ethernet; Standard EasyNetwork	Arcnet; Ethernet	No
Network Interface Card Required	No	No	No	Arcnet; Ethernet
Monitor Included	No	Yes	No	No
Video Card Included	CGA	HGA; Monochrome; VGA	VGA	None identified
Keyboard Included	Yes	Yes	Yes	Yes
<b>Pricing/Support</b>				
Price (\$)	825	500, max. price is 1,149	2,199	595
Date of First Delivery	None identified	None identified	March 1990	October 1988
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied By	Vendor	Vendor	Vendor	Dealer
<b>Comments</b>		\$500 price is for basic unit including monochrome monitor and keyboard, other prices with Starter Kits include a built-in network card and network card for server computer, cable, and networking software.		Available in 12, 16, & 20MHz; expanded memory hardware onboard; BIOS shadow standard utility software supplied.

Vendor	JC Information Systems	JC Information Systems	JC Information Systems	JC Information Systems
<b>Product</b>	<b>5186-400</b>	<b>5188-400</b>	<b>5190-400</b>	<b>5191-400</b>
<b>Characteristics</b>				
Processor	80286	80286	80386	80386
Minimum Memory (bytes)	512K	512K	1M	1M
No. Expansion Slots Included	5	5	5	5
Network Interface Card Included	No	No	No	No
Network Interface Card Required	Arcnet; Ethernet	Arcnet; Ethernet	Arcnet; Ethernet	Arcnet; Ethernet
Monitor Included	No	No	No	No
Video Card Included	None identified	None identified	None identified	None identified
Keyboard Included	Yes	Yes	Yes	Yes
<b>Pricing/Support</b>				
Price (\$)	645	745	1,095	1,245
Date of First Delivery	October 1988	October 1988	September 1989	September 1989
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied By	Dealer	Dealer	Dealer	Dealer
<b>Comments</b>	Available in 12, 16, & 20MHz; expanded memory hardware onboard; BIOS shadow standard utility software supplied.	Available in 12, 16, & 20MHz; expanded memory hardware onboard; BIOS shadow standard utility software supplied.		

Vendor	JC Information Systems	Kimtron Corp.	Lancer Research	Lanmaster
Product	5197-400	Satellite	200/300 Series	LMW 212 286
<b>Characteristics</b>				
Processor	80386	80286; 80386; NEC V20; NEC V40	80286; 80386	80286
Minimum Memory (bytes)	512K	640K	1M	512K
No. Expansion Slots Included	5	3	5	2; 3
Network Interface Card Included	No	No	Arcnet; Ethernet	No
Network Interface Card Required	Arcnet; Ethernet	Arcnet; Ethernet; Token-Ring	No	Arcnet; Ethernet; Token-Ring
Monitor Included	No	No	No	No
Video Card Included	None identified	CGA; VGA	Monochrome; VGA	None identified
Keyboard Included	Yes	Yes	Yes	No
<b>Pricing/Support</b>				
Price (\$)	895	See comments	780, max. price is 2,000	999
Date of First Delivery	November 1989	October 1988	October 1990	September 1988
Standard Warranty	1 year	1 year	1 year	2 years
Service Supplied By	Dealer	Third party; vendor	Dealer; vendor	Dealer; vendor
<b>Comments</b>	16MHz utility diag. and expanded memory driver software included; memory above 1M extended or expanded software to load NW above 640K supplied.	Contact vendor for pricing information.		Can be used with or without disk drives.

Vendor	Lanmaster	Lanmaster	Lanmaster	Lanmaster
Product	LMW 220 286	LMW 316 386 SX	LMW 320 386	LMW 325 386
<b>Characteristics</b>				
Processor	80286	80386; 80386SX	80386; 80386SX	80386; 80386SX
Minimum Memory (bytes)	512K	1M	1M	1M
No. Expansion Slots Included	2; 3	8	8	8
Network Interface Card Included	No	No	No	No
Network Interface Card Required	Arcnet; Ethernet; Token-Ring	Arcnet; Ethernet; Token-Ring	Arcnet; Ethernet; Token-Ring	Arcnet; Ethernet; Token-Ring
Monitor Included	No	No	No	No
Video Card Included	None identified	None identified	None identified	None identified
Keyboard Included	No	No	No	No
<b>Pricing/Support</b>				
Price (\$)	1,649	1,896	2,605	2,929
Date of First Delivery	September 1988	September 1988	September 1988	September 1988
Standard Warranty	2 years	2 years	2 years	2 years
Service Supplied By	Dealer; vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
<b>Comments</b>	Can be used with or without disk drives.			

Vendor	Liberty Electronics	Netcom Research, Inc.	Netcom Research, Inc.	Netcom Research, Inc.
<b>Product</b>	<b>Network Station</b>	<b>1612A</b>	<b>1612E</b>	<b>810A</b>
<b>Characteristics</b>				
Processor	80286; 80386	80286	80286	NEC V20
Minimum Memory (bytes)	512K	1M	1M	704K
No. Expansion Slots Included	4	0	0	0
Network Interface Card Included	Ethernet	Arcnet	Ethernet	Arcnet
Network Interface Card Required	No	No	No	No
Monitor Included	Yes	No	No	No
Video Card Included	None identified	CGA; EGA; HGA; VGA; mono-chrome	CGA; EGA; HGA; VGA; mono-chrome	CGA; monochrome
Keyboard Included	Yes	No	No	No
<b>Pricing/Support</b>				
Price (\$)	2,000	1,382	1,535	See comments
Date of First Delivery	December 1990	January 1990	December 1989	March 1989
Standard Warranty	1 year	2 years	2 years	2 years
Service Supplied By	Third party	None identified	Vendor	Dealer
<b>Comments</b>				Contact vendor for pricing information

Vendor	The Network Connection	Racore Computer Products, Inc.	Racore Computer Products, Inc.	Racore Computer Products, Inc.
<b>Product</b>	<b>Triumph Workstations</b>	<b>M 8720</b>	<b>M 8730</b>	<b>M 8760</b>
<b>Characteristics</b>				
Processor	80286; 80386; 80486	80286	80286	80286
Minimum Memory (bytes)	1M	512K	512K	512K
No. Expansion Slots Included	4	2	2	2
Network Interface Card Included	Arcnet; Ethernet; Token-Ring	No	No	No
Network Interface Card Required	No	Arcnet; Ethernet; Token-Ring	Arcnet; Ethernet; Token-Ring	Arcnet; Ethernet; Token-Ring
Monitor Included	Yes	No	No	No
Video Card Included	Monochrome; VGA	None identified	None identified	None identified
Keyboard Included	Yes	No	No	No
<b>Pricing/Support</b>				
Price (\$)	See comments	979	1,179	1,279
Date of First Delivery	None identified	January 1988	January 1988	January 1988
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied By	Third party; vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Guaranteed 24-hour replacement; contact vendor for pricing information.	0 wait state; expandable to 2M bytes of RAM; 10MHz.	0 wait state; expandable to 2M bytes of RAM; 12.5 MHz.	Expandable to 4M bytes of RAM; 12MHz.

Vendor	Racore Computer Products, Inc.	Racore Computer Products, Inc.	Racore Computer Products, Inc.	Samsung Informations Systems America, Inc.
Product	M 8780	M 8860	M 8880	PCTerminal/286
<b>Characteristics</b>				
Processor	80286	80286	80286	80286
Minimum Memory (bytes)	512K	512K	512K	640K
No. Expansion Slots Included	2	4	4	4
Network Interface Card Included	No	No	No	Ethernet
Network Interface Card Required	Arcnet; Ethernet; Token-Ring	Arcnet; Ethernet; Token-Ring	Arcnet; Ethernet; Token-Ring	No
Monitor Included	No	No	No	No
Video Card Included	None identified	None identified	None identified	None identified
Keyboard Included	No	No	No	Yes
<b>Pricing/Support</b>				
Price (\$)	1,779	1,579	1,979	859
Date of First Delivery	January 1988	January 1988	January 1988	1988
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied By	Vendor	Vendor	Vendor	Dealer; third party; vendor
<b>Comments</b>	Expandable to 4M bytes of RAM; 20MHz.	Expandable to 4M bytes of RAM; 12MHz.	Expandable to 4M bytes of RAM; 20MHz.	12MHz, Novell co-labelled, expandable to 1MB memory; built-in FDC and MGA controllers; has a Novell remote boot PROM; supports 2 3.5-inch or 1 5.25-inch disk drive; 100 percent NetWare-compatible.

Vendor	Samsung Informations Systems America, Inc.	Solid Technologies	Solid Technologies	Sun Microsystems, Inc.
Product	PCTerminal/386SX	286-12 LAN Station	386-SX LAN Station	SPARCstation IPC
<b>Characteristics</b>				
Processor	80386SX	80286	80386	SPARC
Minimum Memory (bytes)	2M	1M	1M	8M
No. Expansion Slots Included	4	4	4	2
Network Interface Card Included	Ethernet	No	No	Ethernet
Network Interface Card Required	No	Yes; Solid LAN network cards	Yes; Solid LAN network cards	No
Monitor Included	No	No	No	Yes
Video Card Included	None identified	Monochrome	Monochrome	None identified
Keyboard Included	Yes	Yes	Yes	Yes
<b>Pricing/Support</b>				
Price (\$)	1,295	456	786	8,995
Date of First Delivery	1990	None identified	None identified	July 1990
Standard Warranty	1 year	1 year	1 year	90 days
Service Supplied By	Dealer; third party; vendor	Vendor	Vendor	Dealer; vendor
<b>Comments</b>	Expandable to 8MB, has Novell remote boot PROM, Samsung Advanced NetWare BIOS, supports 2 3.5-inch or 1 5.25-inch disk drive; 100 percent Novell certified NetWare-compatible.	Designed for use as a diskless workstation in a Solid local area network; VGA interface & monitors are also available.	Designed for use as a diskless workstation in a Solid local area network; VGA interface & monitors are also available.	

Vendor	Sun Microsystems, Inc.	TeleVideo Systems, Inc.	TeleVideo Systems, Inc.	3Com Corp.
Product	SPARCstation SLC	TS2X TeleStation	TS5X TeleStation	3Station/2E
<b>Characteristics</b>				
Processor	SUN SPARC	80286	80386	80286
Minimum Memory (bytes)	8M	1M	1M	1M
No. Expansion Slots Included	0	1	2	0
Network Interface Card Included	Ethernet	No	No	Ethernet
Network Interface Card Required	No	Ethernet	Ethernet	No
Monitor Included	Yes	Yes	No	None identified
Video Card Included	None identified	VGA	VGA	CGA; EGA; Monochrome; VGA
Keyboard Included	Yes	Yes	Yes	None identified
<b>Pricing/Support</b>				
Price (\$)	4,995	1,140	1,725	2,195
Date of First Delivery	May 1990	June 1989	June 1990	May 1989
Standard Warranty	90 days	1 year	1 year	1 year
Service Supplied By	Dealer; vendor	Third party	Third party	Dealer
<b>Comments</b>		Installed Ethernet card optional.	Installed Ethernet card optional	Utilizes a 10 MHz 80286 processor and is expandable up to 5MB of memory. It can also be upgraded with 80287 coprocessor. Standard features include 2 serial, 1 parallel, network (ethernet) ports EGA, VGA, CGA, monochrome & Hercules.

Vendor	3Com Corp.	Top Microsystems	Wyse Technology, Inc.	Xinetron
Product	3Station/2X	TW-286	The Networker WY-212	Xi-286-DLA
<b>Characteristics</b>				
Processor	80286	80286; 80386	80286	80286
Minimum Memory (bytes)	3M	512K	1M	1M
No. Expansion Slots Included	0	5	1	2
Network Interface Card Included	Ethernet	Arcnet; Ethernet	No	Arcnet
Network Interface Card Required	No	Token-Ring	Arcnet; Ethernet; Token-Ring	No
Monitor Included	No	Yes	Yes	No
Video Card Included	CGA; EGA; Monochrome; VGA	EGA; VGA	VGA	HGA
Keyboard Included	Yes	Yes	Yes	No
<b>Pricing/Support</b>				
Price (\$)	3,495	850	1,799	699
Date of First Delivery	May 1989	September 1989	January 1989	February 1990
Standard Warranty	1 year	1 year	1 year	3 years
Service Supplied By	Dealer	Vendor	Vendor	Vendor
<b>Comments</b>	Has a 12MHz 80286 processor and built-in LIM 4.0 EMS memory manager. In addition, it includes a 80287 coprocessor, targeted to memory intensive DOS applications which require LIM 4.0 EMS memory.			Novell boot ROM included; diskette/IDE hard drive controller included; 2 serial, 1 parallel port; coax or twisted pair; 1-4MB RAM.

Vendor	Xinetron	Xinetron	Xinetron
Product	Xi-286-DLE	Xi-386-DLE	Xi-386SX
<b>Characteristics</b>			
Processor	80286	80386	80386
Minimum Memory (bytes)	1M	1M	1M
No. Expansion Slots Included	2	2	2
Network Interface Card Included	Ethernet	Ethernet	Arcnet; Ethernet
Network Interface Card Required	No	No	No
Monitor Included	No	No	No
Video Card Included	VGA	VGA	VGA
Keyboard Included	No	No	No
<b>Pricing/Support</b>			
Price (\$)	999	1,899	1,299
Date of First Delivery	April 1990	June 1990	October 1990
Standard Warranty	3 years	3 years	3 years
Service Supplied By	Vendor	Vendor	Vendor
<b>Comments</b>			
	Novell boot ROM included; diskette/IDE hard drive controllers included; 2 serial; 1 parallel port 1-4MB RAM.	16-bit Novell Ethernet interface; with boot ROM included; diskette/IDE controller included; 2 serial, 1 parallel port; 1-8MB RAM.	16-bit network interface with Novell boot ROM; diskette/IDE hard drive controllers included; 2 serial, 1 parallel port; 1-4MB RAM.

## **Bridges**

### Comparison Column Entry Descriptions

Bridges interconnect networks running the same protocols. They operate at the bottom two layers of the OSI reference model, in particular the Media Access Control (MAC) layer of OSI Layer 2 (Data Link). We have tried to fit each product to the specifications listed, to provide an accurate representation of that product's capabilities. Our survey form provided each vendor with a number of choices for each parameter listed. Space was provided to write in an answer when the proper choices for that vendor were not listed.

**Vendor and Model.** This entry lists the manufacturer and model number or name of each device.

**Characteristics LANs Supported.** This lists the LAN technologies with which the bridge will operate. The most popular LAN technologies include Ethernet, Arcnet, token-ring, Starlan, AppleTalk, and FDDI. Bridges that operate with broadband LANs are also available, generally from broadband LAN vendors.

**Minimum Memory, Bytes.** This entry indicates the amount of random access memory resident in the bridge.

**Operation.** Bridges can support local and/or remote operation.

**Throughput Rate, Packets per Second.** When packets of information are sent to a bridge to be transmitted, their intended destination is checked against an internal routing

table. They are then forwarded to their destination. The number of packets per second that is transmitted after this process is indicated here.

**Filter Rate, Packets per Second.** The address checking and other internal functions performed by a bridge on packets of information are known collectively as filtering. The number of packets per second that a bridge can filter is given here. Note that the filter rate is higher than the throughput rate.

**Configuration.** Some bridges automatically update their routing tables as devices are added to or deleted from the network. These bridges are designated automatic or learning bridges. Manual bridges require the user to manually update routing tables when devices are added to or deleted from the network.

**Media Supported.** This provides an indication of the LAN transmission media over which the bridge

can operate. Choices include standard or thin Ethernet (coaxial cable), broadband (CATV coaxial cable), twisted-pair wire, and optical fiber.

**Pricing/Support Price (\$).** There are a number of different types of bridges on the market. Prices vary accordingly.

**Date of First Delivery.** This entry tells how long the product has been commercially available.

**Standard Warranty.** Warranties offered differ from vendor to vendor. Many offer one-year warranties; some offer less.

**Service Supplied by.** Increasingly, products are serviced by the dealer or via a third-party service arrangement.

**Comments.** This entry includes space for any features, functions, or products not covered by the entries above.

Vendor	Advanced Computer Communications	Advanced Computer Communications	ALANTEC	Allen-Bradley Co., Inc.
Product	Series 2000	Series 4000	1033 MLS	ISO Bridge
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	Arcnet; Ethernet; MAP
Minimum Memory (bytes)	None identified	None identified	None identified	512K
Operation	Local	Remote	Local	None identified
Throughput Rate (packets/sec.)	12,500	10,000	None identified	7,500
Filter Rate (packets/sec.)	20,000	6,000	None identified	15,000
Configuration	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Fractional T1; Optical fiber; Standard Ethernet coaxial; Synchronous Serial; T1; Thin Ethernet coaxial	Broadband coaxial
<b>Pricing/Support</b>				
Price (\$)	3,250	5,500	20,000	See comments
Date of First Delivery	September 1990	March 1989	July 1989	1989
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Third party; vendor	Third party; vendor	Vendor	Vendor
<b>Comments</b>	Can be configured as bridge only, IP router, bridge/router.	Can be configured as bridge only, multiprotocol.	Combines high-performance architecture with sophisticated traffic and path control software, to inter-connect up to 10 Ethernet networks and reduce congestion in work-station networks; price shown is 8-port configuration.	Contact vendor for pricing information.
<b>Vendor</b>	<b>Allied Telesis Inc.</b>	<b>Allied Telesis Inc.</b>	<b>Andrew Corp.</b>	<b>Andrew Corp.</b>
Product	CentreCOM AT-6800	CentreCOM AT-7000	Bridgeport/7404	Bridgeport/7404/16
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Token-Ring	Token-Ring
Minimum Memory (bytes)	512K	None identified	768K	1.15M
Operation	Local	Remote	Local	Local
Throughput Rate (packets/sec.)	12,500	8,000	850	None identified
Filter Rate (packets/sec.)	25,000	14,800	None identified	None identified
Configuration	Automatic (learning bridge); Manual	Automatic (learning bridge)	Source routing	Source routing
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Optical fiber; Shielded twisted-pair; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Unshielded twisted-pair
<b>Pricing/Support</b>				
Price (\$)	2,450	4,950	3,995	3,595
Date of First Delivery	October 1990	April 1989	June 1989	July 1990
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Dealer; vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
<b>Comments</b>	SNMP manageable bridge.		4MB IBM compatible source routing, rack mounted token-ring local bridge; manages attached rings; reports to IBM LAN Manager; supports fail-safe redundant networks; supports Andrew worldwide single point bridge management.	16MB to 4MB IBM compatible rack mounted token-ring local bridge; manages attached rings; reports to IBM LAN Manager; supports fail safe redundant networks; works with Andrew world wide single point bridge management.

Vendor	Andrew Corp.	Andrew Corp.	Andrew Corp.	Applitek Corp.
Product	Bridgeport/7412	Bridgeport/7412/16	Bridgeport/7606	NI10/E Ethernet Bridge
Characteristics LANs Supported	Token-Ring	Token-Ring	Token-Ring	Ethernet; UniLAN
Minimum Memory (bytes) Operation	640K Remote	1.024M Remote	1.5M Local	None identified Local; Remote
Throughput Rate (packets/sec.)	850	None identified	None identified	None identified
Filter Rate (packets/sec.)	None identified	None identified	None identified	None identified
Configuration	Source routing	Source routing	Source routing	Automatic (learning bridge); Manual
Media Supported	Optical fiber; Shielded twisted-pair; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Unshielded twisted-pair	Broadband coaxial; Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial
Pricing/Support Price (\$)	4,995	5,595	4,995	13,750
Date of First Delivery Standard Warranty Service Supplied by	October 1990 1 year Dealer; vendor	July 1990 1 year Dealer; vendor	November 1990 1 year Dealer; vendor	1985 90 days Vendor
Comments	4MB source routing, IBM compatible rack mounted token-ring remote bridge; supports fail safe, load sharing parallel networks; reports to IBM LAN Manager; supports Andrew single point world wide bridge management.	16MB IBM compatible, rack mounted source routing, token-ring remote bridge reports to IBM LAN Manager; supports fail-safe, load sharing, parallel networks; works with Andrew world wide single point bridge management.	4/16MB, selectable, IBM compatible, rack mounted, source routing token-ring bridge; reports to IBM LAN Manager; supports early token release and address filtering; supports fail safe load sharing parallel network connections.	Provides connectivity between IEEE 802.3 or Ethernet subnets utilizing standard CATV broadband backbones; transparent to higher layer protocols and connects Ethernet subnets up to 35 miles away.
Vendor	Artel Communications Corp.	Artel Communications Corp.	AT&T	AT&T
Product	802.3 Bridge	T1/E1 Transport	10:10 Bridge	1:10 Bridge
Characteristics LANs Supported	Ethernet; FiberWay	T1/E1 Devices	Ethernet; Starlan	Ethernet; Starlan
Minimum Memory (bytes) Operation	None identified Local	None identified Local	192K Local	192K Local; Remote
Throughput Rate (packets/sec.)	14,600	14,600	813	813
Filter Rate (packets/sec.)	126,000	126,000	1,800	1,800
Configuration	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)
Media Supported	Optical fiber; Standard Ethernet coaxial	Optical fiber; Unshielded twisted-pair	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
Pricing/Support Price (\$)	22,250	13,000	5,950	4,500
Date of First Delivery Standard Warranty Service Supplied by	January 1988 30 days Vendor	February 1990 30 days Vendor	September 1988 90 days Vendor	None identified 90 days Vendor
Comments	Supports one 802.3/Ethernet LAN connection to the FiberWay fiber optic backbone network.	Supports up to 12 T1 (1.544M) or 8E1 (2.048M) devices for bridging to the FiberWay fiber optic backbone network; supports LAN distribution for video conferencing and video surveillance, etc.		Bridges Starlan (1M bps) and Starlan 10 networks.

Vendor	BICC Data Networks, Inc.	BICC Data Networks, Inc.	BICC Data Networks, Inc.	BICC Data Networks, Inc.
Product	1400 Primary Local Bridge	1410 Managed Bridge	1420 FDDI/802.3 Managed Bridge	1435 Remote Bridge
Characteristics LANs Supported	Ethernet	Ethernet	Ethernet; FDDI	Ethernet
Minimum Memory (bytes) Operation	512K Local	512K Local	512K Local	512K Remote
Throughput Rate (packets/sec.)	13,000	13,600	14,000	700
Filter Rate (packets/sec.)	17,100	21,800	54,000	7,000
Configuration	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)
Media Supported	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
Pricing/Support Price (\$)	2,195	3,995	22,500	5,495
Date of First Delivery	April 1988	January 1989	October 1990	October 1989
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	Locally connects two IEEE 802.3/Ethernet networks; filters packets for reduced traffic congestion; protocol independent.	Local bridge managed through on-board management panel or remotely managed via ISOView Network Manager; filters packets reducing traffic congestion; protocol independent.	Transparent FDDI/802.3 managed bridge; local management controlled on-board or remotely by IOSView Network Manager; features include LED status display, security, and closed user groups.	Supports one or two RS-232, V.35, RS-449, or X.21 WAN links; spanning Tree, triangulation, and adaptive routing at speeds to 128Kbps.
Vendor	Cabletron Systems, Inc.	Cabletron Systems, Inc.	Cabletron Systems, Inc.	Cabletron Systems, Inc.
Product	IRBM	NB20E	NB25E	NB30
Characteristics LANs Supported	Ethernet	Ethernet	Ethernet	Arcnet; Ethernet
Minimum Memory (bytes) Operation	1M Local	512K Remote	512K Local	2M Remote
Throughput Rate (packets/sec.)	21,000	8,000	11,600	2,900
Filter Rate (packets/sec.)	8,000	15,000	28,000	10,000
Configuration	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)
Media Supported	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Broadband coaxial; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
Pricing/Support Price (\$)	See comments	2,995	5,495	17,000
Date of First Delivery	December 1989	June 1989	June 1989	November 1990
Standard Warranty	90 days	90 days	90 days	90 days
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments	Contact vendor for pricing information. Control & monitor via local/remote management.	Control and monitor via remote management.	Control and monitor via local/remote management.	Control and monitor via local/remote management; price shown is per pair.

Vendor	Cabletron Systems, Inc.	CASE/Datatel, Inc.	CBIS, Inc.	Chipcom Corp.
<b>Product</b>	NB35	6445/A	Network OS Plus Bridging	Ethermodem III Bridge
<b>Characteristics</b>				
LANs Supported	Ethernet	AppleTalk; Ethernet	Arcnet; BUSS; Cluster; Ethernet; Starlan; Token-Ring	Ethernet
Minimum Memory (bytes)	1M	1M	128K	512K
Operation	Remote	Local	Local	Local
Throughput Rate (packets/sec.)	2,900	15,000	None identified	13,404
Filter Rate (packets/sec.)	10,000	30,000	None identified	24,200
Configuration	Automatic (learning bridge)	Automatic (learning bridge), manual	Manual	Automatic (learning bridge)
Media Supported	Broadband coaxial; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial	Broadband coaxial; Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Broadband coaxial; Standard Ethernet coaxial; Thin Ethernet coaxial
<b>Pricing/Support</b>				
Price (\$)	22,995	12,000	See comments	8,950
Date of First Delivery	December 1989	December 1988	None identified	April 1988
Standard Warranty	90 days	1 year	120 days	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Control and monitor via local/remote management; price shown is per pair.	Supports both local and remote ports.	Free technical phone support; software only; supports NET-BIOS; contact vendor for pricing information.	Available for 12MHz and 18MHz networks.

Vendor	Chipcom Corp.	Chipcom Corp.	Codex Corp.	Concord Communications, Inc.
<b>Product</b>	Marathon Bridge	Midnight Bridge	EtherSpan Bridge	Series 4200
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet; Token Bus; Token-Ring
Minimum Memory (bytes)	512K	512K	None identified	None identified
Operation	Local	Local	Remote	Local
Throughput Rate (packets/sec.)	7,500	10,000	4,000	None identified
Filter Rate (packets/sec.)	15,000	20,000	15,000	None identified
Configuration	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)
Media Supported	Broadband coaxial; Standard Ethernet coaxial; Thin Ethernet coaxial	Optical fiber; Standard Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Broadband coaxial; Carrier-band; Standard Ethernet coaxial
<b>Pricing/Support</b>				
Price (\$)	9,950	2,950, max. price is 3,950	12,000	10,900
Date of First Delivery	November 1988	April 1990	April 1990	August 1988
Standard Warranty	1 year	1 year	1 year	90 days
Service Supplied by	Vendor	Vendor	Vendor	Vendor

<b>Comments</b>	IEEE 802.3-to-802.4 bridge.	All IEEE 802.3: AUI-AUI bridge \$2,950; AUI-Fiber bridge \$3,450 (ST connector); Fiber-Fiber bridge \$3,950 (ST connectors); AUI-Fiber bridge \$3,450 (SMA connector); Fiber-Fiber bridge \$3,950 (SMA connector).		Provides TokenBus backbone bridging for Ethernet subnets; offers up to 25 miles in distance and up to three 10Mbps channels.
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Vendor	CrossComm Corp.	CrossComm Corp.	CrossComm Corp.	CrossComm Corp.
Product	HSB-EE	HSB-ELL	HSB-ETT	HSB-RR
Characteristics				
LANs Supported	Ethernet	Ethernet	Ethernet	Token-Ring
Minimum Memory (bytes)	None identified	512K	None identified	512K
Operation	Local	Remote	Remote	Local
Throughput Rate (packets/sec.)	14,500	2,000	7,200	2,300
Filter Rate (packets/sec.)	30,000	15,000	15,000	93,000
Configuration	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Shielded twisted-pair
Pricing/Support				
Price (\$)	4,395	5,995	7,995	6,500
Date of First Delivery	October 1989	August 1990	August 1990	May 1990
Standard Warranty	90 days	90 days	90 days	90 days
Service Supplied by	Vendor	Vendor	Vendor	Vendor
Comments			Free form text provided by the vendor for this product.	Supports IEEE 802.1D, source routing, and new source routing transparent (SRT) standard.

Vendor	Cryptall Communications Corp.	Cryptall Communications Corp.	Cryptall Communications Corp.	Cryptall Communications Corp.
Product	3000CB Compression Bridge	3000FT1 Fractional T1 Bridge	3000MB Microwave Bridge	3000T1 T1 Bridge
Characteristics				
LANs Supported	Ethernet; Token-Ring	Ethernet; Token-Ring	Ethernet; Token-Ring	Ethernet
Minimum Memory (bytes)	2.5M	512K	512K	512K
Operation	Remote	Remote	Remote	Remote
Throughput Rate (packets/sec.)	None identified	None identified	None identified	None identified
Filter Rate (packets/sec.)	14,880	14,880	14,880	14,880
Configuration	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial
Pricing/Support				
Price (\$)	8,500	5,500	8,000	7,500
Date of First Delivery	February 1990	June 1989	June 1989	June 1989
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Dealer; vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
Comments	For WAN link speeds of 64K offers 4:1 data compression i.e. over 256K throughput over 64K line; optional DES encryption & ANSI X9.17 key management; auto-dial redundant link; spanning tree, extensive diagnostic capabilities includ. non-invasive loopback.	For WAN links through 768K, optional DES Encryption and ANSI X9.17 key management; auto dial redundant link; spanning tree, extensive diagnostic capabilities including non-invasive loopbacks.	Ethernet to Microwave bridge with lvp/p analog interface. Offers full duplex 10M throughput. Distance only limited to Microwave range, i.e. 15 miles or more with repeaters. Spanning tree auto-redundant link & extensive network diagnostics.	For WAN links through 2.048M bps optional DES encryption and ANSI X9.17 key management; auto dial redundant link; spanning tree, extensive diagnostic capabilities including non-invasive loopbacks.

Vendor	Cryptall Communications Corp.	Cryptall Communications Corp.	Cryptall Communications Corp.	Cryptall Communications Corp.
<b>Product</b>	3000UB Unlimited Bridge	4000CB-2 Multiport Compression Bridge	4000CB-4 Multiport Compression Bridge	4000FT1-2 Fractional T1 Multiport Bridge
<b>Characteristics</b>				
LANs Supported	Ethernet; Token-Ring	Ethernet	Ethernet	Ethernet
Minimum Memory (bytes)	512K	2.5M	2.5M	512K
Operation	Remote	Remote	Remote	Remote
Throughput Rate (packets/sec.)	None identified	None identified	None identified	None identified
Filter Rate (packets/sec.)	14,880	14,880	14,880	14,880
Configuration	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial
<b>Pricing/Support</b>				
Price (\$)	8,500	12,000	16,000.00	8,000
Date of First Delivery	June 1990	None identified	None identified	August 1990
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Dealer; vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
<b>Comments</b>	High performance, distance unlimited bridge with wide area network link for operation at all data rates through 10M. Spanning tree, auto redundant link and extensive network diagnostics including non-invasive loopbacks.	For WAN link speeds of 64K offers 4:1 data compression i.e. over 256K throughput over 64K line; optional DES Encryption and ANSI X9.17 key management; auto-dial redundant link; spanning tree, extensive diagnostic capabilities incl. non-invasive loopback.	For WAN link speeds of 64K offers 4:1 data compression i.e. over 256K throughput over 65K line; optional DES Encryption & ANSI X9.17 key management; auto-dial redundant link; spanning tree, extensive diagnostic capabilities incl. non-invasive loopback	For WAN links through 768K, optional DES Encryption & ANSI X9.17 key management; auto-dial redundant link; spanning tree, extensive diagnostic capabilities incl. non-invasive loopbacks; load sharing for multiport.
<b>Vendor</b>	Cryptall Communications Corp.	Cryptall Communications Corp.	Cryptall Communications Corp.	Cryptall Communications Corp.
<b>Product</b>	4000FT1-4 Fractional Multiport Bridge	4000MB-2 Microwave Multiport Bridge	4000T1-2 Multiport Bridge	4000T1-4 T1 Multiport Bridge
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Minimum Memory (bytes)	512K	512K	512K	512K
Operation	Remote	Remote	Remote	Remote
Throughput Rate (packets/sec.)	None identified	None identified	None identified	None identified
Filter Rate (packets/sec.)	14,880	14,880	14,880	14,880
Configuration	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial
<b>Pricing/Support</b>				
Price (\$)	10,000	11,000	10,500	13,000
Date of First Delivery	August 1990	September 1990	September 1990	September 1990
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Dealer; vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
<b>Comments</b>	For WAN links through 768K, optional DES Encryption and ANSI X9.17 key management; auto-dial redundant link; spanning tree, extensive diagnostic capabilities incl. non-invasive loopbacks; load sharing for multiport.	Ethernet to Microwave bridge with lvp/p analog interface; offers full duplex 10M throughput; distance only limited to Microwave range, i.e. 15 miles or more with repeaters; spanning tree, auto redundant link & extensive network diagnostics.	For WAN links through 2.048M, optional DES Encryption and ANSI X.9.17 key management; auto dial redundant link; spanning tree, extensive diagnostics capabilities incl. non-invasive loopbacks and load sharing.	For WAN links through 2.048M, optional DES Encryption & ANSI X9.17 key management; auto dial redundant link; spanning tree, extensive diagnostics capabilities incl. non-invasive loopbacks and load sharing.

Vendor	Cryptall Communications Corp.	Cryptall Communications Corp.	Datapoint Corp.	Dayna Communications, Inc.
Product	4000T2-2 T2 Multiport Bridge	4000UB-2 Unlimited Multiport Bridge	PowerBridge II	EtherPrint
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Arcnet; Ethernet; Token-Ring	Ethernet
Minimum Memory (bytes)	512K	512K	1M	None identified
Operation	Remote	Remote	Local	None identified
Throughput Rate (packets/sec.)	None identified	None identified	None identified	None identified
Filter Rate (packets/sec.)	14,880	14,880	None identified	None identified
Configuration	Automatic (learning bridge)	Automatic (learning bridge)	Manual	Automatic (learning bridge)
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Broadband coaxial; Optical fiber; RG 62 coaxial; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
<b>Pricing/Support</b>				
Price (\$)	17,000	12,000.00	See comments	499
Date of First Delivery	September 1990	September 1990	June 1990	June 1990
Standard Warranty	1 year	1 year	30 days	1 year
Service Supplied by	Dealer; vendor	Dealer; vendor	Vendor	Vendor
<b>Comments</b>	Includes a T2 DSU interface at 6.312M; can be used with T2 services, T2 microwave, or be multiplexed into a T3 (44M) data channel with an M13 multiplexer; can transport 100% active traffic in most interactive environments	High performance, distance unlimited bridge with wide area network link for operation at all data rates through 10M; spanning, auto redundant link & extensive network diagnostics incl. non-invasive loopbacks and load sharing.	Complaint NETBIOS required; contact vendor for pricing information.	Converts LocalTalk to Ethernet.
Vendor	Develcon Electronics Ltd.	Develcon Electronics Ltd.	Digital Communications Associates, Inc.	Digital Communications Associates, Inc.
Product	INB 1000 Series	INB 2000 Series	10NET Plus LAN Bridge	10NET Plus RS-232/NetBIOS Bridge
<b>Characteristics</b>				
LANs Supported	Ethernet	Token-Ring	Ethernet; Starlan	Arcnet; Ethernet; Starlan; Token-Ring
Minimum Memory (bytes)	Does Not Apply	Does Not Apply	512K	512K
Operation	Local; Remote	Local; Remote	Local	Local
Throughput Rate (packets/sec.)	None identified	None identified	1,404	None identified
Filter Rate (packets/sec.)	11,000	20,000	3,226	None identified
Configuration	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Shielded twisted-pair	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
<b>Pricing/Support</b>				
Price (\$)	6,000	8,800	595	249
Date of First Delivery	None identified	None identified	June 1989	July 1990
Standard Warranty	None identified	None identified	30 days	30 days
Service Supplied by	Vendor	Vendor	Dealer; vendor	Dealer; vendor
<b>Comments</b>	Compatible with INB 2000 Token Ring Bridging System.	Supports 4 and 16Mbps Token Ring; compatible with INB 1000 Ethernet Bridging System allowing Ethernet and Token Ring to coexist and share communications facilities and network management.	Provides connectivity to different speed 10NET Networks.	Connects similar and dissimilar networks; also provides remote connectivity.

Vendor	Digital Equipment Corp.	Digital Equipment Corp.	Dupont Electronics	Fairchild Data Corp.
<b>Product</b>	DECbridge 500	LANBridge	ELB-010 Ethernet Local Bridge Module	LBR8323
<b>Characteristics</b>				
LANs Supported	Ethernet; FDDI	Ethernet; FDDI	Ethernet	Ethernet
Minimum Memory (bytes)	640K	640K	512K	None identified
Operation	Local; Remote	Local; Remote	Local	None identified
Throughput Rate (packets/sec.)	None identified	None identified	8,000	14,000
Filter Rate (packets/sec.)	None identified	None identified	10,000	25,000
Configuration	Automatic (learning bridge); Manual	Automatic (learning bridge); Manual	Automatic (learning bridge)	None identified
Media Supported	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Broadband coaxial; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
<b>Pricing/Support</b>				
Price (\$)	See comments	5,500, max. price is 9,500	2,995	6,995
Date of First Delivery	None identified	None identified	November 1990	None identified
Standard Warranty	90 days	90 days	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Contact vendor for pricing information.	Available as LANBridge 150 and LANBridge 200.	Uses the Spanning Tree Protocol to resolve multiple connections between segments and establish redundant paths to guard against failure of the primary link. Also may be used in conjunction with DuPont's Enhanced Management Software (LBS-010).	
Vendor	FiberCom, Inc.	Fibermux Corp.	Fibronics International Inc.	Halley Systems, Inc.
<b>Product</b>	RingMaster 7200	FX709	FX8210 FDDI Bridge	ConnectLAN 300
<b>Characteristics</b>				
LANs Supported	Ethernet; FDDI; Token-Ring	Ethernet	FDDI	Token-Ring
Minimum Memory (bytes)	5M	640K	256K	640K
Operation	Local	Local	Local	Local; Remote
Throughput Rate (packets/sec.)	20,000	12,500	500,000	None identified
Filter Rate (packets/sec.)	50,000	14,000	10,000	90,000
Configuration	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)
Media Supported	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair; Broadband Coaxial	RS-449; Standard Ethernet coaxial	Optical fiber	Shielded twisted-pair
<b>Pricing/Support</b>				
Price (\$)	15,000	9,500	18,000	6,995, max. price is 11,500
Date of First Delivery	September 1990	May 1990	None identified	September 1990
Standard Warranty	1 year	1 year	90 days	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Multiprot transparent bridge supports Ethernet and token-ring in any mixture up to 4 sub-networks; SNMP manageable; supports IEEE 802.1d incl. spanning tree.	Ethernet-to-RS449 bridge designed for use in encrypted-data applications with RG encryption gear; it can also be used with the FX103 RS449-fiber converter for remote bridging applications.		ConnectLAN 300 is a family of high-performance Token Ring bridge products capable of interconnecting local or geographically-dispersed 16/4Mbps Token Ring/IEEE 802.5 Local Area Networks.

Vendor	Hayes Microcomputer Products, Inc.	Hewlett-Packard Co.	Hewlett-Packard Co.	IN-Net Corp.
Product	InterBridge V2.0	28673A	28674A	FiberTalk 5000 802.3/802.5 Bridge
<b>Characteristics</b>				
LANs Supported	AppleTalk; LocalTalk	Ethernet; Starlan	Ethernet; Starlan	DECnet; Ethernet; FDDI; Token-Ring
Minimum Memory (bytes) Operation	512K Local; Remote	512K Local	512K Remote	None identified
Throughput Rate (packets/sec.)	None identified	14,880	14,880	None identified 100,000
Filter Rate (packets/sec.)	None identified	29,760	29,760	None identified
Configuration	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)
Media Supported	Optical fiber; Shielded twisted-pair; Unshielded twisted-pair	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Standard Ethernet coaxial
<b>Pricing/Support</b>				
Price (\$)	799	4,999	3,999	22,000
Date of First Delivery	January 1986	September 1990	September 1990	1990
Standard Warranty	2 years	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Supports AppleTalk Phase 2; InterBridge 1.0 for AppleTalk Phase 1 networks is also available.	Unshielded twisted-pair and optical fiber require a transceiver.	Unshielded twisted-pair and optical fiber require a transceiver.	Throughput rate pertains to FDDI portion.
<b>Vendor</b>	Infotron Systems Corp.	Interlink Computer Sciences, Inc.	International Business Machines Corp. (IBM)	International Business Machines Corp. (IBM)
Product	LAN Span 200	SNS/B320	8209 LAN Bridge	IBM Token Ring Bridge Program 2.1
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet; Token-Ring	Ethernet; Token-Ring	Token-Ring
Minimum Memory (bytes) Operation	2M Remote	1M Remote	128K Local	300K Local, remote
Throughput Rate (packets/sec.)	3,600	5,000	3,000	1,750
Filter Rate (packets/sec.)	15,000	12,000	10,000	20,000
Configuration	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial; Using external transceiver & cable	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Shielded twisted-pair
<b>Pricing/Support</b>				
Price (\$)	10,430	6,950	7,200	1,595
Date of First Delivery	December 1988	March 1990	October 1989	July 1989
Standard Warranty	90 days	1 year	1 year	90 days
Service Supplied by	Vendor	Dealer; third party; vendor	Vendor	Vendor
<b>Comments</b>	LAN Span 200 is a multi-link, protocol-transparent, routing bridge; it supports up to 4 WAN links and provides automatic reconfiguration/rerouting and traffic load balancing.	Provides SNMP management with centralized support through each bridge.	Provides connectivity between Version 2/802.3 and token-ring networks.	Enables communication between devices connected to different LAN segments.

Vendor	LANEX Corp.	LANNET Data Communications, Inc.	Lantana Technology	Lantana Technology
Product	REM 8023 Remote Bridge	1ELB	CYPRESS/B7404	CYPRESS/B7412
Characteristics LANs Supported	Ethernet	Ethernet	Token-Ring	Token-Ring
Minimum Memory (bytes) Operation	1M	None identified	None identified	None identified
Throughput Rate (packets/sec.)	Remote 2,200	Local 7,500	Local None identified	Remote None identified
Filter Rate (packets/sec.)	15,000	14,000	None identified	None identified
Configuration	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge); Manual	Automatic (learning bridge); Manual
Media Supported	DSU/CSU; Standard Ethernet coaxial; Thin Ethernet coaxial; dial/dedicated; satellite	Standard Ethernet coaxial; Un- shielded twisted-pair	Shielded twisted-pair; Un- shielded twisted-pair	Shielded twisted-pair; Un- shielded twisted-pair
Pricing/Support Price (\$)	5,995	2,495	4,995	5,995
Date of First Delivery	1988	January 1991	June 1990	June 1990
Standard Warranty	None identified	1 year	1 year	1 year
Service Supplied by	Vendor	Dealer, vendor	Vendor	Vendor
Comments	T1 DSU/CSU is \$995.	Module for Lannet's wiring hub.		

Vendor	Lantana Technology	Maco Networks, Inc.	Microcom, Inc.	Microcom, Inc.
Product	TAMARIX/B1400	LANFrame PSP	MLB/5500 ISDN Remote Bridge	MLB/6000 Local/Remote T1 Bridge
Characteristics LANs Supported	Ethernet	Ethernet	Ethernet; Token-Ring	Ethernet; Token-Ring
Minimum Memory (bytes) Operation	512K	640K	512K	512K
Throughput Rate (packets/sec.)	Local 13,000	Local 15,000	Remote 1,000	Remote 4,000
Filter Rate (packets/sec.)	17,100	15,000	None identified	None identified
Configuration	Automatic (learning bridge); Manual	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)
Media Supported	Optical fiber; Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
Pricing/Support Price (\$)	3,695	See comments	9,200	9,000
Date of First Delivery	August 1988	None identified	May 1990	May 1989
Standard Warranty	1 year	None identified	90 days	90 days
Service Supplied by	Vendor	Vendor	Dealer; vendor	Vendor
Comments		Contact vendor for pricing infor- mation.	Price is for turnkey system.	Price is for turnkey system.

Vendor	Microcom, Inc.	NCR Corp.	NCR Corp.	Netronix
Product	MLB/6500 X.25 Bridge	ONS 3320	ONS 3445	EtherMaster 100
Characteristics LANs Supported	Ethernet; Token-Ring	AppleTalk; Ethernet; FDDI; Starlan; Token-Ring	AppleTalk; Ethernet; FDDI; Starlan; Token-Ring	Ethernet
Minimum Memory (bytes) Operation Throughput Rate (packets/sec.)	512K Remote 4,000	8M Local; Remote 9,281	8M Local; Remote 27,843	None identified Local 12,500
Filter Rate (packets/sec.)	None identified	16,515	49,545	25,000
Configuration	Automatic (learning bridge)	Automatic (learning bridge); Manual	Automatic (learning bridge); Manual	Automatic (learning bridge)
Media Supported	Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Broadband coaxial; Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Broadband coaxial; Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial
Pricing/Support Price (\$)	9,700	1,125	1,000	See comments
Date of First Delivery Standard Warranty Service Supplied by	May 1990 90 days Dealer; vendor	April 1991 1 year Vendor	April 1991 1 year Vendor	October 1989 1 year Vendor
Comments	Price is for turnkey system.	Routing is an orderable feature on an ONS system; in general, ONS 3320s range from \$20,000 to \$60,000 for a fully configured system.	Routing is an orderable feature on an ONS system; in general, ONS 3445s range from \$35,000 to \$150,000 for a fully config- ured system.	SNMP agent for NetView Man- agement and Netronix Network Management; contact vendor for pricing information.
Vendor	Netronix	Netronix	Netronix	Netronix
Product	EtherMaster 200	TokenMaster 100 Bridge	TokenMaster 200	TokenMaster 400
Characteristics LANs Supported	Broadband; Ethernet	Token-Ring	Broadband; Token-Ring	Token-Ring
Minimum Memory (bytes) Operation Throughput Rate (packets/sec.)	None identified Local None identified	None identified Local 1,650	None identified Local 1,150	512K Remote None identified
Filter Rate (packets/sec.)	25,000	153; 16,000,000; 38,400; 4,000,000; 600	153,600; 16,000,000; 38,400	None identified
Configuration	Automatic (learning bridge)	None identified	Source routing	None identified
Media Supported	Broadband coaxial; Standard Ethernet coaxial; Thin Ethernet coaxial	IBM Type 1; IBM Type 3; Shielded twisted-pair; Un- shielded twisted-pair	Broadband coaxial; Shielded twisted-pair; Unshielded twisted-pair	IBM Type 1; IBM Type 3; Shielded twisted-pair; Un- shielded twisted-pair
Pricing/Support Price (\$)	See comments	See comments	See comments	See comments
Date of First Delivery Standard Warranty Service Supplied by	October 1989 1 year Vendor	October 1989 1 year Vendor	October 1989 1 year Vendor	November 1990 1 year Vendor
Comments	SNMP network management and Netronix Bridge Manage- ment; frequency agile; contact vendor for pricing information.	Supports IBM source routing, LAN manager, and Netview; 4Mbps and 16Mbps token ring supports Netronix Bridge Man- agement; interoperability with IBM bridges; contact vendor for pricing information.	Supports IBM Source Routing, LAN Manager, and Netview; supports 4Mbps and 6Mbps to- ken ring, Netronix Bridge Man- agement and IBM bridges; con- tact vendor for pricing informa- tion.	Supports IBM source routing, IBM LANmanage, and NETview; supports 4M and 16M bps token-ring, Netronix Bridge Management available in addi- tion to LANmanager; complete interoperability with IBM Bridges. Contact vendor for pricing information.

Vendor	Network Resources Corp.	Optical Data Systems, Inc.	Optical Data Systems, Inc.	Performance Technology
Product	MultiGate Bridge	ODS 2009, 2010	ODS 8008	POWERBridge II
Characteristics LANs Supported	AppleTalk; Ethernet	Ethernet	Token-Ring	Any NETBIOS LAN
Minimum Memory (bytes) Operation	None identified Local	1M Local	1M Local	100K Local
Throughput Rate (packets/sec.)	None identified	14,800	None identified	None identified
Filter Rate (packets/sec.)	None identified	14,800	None identified	Does not apply
Configuration	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)	None identified
Media Supported	Broadband coaxial; Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Standard Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Shielded twisted-pair; Unshielded twisted-pair	Any NETBIOS LAN
Pricing/Support Price (\$)	2,495	3,650	8,270	495
Date of First Delivery Standard Warranty Service Supplied by	None identified None identified Vendor	September 1990 1 year Vendor	November 1990 1 year Vendor	None identified Does not apply Dealer
Comments		2009: 400 address table; 2010: 4096 address table; full bandwidth simultaneous both directions.		Software-only product; NET-BIOS bridge; runs as TSR in a PC; takes approx. 100K bytes.

Vendor	Persoft, Inc.	Plexcom, Inc.	Racal InterLan	Racal InterLan
Product	Intersect 1.0a	8029	INX400 Series Local Bridge	INX400 Series Remote Bridge
Characteristics LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Minimum Memory (bytes) Operation	256K Local	256K Local	896K Local	None identified Remote
Throughput Rate (packets/sec.)	8,000	12,500	12,000	8,000
Filter Rate (packets/sec.)	22,000	25,000	23,000	14,880
Configuration	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Optical fiber; Standard Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial
Pricing/Support Price (\$)	1,495	3,095	3,195	10,400, max. price is 14,900
Date of First Delivery Standard Warranty Service Supplied by	September 1990 30 days Vendor	June 1989 1 year Vendor	January 1991 1 year Vendor	January 1991 1 year Vendor
Comments	802.3 Media Access Control Layer Bridge designed for existing PC with 2 Ethernet boards provided; supports 802.1 Spanning Tree and access control using a permanent database.			

Vendor	Racal-Milgo	Raycom Systems, Inc.	Raycom Systems, Inc.	Retix
<b>Product</b>	<b>RACALAN NetExpress</b>	<b>Bridge + Fiber</b>	<b>Bridge + 1.5</b>	<b>2244 Local LAN Bridge</b>
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet; Starlan	Ethernet; Starlan	Ethernet; Starlan
Minimum Memory (bytes) Operation	None identified Local; Remote	256K Remote	256K Remote	512K Local
Throughput Rate (packets/sec.)	30,000	6,000	3,200	8,400
Filter Rate (packets/sec.)	75,000	16,000	16,000	12,000
Configuration	Automatic (learning bridge)	Automatic (learning bridge), manual	Automatic (learning bridge), manual	Automatic (learning bridge)
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Optical fiber; Standard Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
<b>Pricing/Support</b>				
Price (\$)	5,890, max. price is 25,000	5,550	6,975	1,950
Date of First Delivery	October 1990	June 1988	June 1988	March 1988
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Third party; vendor	Third party; vendor	Third party
<b>Comments</b>		Works over standard fibers at 10M bps.		

Vendor	Retix	Retix	Retix	Retix
<b>Product</b>	<b>2265 Local LAN Bridge</b>	<b>4660 Local LAN Bridge</b>	<b>4820 Remote LAN Bridge</b>	<b>4880 High Performance Remote LAN Bridge</b>
<b>Characteristics</b>				
LANs Supported	Ethernet; Starlan	Ethernet	Ethernet	Ethernet
Minimum Memory (bytes) Operation	512K Local	1M Local	1M Remote	2M Remote
Throughput Rate (packets/sec.)	8,400	13,650	870	8,000
Filter Rate (packets/sec.)	12,000	29,000	9,000	14,880
Configuration	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)
Media Supported	Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial
<b>Pricing/Support</b>				
Price (\$)	2,650	3,750	4,950	10,400
Date of First Delivery	March 1988	September 1990	January 1989	January 1989
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Third party	Third party	Third party	Third party
<b>Comments</b>				

Vendor	The Santa Cruz Operation, Inc.	Ship Star Assoc.	Symciron, Inc.	SynOptics Communications, Inc.
<b>Product</b>	TCP/IP	LB 8323	Symbridge-S	Local Bridge 3323
<b>Characteristics</b>	LANs Supported			
	Ethernet; Starlan; Token-Ring	Ethernet	Arcnet; Ethernet; Token-Ring	Ethernet
Minimum Memory (bytes)	2M	None identified	512K	None identified
Operation	Local, remote	Local	Remote	Local
Throughput Rate (packets/sec.)	None identified	14,000	None identified	14,000
Filter Rate (packets/sec.)	None identified	25,000	None identified	29,000
Configuration	Manual	Automatic (learning bridge)	Manual	Automatic (learning bridge)
Media Supported	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial	Broadband coaxial; Standard Ethernet coaxial; Thin Ethernet coaxial	None identified	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair
<b>Pricing/Support</b>	Price (\$)			
	695	5,665, max. price is 6,085	2,595	See comments
Date of First Delivery	December 1988	June 1990	May 1990	1990
Standard Warranty	30 days	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Meets IEEE 802.3 & IEEE 802.1 Standards.		Comprises X.25 card for PC or PS/2 and software; supports Novell Netware V2.15 revision C or later.	Contact vendor for pricing information.

Vendor	SynOptics Communications, Inc.	3Com Corp.	3Com Corp.	3Com Corp.
<b>Product</b>	Remote Bridge 3356	IB/1	IB/2000	IB/3
<b>Characteristics</b>	LANs Supported			
	Ethernet	Ethernet	Ethernet	Ethernet
Minimum Memory (bytes)	None identified	1.5M	2.5M	1.5M
Operation	Remote	Local	Local	Remote
Throughput Rate (packets/sec.)	8,000	6,200	9,500	None identified
Filter Rate (packets/sec.)	15,000	17,000	19,200	None identified
Configuration	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)
Media Supported	Optical fiber; Shielded twisted-pair; Standard Ethernet coaxial; Thin Ethernet coaxial; Unshielded twisted-pair	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Broadband coaxial; Standard Ethernet coaxial
<b>Pricing/Support</b>	Price (\$)			
	See comments	9,100	4,995	7,500
Date of First Delivery	August 1990	1987	March 1989	1987
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Contact vendor for pricing information.			

Vendor	TRW	TRW	TRW	TRW
Product	NB2000-ENEN	NB2000-ENEX	NB2000-ENT1	NB2010
<b>Characteristics</b>				
LANs Supported	Ethernet	Broadband; Ethernet	Ethernet	Ethernet
Minimum Memory (bytes) Operation	None identified Local	None identified Local	None identified Remote	None identified Local
Throughput Rate (packets/sec.)	5,000	3,000	2,800	13,000
Filter Rate (packets/sec.)	8,000	8,000	8,000	24,000
Configuration	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)
Media Supported	Standard Ethernet coaxial; Thin Ethernet coaxial	Broadband coaxial; Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial	Standard Ethernet coaxial; Thin Ethernet coaxial
<b>Pricing/Support</b>				
Price (\$)	5,395	5,395	9,640	5,000
Date of First Delivery	None identified	None identified	None identified	February 1990
Standard Warranty	90 days	90 days	90 days	90 days
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Supports Ethernet or thin Ethernet (switch-selectable).	Supports Ethernet or thin Ethernet.	Supports Ethernet or thin Ethernet.	Supports Ethernet or thin Ethernet.

Vendor	Ungermann-Bass, Inc.	Ungermann-Bass, Inc.	Ungermann-Bass, Inc.	Ungermann-Bass, Inc.
Product	ASM 5300	ASM-5550	ASM-5560	ASM-6300
<b>Characteristics</b>				
LANs Supported	Ethernet	Token-Ring	Ethernet; FDDI	Ethernet
Minimum Memory (bytes) Operation	1M Local	1M Local	1M Local	1M Remote
Throughput Rate (packets/sec.)	6,000	4,500	4,000	7,600
Filter Rate (packets/sec.)	8,000	None identified	9,000	9,000
Configuration	Automatic (learning bridge)	Manual	Automatic (learning bridge)	Automatic (learning bridge)
Media Supported	Broadband coaxial; Standard Ethernet coaxial	Shielded twisted-pair; Token-Ring; Unshielded twisted-pair	Standard Ethernet coaxial	Broadband coaxial; Standard Ethernet coaxial
<b>Pricing/Support</b>				
Price (\$)	3,950	5,250	25,000	4,195
Date of First Delivery	October 1990	October 1989	October 1989	October 1989
Standard Warranty	90 days	90 days	90 days	90 days
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Hot swap bridge card for Access/One.	Hot swap bridge card for Access/One.	Hot swap Ethernet-FDDI bridge for Access/One.	Remote bridge card for Access/One.

Vendor	Ungermann-Bass, Inc.	Ungermann-Bass, Inc.	Vitalink Communications Corp.	Vitalink Communications Corp.
<b>Product</b>	<b>ASM-6500</b>	<b>BR3300</b>	<b>TransLAN 320</b>	<b>TransLAN 350</b>
<b>Characteristics</b>				
LANs Supported	Token-Ring	Ethernet	Ethernet	Ethernet
Minimum Memory (bytes)	1M	512K	1M	2M
Operation	Remote	Local	Remote	Remote
Throughput Rate (packets/sec.)	7,600	6,000	None identified	None identified
Filter Rate (packets/sec.)	None identified	9,000	15,000	15,000
Configuration	Manual	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)
Media Supported	Shielded twisted-pair; Unshielded twisted-pair	Broadband coaxial; Standard Ethernet coaxial	Standard Ethernet coaxial	Standard Ethernet coaxial
<b>Pricing/Support</b>				
Price (\$)	5,250	9,450	7,000	16,500
Date of First Delivery	October 1989	January 1988	None identified	None identified
Standard Warranty	90 days	90 days	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>				Upgradable to bridge/router.

Vendor	Vitalink Communications Corp.	Vitalink Communications Corp.	Vitalink Communications Corp.	Wang Laboratories, Inc.
<b>Product</b>	<b>TransLAN III</b>	<b>TransRing 530</b>	<b>TransRing 550</b>	<b>8023-Bridge</b>
<b>Characteristics</b>				
LANs Supported	Ethernet	Token-Ring	Ethernet	Ethernet
Minimum Memory (bytes)	1M	2M	2M	None identified
Operation	Remote	Remote	Remote	Local
Throughput Rate (packets/sec.)	None identified	None identified	None identified	13,600
Filter Rate (packets/sec.)	15,000	20,000	20,000	30,000
Configuration	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)	Automatic (learning bridge)
Media Supported	Standard Ethernet coaxial	IEEE 802.5 interface	IEEE 802.5 interface	Standard Ethernet coaxial
<b>Pricing/Support</b>				
Price (\$)	11,500	9,000	13,500	3,900
Date of First Delivery	None identified	None identified	None identified	December 1990
Standard Warranty	1 year	1 year	1 year	90 days
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>		Upgradable to router/ transparent bridge.	Upgradable to router/ transparent bridge.	

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<b>Vendor</b>	<b>Wang Laboratories, Inc.</b>
<b>Product</b>	<b>8023-WB5</b>
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<b>Characteristics</b>	
LANs Supported	Broadband; Ethernet
Minimum Memory (bytes)	None identified
Operation	Local
Throughput Rate (packets/sec.)	13,600
Filter Rate (packets/sec.)	30,000
Configuration	Automatic (learning bridge)
Media Supported	Broadband coaxial; Standard Ethernet coaxial

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<b>Pricing/Support</b>	
Price (\$)	6,500
Date of First Delivery	December 1990
Standard Warranty	90 days
Service Supplied by	Vendor

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**Comments**

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## Routers/Brouters Comparison Column Entry Descriptions

Routers interconnect networks in much the same way as bridges. The difference is that routers use more sophisticated software that determines preferred paths. We have tried to fit each product to the specifications listed, to provide an accurate representation of that product's capabilities. Our survey form provided each vendor with a number of choices for each parameter listed. Space was provided to write in an answer when the proper choices for that vendor were not listed. (Please note that some vendors offer products that they call "brouters"—combination bridge/routers. These products are also covered in this section.)

**Vendor and Model.** This entry lists the manufacturer and model number or name of each device.

### **Characteristics**

**LANs Supported.** Vendors selected Ethernet, token-ring, Arcnet, Starlan, Appletalk, FDDI, or

Other. Ethernet is a baseband carrier sense multiple access with collision detection (CSMA/CD) network that operates at 10M bps. Token-Ring refers to a LAN designed with a ring topology that uses the token-passing technique. Arcnet is a token-passing network that uses a star or bus topology and runs at 2.5M bps. Starlan is a CSMA star topology LAN that uses unshielded twisted-pair wiring with either 1M bps or 10M bps transmission speed. AppleTalk is Apple's Macintosh networking protocol that can run on most industry-standard networking schemes. FDDI stands for Fiber Distributed Data Interface and can be a 100M bps fiber optic network.

**Protocols Supported.** A protocol is a set of procedures that establish, maintain, and control communications. Protocols include Transmission Control Protocol/Internet Protocol (TCP/IP), Xerox Network Systems (XNS),

DECnet (Digital Equipment Corp.'s network), Open Systems Interconnection/Connectionless Network Service (OSI/CLNS), Novell's Internetwork Packet Exchange Protocol (IPX), and AppleTalk (Apple Computer).

**Routing Protocols Supported.** Routing protocols are the rules for directing data message packets from source nodes to destination nodes. The two most widely used are Routing Information Protocol (RIP) and Open Shortest Path First (OSPF).

**Wide Area Network Interfaces.** A wide area network (WAN) covers hundreds or thousands of miles via lines supplied by a common carrier, usually a telephone company. In this entry, vendors indicated if their products connect with WANs.

**SNMP Network Management.** Vendors answered whether they offered network management based on the Simple Network Management Protocol (SNMP).

**SNMP Management Stations.** Vendors answered whether they support SNMP management stations, which can be user

workstations, virtual consoles, or file server consoles.

**Throughput Rate, Packets per Second.** This entry refers to the rates at which information is processed or communicated.

**Maximum Number of Network Interfaces Supported.** Interfaces are the connection points between devices. This entry indicates the highest number of network interfaces supported by the router/brouter.

**Pricing/Support Price (\$).** The basic price of the unit, excluding any options, is noted here.

**Date of First Delivery.** The date the vendor first delivered the product to market.

**Standard Warranty.** Vendors indicated the length of their warranties.

**Serviced Supplied by.** The vendor usually offers service on an on-site or factory repair/return basis. In some cases, a dealer or third party provides service.

**Comments.** In this space, vendors listed special characteristics of their products, such as additional capabilities, features, or software not covered in the column.

Vendor	Advanced Computer Communications	Advanced Computer Communications	Allen-Bradley Co., Inc.	Allen-Bradley Co., Inc.
Product	Series 2000	Series 4000	LAN/1	LAN/1-6620-BHA
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Arcnet	Arcnet
Protocols Supported	TCP/IP	DECnet; IPX; TCP/IP; XNS	Proprietary LAN/1	Proprietary LAN/1
Routing Protocols Supported	RIP	OSPF; RIP	None identified	None identified
Wide Area Network Interface	56K-byte T1 service; DDN X.25; PDN X.25	56K-byte T1 service; DDN X.25; PDN X.25	None identified	None identified
SNMP Network Management	Yes	Yes	No	No
SNMP Management Stations	Yes	Yes	No	No
Throughput Rate (packets per second)	12,500	10,000	None identified	None identified
Max. Network Interfaces Supported	See comments	4	256	256
<b>Pricing/Support</b>				
Price (\$)	3,250	5,500	See comments	See comments
Date Available	November 1990	August 1989	1990	1989
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Third party; vendor	Third party; vendor	Vendor	Vendor
<b>Comments</b>	Unlimited network interfaces supported.		Contact vendor for pricing information.	Contact vendor for pricing information.

Vendor	Apple Computer, Inc.	APT Communications	AT&T	AT&T
Product	AppleTalk Internet Router	ComTalk	StarGROUP Software X.25 Router Program	StarWAN Multi-Protocol Brouter
<b>Characteristics</b>				
LANs Supported	Arcnet; Ethernet; LocalTalk; Token-Ring	AppleTalk; Ethernet; Token-Ring	Ethernet; Token-Ring	Ethernet
Protocols Supported	AppleTalk	AppleTalk	OSI/CLNS	AppleTalk; DECnet; IPX; OSI/CLNS; TCP/IP; XNS
Routing Protocols Supported	AppleTalk Phase2 RTMP	AppleTalk RTMP/ZIP	None identified	IGRP; RIP
Wide Area Network Interface	None identified	56K-byte T1 service; PDN X.25	56K-byte T1 service; PDN X.25	56K-byte T1 service; PDN X.25
SNMP Network Management	No	Yes	No	No
SNMP Management Stations	No	No	No	No
Throughput Rate (packets per second)	1,000	None identified	None identified	None identified
Max. Network Interfaces Supported	8	7	None identified	None identified
<b>Pricing/Support</b>				
Price (\$)	399	3,250	1,675, max. price is 1,975	12,000
Date Available	None identified	October 1989	March 1989	May 1990
Standard Warranty	90 days	90 days	90 days	90 days
Service Supplied by	Dealer; third party	Vendor	Vendor	Vendor
<b>Comments</b>	Software product that runs in the background of a Macintosh Plus through Macintosh II fx; provides local management display for traffic and statistics.	Available with multiple LAN/WAN port configurations; TCP/IP gateway software included; WAN ports support synchronous 56K bps-1.544M bps lines or X.25 networks.	Software-based router for AT&T StarGroup.	Network management in future releases.

<b>Vendor</b>	CASE/Datatel, Inc.	cisco Systems, Inc.	cisco Systems, Inc.	cisco Systems, Inc.
<b>Product</b>	6440	AGS	AGS+	CGS
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet; Token-Ring	Ethernet; FDDI; Token-Ring	Ethernet
Protocols Supported	OSI/CLNS	AppleTalk; DECnet; IPX; OSI; TCP/IP; XNS	AppleTalk; DECnet; IPX; OSI; TCP/IP; XNS	AppleTalk; DECnet; IPX; OSI; TCP/IP; XNS
Routing Protocols Supported	None identified	IGRP; RIP	IGRP; RIP	IGRP; RIP
Wide Area Network Interface	56K-byte T1 service; PDN X.25	56K-byte T1 service; DDN X.25; PDN X.25	56K-byte T1 service; DDN X.25; PDN X.25	56K-byte T1 service; DDN X.25; PDN X.25
SNMP Network Management	No	Yes	Yes	Yes
SNMP Management Stations	No	Yes	Yes	Yes
Throughput Rate (packets per second)	None identified	20,000	20,000	20,000
Max. Network Interfaces Supported	8 remote	16	32	4
<b>Pricing/Support</b>				
Price (\$)	2,350	15,000, max. price is 35,000	15,000, max. price is 40,000	8,000, max. price is 12,000
Date Available	December 1988	1986	April 1990	1988
Standard Warranty	1 year	1 year; 90 days	1 year; 90 days	1 year; 90 days
Service Supplied by	Vendor	Third party	Third party	Third party
<b>Comments</b>		Supports routing for all protocols and concurrent bridging. IGRP is cisco's routing protocol which is in use in over 10,000 routers worldwide.	Supports routing for all protocols and concurrent bridging. IGRP is cisco's routing protocol which is in use in over 10,000 routers worldwide.	Supports routing for all protocols and concurrent bridging. IGRP is cisco's routing protocol which is in use in over 10,000 routers worldwide.
<b>Vendor</b>	cisco Systems, Inc.	cisco Systems, Inc.	CMC	Compatible Systems Corp.
<b>Product</b>	IGS	MGS	DRN-3200 Ethernet-to-DDN Router	Ether*Route
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet; Token-Ring	DDN; Ethernet	AppleTalk; Ethernet
Protocols Supported	AppleTalk; DECnet; IPX; OSI; TCP/IP; XNS	AppleTalk; DECnet; IPX; OSI; TCP/IP; XNS	TCP/IP	AppleTalk; TCP/IP
Routing Protocols Supported	IGRP; RIP	IGRP; RIP	EGP	RIP; RTMP
Wide Area Network Interface	56K-byte T1 service; DDN X.25; PDN X.25	56K-byte T1 service; DDN X.25; PDN X.25	DDN X.25	None identified
SNMP Network Management	Yes	Yes	Yes	No
SNMP Management Stations	Yes	Yes	No	No
Throughput Rate (packets per second)	6,000	20,000	None identified	220
Max. Network Interfaces Supported	2	8	3	3
<b>Pricing/Support</b>				
Price (\$)	4,995	12,500, max. price is 30,000	11,900, max. price is 18,900	1,495, max. price is 1,895
Date Available	November 1990	1987	None identified	November 1990
Standard Warranty	1 year	1 year; 90 days	1 year; 90 days	1 year
Service Supplied by	Third party; vendor	Third party	Vendor	Vendor
<b>Comments</b>	Offers full software support of its high-end routed bridges. At \$4995 the IGS offers routing support for 12 protocols, comes with multiple routine, protocols, and has a \$450 concurrent bridging option. The remote IGS, priced at \$5495 supp. synchronous.	Supports routing for all protocols and concurrent bridging. IGRP is cisco's routing protocol which is in use in over 10,000 routers worldwide.	An Ethernet-to-DDN Router designed to connect Ethernet TCP/IP local area networks to the Defense Data Network (DDN). Comes with two 10MHz microprocessors, 604KB or dynamic RAM and a DDN standard X.25 of 1822 DDN interface.	4 mods avail.: Ether*Route supports thin/thick Ethernet; Ether*Route Twisted Pr supports 10BaseT/thick Ethernet; Ether*Route/TLP supports thin/thick Ethernet with TLP/IP support; Ether*Route/TLP Twisted Pr supports 10BaseT/thick Ethernet with RP/IP supp.

Vendor	CrossComm Corp.	Digital Equipment Corp.	Eicon Technology Corp.	Eicon Technology Corp.
<b>Product</b>	<b>ILAN Internetworking Server</b>	<b>DECrouter 2000</b>	<b>NetBIOS Bridges</b>	<b>NetWare Bridges</b>
<b>Characteristics</b>				
LANs Supported	Ethernet; Starlan; Token-Ring	Ethernet	Arcnet; Ethernet; FDDI; NET- BIOS; Starlan; Token-Ring	Arcnet; Ethernet; FDDI; Starlan; Token-Ring
Protocols Supported	None identified	DECnet	NETBIOS	IPX; SPX
Routing Protocols Supported	None identified	None identified	NETBIOS	Proprietary
Wide Area Network Interface	56K-byte T1 service	56K-byte T1 service; DDN X.25	56K-byte T1 service; DDN X.25; PDN X.25	56K-byte T1 service; DDN X.25; PDN X.25
SNMP Network Management	Yes	No	No	No
SNMP Management Stations	None identified	No	No	No
Throughput Rate (packets per second)	Not available	None identified	70	70
Max. Network Interfaces Supported	4	None identified	128	11
<b>Pricing/Support</b>				
Price (\$)	6,000, max. price is 13,000	13,230	See comments	See comments
Date Available	November 1987	None identified	March 1988	August 1987
Standard Warranty	90 days	1 year	1 year	1 year
Service Supplied by	None identified	Vendor	Dealer; third party; vendor	Dealer; third party; vendor
<b>Comments</b>			Connect 2 or more remote Net- BIOS compat. LANs. Provide transparent LAN-to-LAN con- nections for access to remote resources; uses an EiconCard to support up to 254 simul. sessions on any NetBIOS compati- ble LAN. Contact vendor for pricing information.	Contact vendor for pricing infor- mation. Connect 2 or more Nov- ell LANs and isolated PCs to- gether over leased lines and X.25 packet switched data net- works.
Vendor	Fibermux Corp.	Fibronics International Inc.	Gateway Communications, Inc.	Gateway Communications, Inc.
<b>Product</b>	<b>FX5520Z</b>	<b>FX8310</b>	<b>G/Remote Bridge</b>	<b>G/Remote Bridge 64</b>
<b>Characteristics</b>				
LANs Supported	Ethernet; FDDI	FDDI	Arcnet; Ethernet; Token-Ring	Arcnet; Ethernet; Token-Ring
Protocols Supported	TCP/IP	TCP/IP	IPX	IPX
Routing Protocols Supported	RIP	None identified	NetWare Core Protocol	NetWare Core Protocol
Wide Area Network Interface	None identified	56K-byte T1 service	DDN X.25; PDN X.25	56K-byte T1 service; DDN X.25; PDN X.25
SNMP Network Management	None identified	Yes	No	No
SNMP Management Stations	None identified	No	No	No
Throughput Rate (packets per second)	None identified	None identified	100	250
Max. Network Interfaces Supported	3	2	32	128
<b>Pricing/Support</b>				
Price (\$)	22,000, max. price is 27,000	24,000	2,990	4,495
Date Available	October 1989	None identified	February 1986	April 1989
Standard Warranty	1 year	90 days	1 year	1 year
Service Supplied by	Vendor	Vendor	Dealer	Dealer
<b>Comments</b>	Can be configured as a trans- parent, translating bridge; the choice is up to the network ad- ministrator during bring-up time.		Price shown is for 2 links.	Price shown is for 2 links.

Vendor	General DataComm, Inc.	Halley Systems, Inc.	Halley Systems, Inc.	Hewlett-Packard Co.
Product	MEGA*BRIDGE	ConnectLAN 100	ConnectLAN 200	HP 27270A
<b>Characteristics</b>				
LANs Supported	Ethernet; Starlan; Token-Ring	Ethernet	Token-Ring	Ethernet; Token-Ring
Protocols Supported	DECnet; OSI; TCP/IP; XNS	AppleTalk; DECnet; IPX; OSI; TCP/IP; XNS	AppleTalk; DECnet; IPX; OSI; SNA; TCP/IP; XNS	AppleTalk; DECnet; IPX; TCP/IP; XNS
Routing Protocols Supported	STP	None identified	None identified	RIP
Wide Area Network Interface	56K-byte T1 service	56K-byte T1 service	56K-byte T1 service	56K-byte T1 service; DDN X.25; PDN X.25
SNMP Network Management	Yes	No	No	Yes
SNMP Management Stations	Yes	No	No	Yes
Throughput Rate (packets per second)	7,000	2,300	None identified	None identified
Max. Network Interfaces Supported	4	None identified	None identified	16
<b>Pricing/Support</b>				
Price (\$)	6,000, max. price is 15,000	6,495, max. price is 11,500	6,995, max. price is 11,500	13,000
Date Available	None identified	December 1989	December 1989	July 1990
Standard Warranty	None identified	1 year	1 year	90 days
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Transparent to all Ethernet protocols (DecNet, TCP/IP, XNS, OSI, LAT, TOP, etc); all AT&T protocols, NetWare and other standard network layer protocols forwards IBM, 3Com, Novell TCP/IP and other token ring protocols.	A high-performance local and remote bridge/router (Brouter); this device combines both local and remote Ethernet or IEEE 802.3 LANs into a single wide-area network.	A series of high-performance brouter (bridge/router) products capable of interconnecting geographically-dispersed Token Ring/IEEE 802.5 local area networks.	Price shown is for 2-port version.

Vendor	Interlink Computer Sciences, Inc.	Interlink Computer Sciences, Inc.	Mitek OpenConnect Systems, Corp.	NCR Corp.
Product	SNS/BR340	SNS/BR380	OpenConnect/IP Router	ONS 3320
<b>Characteristics</b>				
LANs Supported	Ethernet; Token-Ring	Ethernet; Token-Ring	Ethernet	AppleTalk; Ethernet; FDDI; Starlan; Token-Ring
Protocols Supported	DECnet; IPX; TCP/IP; XNS	DECnet; IPX; TCP/IP; XNS	SNA; TCP/IP	AppleTalk; DECnet; IPX; OSI; SNA; TCP/IP; X.25; XNS
Routing Protocols Supported	RIP	RIP	Transparent routing	ARP; EGP; IP/ICMP; OSI; OSPF; RIP; UDP; XNS Router
Wide Area Network Interface	56K-byte T1 service; DDN X.25; PDN X.25	56K-byte T1 service; DDN X.25; PDN X.25	56K-byte T1 service; DDN X.25; PDN X.25	56K-byte T1 service; DDN X.25; PDN X.25
SNMP Network Management	Yes	Yes	Yes	Yes
SNMP Management Stations	Yes	Yes	No	Yes
Throughput Rate (packets per second)	12,000	12,000	None identified	9,281
Max. Network Interfaces Supported	3	8	127	12
<b>Pricing/Support</b>				
Price (\$)	8,400	See comments	2,495	1,125
Date Available	March 1990	March 1990	May 1990	April 1991
Standard Warranty	1 year	1 year	90 days	1 year
Service Supplied by	Dealer; third party; vendor	Dealer; third party; vendor	Dealer; third party; vendor	Vendor
<b>Comments</b>		Contact vendor for pricing information.	Software routing for OpenConnect/ Server SNA gateway. Uses SNA as the wide area network.	Routing is an orderable feature on an ONS system; in general, ONS 3320s range from \$20,000 to \$60,000 for a fully configured system.

Vendor	NCR Corp.	Network Resources Corp.	Network Systems Corp.	Newport Systems Solutions, Inc.
<b>Product</b>	ONS 3445	MultiGate 2000	EN Series	LAN2LAN/64
<b>Characteristics</b>				
LANs Supported	AppleTalk; Ethernet; FDDI; Starlan; Token-Ring	Ethernet	AppleTalk; Ethernet; FDDI; Token-Ring	Arcnet; Ethernet; Starlan; Token-Ring
Protocols Supported	AppleTalk; DECnet; IPX; OSI; SNA; TCP/IP; X.25; XNS	AppleTalk; TCP/IP	AppleTalk; DECnet; HP Probe; HYPERchannel; IPX; TCP/IP; XNS	IPX
Routing Protocols Supported	ARP; EGP; IP/ICMP; OSI; OSPF; RIP; UDP; XNS Router	RIP; RTMP	OSPF; RIP	None identified
Wide Area Network Interface	56K-byte T1 service; DDN X.25; PDN X.25	None identified	56K-byte T1 service; PDN X.25	56K-byte T1 service
SNMP Network Management	Yes	Yes	Yes	No
SNMP Management Stations	Yes	No	Yes	No
Throughput Rate (packets per second)	27,843	None identified	14,000	None identified
Max. Network Interfaces Supported	57	2	50	4
<b>Pricing/Support</b>				
Price (\$)	1,000	2,395	Not Available	2,695
Date Available	April 1991	May 1989	None identified	September 1988
Standard Warranty	1 year	1 year	90 days	2 years
Service Supplied by	Vendor	Vendor	None identified	None identified
<b>Comments</b>	Routing is an orderable feature on an ONS system; in general, ONS 3445s range from \$35,000 to \$150,000 for a fully configured system.		Offer a family of high-performance bridges & routers for linking & managing LANs & WANs in an enterprise-wide network. Send packets of data to correct destination at very high speeds, & come with network mgmt & security features.	Supports 2 or 4 full duplex ports at speeds from 9.6 to 64 kbps over conventional phone lines, direct digital service or leased lines. Avail. in LSA & MCA config. NetWare 286 & 386 NLM ver. are incl. with every product. Field upgradable.
<b>Vendor</b>	Newport Systems Solutions, Inc.	Newport Systems Solutions, Inc.	Newport Systems Solutions, Inc.	Niwot Networks Inc.
<b>Product</b>	LAN2LAN/Compression Router	LAN2LAN/FT1 (fractional T1)	LAN2LAN/Mega	AT/SD
<b>Characteristics</b>				
LANs Supported	Arcnet; Ethernet; Starlan; Token-Ring	Arcnet; Ethernet; Starlan; Token-Ring	Arcnet; Ethernet; Starlan; Token-Ring	Arcnet; Ethernet; Starlan; Token-Ring
Protocols Supported	IPX	IPX	IPX	IPX
Routing Protocols Supported	None identified	None identified	None identified	None identified
Wide Area Network Interface	56K-byte T1 service	56K-byte T1 service	56K-byte T1 service	None identified
SNMP Network Management	No	No	No	No
SNMP Management Stations	No	No	No	No
Throughput Rate (packets per second)	None identified	None identified	None identified	None identified
Max. Network Interfaces Supported	2	4	2	None identified
<b>Pricing/Support</b>				
Price (\$)	4,195	4,095	5,395.00	3,500
Date Available	October 1990	February 1990	September 1988	November 1990
Standard Warranty	2 years	2 years	2 years	1 year
Service Supplied by	None identified	None identified	None identified	Vendor
<b>Comments</b>	Allows users to increase the throughput of their LAN-to-LAN communications of lines without increasing line speeds or incurring higher line costs. Employs a proprietary compression algorithm which achieves an average ratio of 4:1, data depend.	Supports four full duplex ports at speeds from 9.6 to 768Kbps. Product is upgradeable with compression or to full T1 capacity. Available in both ISA and MCA versions. NetWare 286 and NetWare 386 NLM versions are included with every product.	Supports two full duplex ports at speeds from 9.6Kbps to 2.048Mbps. Aggregate speeds on both ports are limited to a total of 6.176Mbps. All products are available in ISA and MCA versions. NetWare 286 and NetWare 386 NLM versions are included.	A bus master card to eliminate "double-shuffle" on data transfers. Supports full ISDN suite of services. Data rates of 56K to 2.048M (CEPT) clockable from synchronous input.

Vendor	Niwot Networks	Niwot Networks	Niwot Networks	Novell, Inc.
<b>Product</b>	AT/SYNC	AT/T1	AT/T1D	NetWare Async Remote Bridge
<b>Characteristics</b>				
LANs Supported	Arcnet; Ethernet; Starlan; Token-Ring	Arcnet; Ethernet; Starlan; Token-Ring	Arcnet; Ethernet; Starlan; Token-Ring	Ethernet; Token-Ring; all topologies by NetWare V2.1 or higher
Protocols Supported	IPX	IPX	IPX	IPX
Routing Protocols Supported	None identified	None identified	None identified	RIP
Wide Area Network Interface	None identified	None identified	None identified	Async
SNMP Network Management	No	No	No	No
SNMP Management Stations	No	No	No	No
Throughput Rate (packets per second)	None identified	1544000	None identified	None identified
Max. Network Interfaces Supported	None identified	None identified	None identified	3
<b>Pricing/Support</b>				
Price (\$)	3,500	3,500	3,500	395
Date Available	February 1989	November 1988	December 1990	June 1988
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Dealer; third party; vendor
<b>Comments</b>	Point-to-point synchronous communication link that will clock to the selected line speed from 56K up to and including 2.048M (CEPT).	Point-to-Point T-1 connections. Board does own D4 framing for T1. Can be used on private microwave infrared; private lines without a CSU/DSU or with common carriers (ATT, MCI, etc.) with CSU (no DSU required).	Supports ISDN Primary Rate Service; full T1 and fractional T1; supports D4, ESF framing, and AMI, B825 coding; designed for switched 3B4, switched 768 service.	Requires Novell WNIM+ or IBM Com1/Com2; supports 9600-19.2Kbps with WNIM+ and 2400 with comm port alone.

Vendor	Novell, Inc.	Novell, Inc.	Novell, Inc.	NTI Group, Inc.
<b>Product</b>	NetWare Link/64	NetWare Link/T1	NetWare Link/X.25	NTI 3000 Router
<b>Characteristics</b>				
LANs Supported	All topologies by NetWare V2.1 or higher; Ethernet; Token-Ring	Ethernet; Token-Ring; all topologies by NetWare V2.1 or higher	All topologies by NetWare V2.1 or higher	Desnet; Ethernet
Protocols Supported	IPX; NETBIOS interface	IPX; NETBIOS interface	IPX; X.25	TCP/IP
Routing Protocols Supported	RIP	RIP	RIP	OSPF
Wide Area Network Interface	64K byte; FT1	9600-2.048Mbps T1 service	9600-64Kbps; PDN X.25	56K-byte T1 service; PDN X.25
SNMP Network Management	No	No	No	Yes
SNMP Management Stations	No	No	No	None identified
Throughput Rate (packets per second)	13	320	None identified	None identified
Max. Network Interfaces Supported	3	3	3	None identified
<b>Pricing/Support</b>				
Price (\$)	1,495	3,995	1,750	See comments
Date Available	December 1989	December 1989	December 1989	None identified
Standard Warranty	1 year	1 year	1 year	90 days
Service Supplied by	Dealer; third party; vendor	Dealer; third party; vendor	Dealer; third party; vendor	Vendor
<b>Comments</b>	Requires Synchronous/+ Adapter; supports 2 ports per board.	Requires Synchronous/+ Adapter; supports 9600 to 2.048Mbps and 2 ports per board.	Requires Novell X.25 extended Adapter.	Contact vendor for pricing information.

Vendor	Phaser Systems, Inc.	Promptus Communications, Inc.	Proteon, Inc.	Proteon, Inc.
<b>Product</b>	<b>SNA Router 286 &amp; 386</b>	<b>T-1 LanRouter</b>	<b>p4100+</b>	<b>p4200 FDDI Router</b>
<b>Characteristics</b>				
LANs Supported	Ethernet; Token-Ring	AppleTalk; Arcnet; Ethernet; FDDI; Starlan; Token-Ring	AppleTalk; Ethernet; ProNET-10; Token-Ring	Ethernet; FDDI; Token-Ring
Protocols Supported	IPX; SNA/SDLC	IPX	Apollo Domain; AppleTalk; DECnet; IPX; OSI; TCP/IP; XNS	Apollo Domain; AppleTalk; DECnet; IPX; OSI; TCP/IP; XNS
Routing Protocols Supported	None identified	None identified	OSPF	OSPF; RIP
Wide Area Network Interface	56K-byte T1 service	56K-byte T1 service	56K-byte T1 service; DDN X.25; PDN X.25	DDN X.25; PDN X.25
SNMP Network Management	No	No	Yes	Yes
SNMP Management Stations	No	No	None identified	None identified
Throughput Rate (packets per second)	None identified	None identified	5,000	5,000
Max. Network Interfaces Supported	None identified	4	4	14
<b>Pricing/Support</b>				
Price (\$)	See comments	5,900	6,900, max. price is 9,900	7,900, max price is 14,950
Date Available	June 1989	April 1990	January 1989	June 1987
Standard Warranty	None identified	1 year	90 days	90 days
Service Supplied by	Vendor	Dealer	Vendor	Vendor
<b>Comments</b>	Contact vendor for pricing information. Enables Novell NetWare LAN's to communicate across established SNA wide area network.	LAN interconnect system for Novell NetWare LANS; built-in DSU/CSU allow direct connection to T1 services, no external equip. required.	Offers 16Mbps backbone capability, source routing and spanning tree bridging.	
Vendor	Retix	The Santa Cruz Operation, Inc.	Shiva	Shiva
<b>Product</b>	<b>4942 Remote Bridge/Router</b>	<b>TCP/IP</b>	<b>NetBridge</b>	<b>TeleBridge</b>
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet; FDDI; Token-Ring	AppleTalk	AppleTalk
Protocols Supported	All protocols-bridged/TCP/IP-routed; TCP/IP	TCP/IP	AppleTalk	AppleTalk
Routing Protocols Supported	RIP; STP/Adaptive Routing	RIP	RTMP	RTMP
Wide Area Network Interface	56K-byte T1 service	DDN X.25	None identified	None identified
SNMP Network Management	Yes	Yes	No	No
SNMP Management Stations	Yes	No	No	No
Throughput Rate (packets per second)	8,000	None identified	Does not apply	Does not apply
Max. Network Interfaces Supported	2	None identified	2	2
<b>Pricing/Support</b>				
Price (\$)	10,900	695	499	499
Date Available	November 1990	December 1988	November 1988	January 1989
Standard Warranty	1 year	30 days	1 year	1 year
Service Supplied by	Third party	Vendor	Vendor	Vendor
<b>Comments</b>			Expands the efficiency of AppleTalk networks beyond the normal 32 users and allows large and efficient networks to be built. Combines various small networks into one complete internetwork; splits a saturated network into two.	Acts as a bridge between remote networks; AppleTalk systems, each with a TeleBridge and attached modem, can be linked over phone lines to form one continuous network.

Vendor	SynOptics Communications, Inc.	3Com Corp.	Tri-Data Corp.	Ungermann-Bass, Inc.
<b>Product</b>	3383	BR/2000	MaxWay 500	ASM-7100 MaxTalk
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	AppleTalk; Ethernet; FDDI; Token-Ring	AppleTalk; Ethernet
Protocols Supported	AppleTalk; DECnet; IPX; OSI; TCP/IP; Total of 14 protocols; XNS	OSI/CLNS; TCP/IP; XNS	AppleTalk; IPX; TCP/IP	AppleTalk; TCP/IP
Routing Protocols Supported	IGRP; RIP	None identified	None identified	DDP, ZIP, other AppleTalk protocols
Wide Area Network Interface	None identified	None identified	None identified	None identified
SNMP Network Management	Yes	Yes	Yes	Yes
SNMP Management Stations	Yes	Yes	Yes	None identified
Throughput Rate (packets per second)	6,000	None identified	15,000	Does not apply
Max. Network Interfaces Supported	2	2	6	16
<b>Pricing/Support</b>				
Price (\$)	See comments	5,495	5,495	4,695
Date Available	December 1990	February 1990	June 1990	October 1989
Standard Warranty	1 year	1 year	120 days	90 days
Service Supplied by	Third party; vendor	Third party; vendor	Vendor	Vendor
<b>Comments</b>	Contact vendor for pricing information.			

Vendor	Ungermann-Bass, Inc.	Unisync Inc.	Vitalink Communications Corp.	Vitalink Communications Corp.
<b>Product</b>	BR3000	Unilinc LAN Communication Server	Transpath 530	Transpath 550
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet; Token-Ring	Token-Ring	Token-Ring
Protocols Supported	XNS	DECnet; IPX; TCP/IP	TCP/IP	TCP/IP
Routing Protocols Supported	RIP	Proprietary	OSPF	OSPF
Wide Area Network Interface	56K-byte T1 service	56K-byte T1 service; DDN X.25; PDN X.25	56K-byte T1 service	56K-byte T1 service
SNMP Network Management	No	No	Yes	Yes
SNMP Management Stations	No	No	Yes	None identified
Throughput Rate (packets per second)	2,600	200	None identified	None identified
Max. Network Interfaces Supported	1	8	1, 1-8 I/O ports	1, 1-8 I/O ports
<b>Pricing/Support</b>				
Price (\$)	9,700	2,100	9,000	13,000
Date Available	February 1988	None identified	None identified	None identified
Standard Warranty	90 days	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Also comes in bridge configuration.	Can run as part of Unisync's LAN Gateway Server.	Bridge/router.	Bridge/router.

Vendor	Vitalink Communications Corp.	Wellfleet Communications	Wellfleet Communications	Wellfleet Communications
Product	Transpath 350	Concentrator Node	Feeder Node	Link Node
<b>Characteristics</b>				
LANs Supported	Ethernet	AppleTalk; Ethernet; FDDI; Starlan; Token-Ring	AppleTalk; Ethernet; FDDI; Starlan; Token-Ring	AppleTalk; Ethernet; FDDI; Starlan; Token-Ring
Protocols Supported	TCP/IP	AppleTalk; DECnet; IPX; OSI; TCP/IP; X.25; XNS	AppleTalk; DECnet; IPX; OSI; TCP/IP; X.25; XNS	AppleTalk; DECnet; IPX; OSI; TCP/IP; X.25; XNS
Routing Protocols Supported	OSPF	IS-IS 1991; OSPF; RIP	IS-IS 1991; OSPF; RIP	IS-IS 1991; OSPF; RIP
Wide Area Network Interface	56K-byte T1 service	56K-byte T1 service; DDN X.25; PDN X.25	56K-byte T1 service; DDN X.25; PDN X.25	56K-byte T1 service; DDN X.25; PDN X.25
SNMP Network Management	Yes	Yes	Yes	Yes
SNMP Management Stations	None identified	Yes	Yes	Yes
Throughput Rate (packets per second)	None identified	14,000	14,000	14,000
Max. Network Interfaces Supported	1, 1-8 I/O ports	26, 52 WAN	26, 52 WAN	26, 52 WAN
<b>Pricing/Support</b>				
Price (\$)	16,500	14,000	8,995, max. price is 10,995	6,330
Date Available	None identified	November 1988	November 1988	November 1988
Standard Warranty	1 year	90 days	90 days	90 days
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Bridge/router.			

Vendor	Zenith Electronics Corp.
Product	Galaxy Exchange
<b>Characteristics</b>	
LANs Supported	AppleTalk; Ethernet; Token-Ring
Protocols Supported	AppleTalk; DECnet; IPX; OSI; TCP/IP; XNS
Routing Protocols Supported	Source Routing; Source Routing Transparent; Spanning Tree
Wide Area Network Interface	56K-byte T1 service
SNMP Network Management	Yes
SNMP Management Stations	Yes
Throughput Rate (packets per second)	None identified
Max. Network Interfaces Supported	4
<b>Pricing/Support</b>	
Price (\$)	4,995
Date Available	None identified
Standard Warranty	1 year
Service Supplied by	Vendor
<b>Comments</b>	Interface modules available for Ethernet, Token-Ring, Broadband, T1, and Leased Lines (at additional cost). The Galaxy Exchange is a protocol-transparent system.

## Gateways Comparison Column Entry Descriptions

Gateways are the most complex of the internet-working products currently gaining in popularity. Gateways vary from vendor to vendor and model to model, so a wide variety of product types exists. We have tried to fit each product to the specifications listed, to provide an accurate representation of that product's capabilities. Our survey form provided each vendor with a number of possible choices for each parameter listed. There was also a space to write in a specific answer when the proper choices for that vendor were not listed.

**Vendor and Model.** This entry lists the manufacturer and model number or name of each device.

### **Characteristics**

**LANs Supported.** This entry lists the LAN technologies the gateway will operate with. The most popular LAN technologies include Ethernet, Arcnet, token-ring, Starlan, AppleTalk, and FDDI. There

are also gateways available that operate with broadband LANs; these are generally supplied by broadband LAN vendors.

### **Protocols Supported.**

LAN gateways operate at the upper layers of the OSI Reference Model. They accomplish their gateway functions by translating the protocols used on dissimilar LANs. This parameter will tell you exactly which protocols the gateway can translate. Popular protocols include IBM Systems Network Architecture (SNA); X.25 (CCITT's packet-switching protocol); TCP/IP (Transmission Control Protocol/Internet Protocol, a protocol supported and standardized by the Department of Defense); XNS (Xerox Network Services); DECnet (Digital Equipment Corp.'s networking architecture); SDLC (IBM's Synchronous Data Link Control); and HDLC (the International Organization for Standardization's High-level Data Link Control).

### **Host Systems Supported.**

Many gateways provide a link between the LAN and a host computer. The most often supported hosts include IBM's 43XX and 30XX mainframe families, IBM's System/34/36/38 and AS/400 minicomputers, and Digital's VAX minicomputers.

**Operation.** Gateways can support local and/or remote operation.

### **Gateway Workstation.**

Many gateways must have a device on the LAN dedicated to the gateway function. Popular gateway workstations include the IBM PC/XT/AT family or IBM compatibles; the IBM PS/2 Models 30, 50, 60, and 80; or the Apple Macintosh. Not all gateways, however, require a dedicated workstation.

### **Minimum Memory, Bytes.**

This entry provides the minimum amount of memory, in bytes, that the gateway workstation requires for its operation.

### **Line Speeds Supported,**

**bps.** This entry provides the communication line speeds, in bits per second, that the gateway supports.

**API Support.** Many LAN gateways require a level of programming to operate effectively. In this

case, the application programming interface (API) supported by the gateway is critical. The most popular APIs are the IBM API, APPC/LU6.2, and DCA IRMA API. Many gateways provide a proprietary API.

### **Pricing/Support**

**Price (\$).** There are a number of gateway types currently on the market providing a wide range of functionality. Likewise, gateways are available in a wide range of prices. The price of a gateway often depends on the configuration, the number of LUs (logical units), or the number of users.

### **Date of First Delivery.**

This entry will tell you how long the product has been commercially available.

**Standard Warranty.** Warranties offered differ from vendor to vendor. Many offer one-year warranties; some offer less.

**Service Supplied by.** Increasingly, many products are now being serviced by the dealer or via a third-party service arrangement.

**Comments.** This entry includes space for any features, functions, or products not covered by the entries above.

Vendor	Able Computer Communications	Able Computer Communications	Able Computer Communications	Advanced Digital Corp.
<b>Product</b>	DE250	PL550	RG300	ADNet
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Lease line	Arcnet; Ethernet
Protocols Supported	TCP/IP	DECnet; LAT	AT&T/Paradyne; Case/Datatel	None identified
Host Systems Supported	UNIX	Digital VAX	Digital VAX	PC
Operation	Local	Local	Remote	Local
Gateway Workstation Supported	UNIX	DEC LAT	DEC	IBM PC/XT/AT or compatible; IBM PS/2 Model 30
Minimum Memory (bytes)	2M	2M	512K	128K
Line Speeds Supported (bps)	1M	1M	80K	None identified
API Support	Proprietary API	Proprietary API	Proprietary API	None identified
<b>Pricing/Support</b>				
Price (\$)	6,500	15,750	5,750	395
Date of First Delivery	November 1990	October 1988	December 1987	1989
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Third party; vendor	Third party; vendor	Vendor	Dealer; vendor
<b>Comments</b>	Supports full TCP/IP suite and SNMP network management; provides TCP/IP connection via Ethernet to Able async solutions.	Provides Ethernet connection to Able async connectivity devices.	Provides 2 high speed ports for wide area connectivity, and Ethernet access to CASE/Datatel and AT&T/Paradyne switch networks.	
Vendor	Applitek Corp.	Applitek Corp.	APT Communications	AST Research Inc.
<b>Product</b>	NI10/G-SNA Gateway	NI10/G-X.25 Gateway	ComTalk	AST-5250 Gateway Option
<b>Characteristics</b>				
LANs Supported	UniLAN	UniLAN	AppleTalk; Ethernet; Token-Ring	NETBIOS-compatible LANs
Protocols Supported	SNA	X.25	AppleTalk	NETBIOS interface
Host Systems Supported	IBM 3270 hosts	X.25 hosts	Digital VAX; UNIX; other TCP/IP hosts	IBM AS/400
Operation	Remote	Local; Remote	Local; Remote	Local; Remote
Gateway Workstation Supported	None identified	None identified	Apple Macintosh	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above 128K
Minimum Memory (bytes)	None identified	None identified	512K	
Line Speeds Supported (bps)	19.2K; 9.6K	19.2K; 56K; 64K; 9.6K	1.544M; 19.2K; 56K; 64K; 9.6K	9.6K
API Support	None identified	None identified	Mac TCP or compatible	IBM API
<b>Pricing/Support</b>				
Price (\$)	18,810	18,810	3,250	995
Date of First Delivery	1987	1986	October 1989	1986
Standard Warranty	90 days	90 days	90 days	2 years
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Allows asynchronous terminals and printers connected to a UniLAN to communicate with hosts running SNA; allows IBM PCs to emulate 3270 terminals and utilize the 3270-PC file transfer facility.	Allows connectivity between X.25 hosts over a UniLAN backbone and provides access to Public Data Networks; supports up to 8 19.2Kbps links; gateway contains X.3, X.28, X.29 CCITT PAD facility.	Available with multiple LAN/WAN port configurations; TCP/IP gateway software included; WAN ports support synchronous 56K bps-1.544M bps lines or X.25 networks.	

Vendor	AT&T	AT&T	AT&T	AT&T
<b>Product</b>	<b>Async Gateway Server</b>	<b>NAS Gateway-SBS</b>	<b>Remote PC Gateway</b>	<b>StarGROUP Software Asynchronous Gateway</b>
<b>Characteristics</b>				
LANs Supported	Ethernet; Starlan	Ethernet; Starlan	Ethernet; Starlan	Ethernet; Starlan; Token-Ring
Protocols Supported	IBM async protocols; ISO/OSI	SDLC; SNA	ISO/OSI	ISO
Host Systems Supported	AT&T ISN & System 75/85 modules	SNA mainframes	None identified	None identified
Operation	Remote	Remote	Remote	Local; Remote
Gateway Workstation Supported	AT&T 6380 WGS; IBM PC/XT/AT or compatible; IBM PS/2	AT&T 6380 WGS; IBM PC/XT/AT or compatible; IBM PS/2	AT&T 6386 WGS; IBM PC/XT/AT or compatible; IBM PS/2	AT&T 6386
Minimum Memory (bytes)	256K	256K	256K	4M
Line Speeds Supported (bps)	19.2K	19.2K	9.6K	19.2K; 9.6K
API Support	None identified	None identified	None identified	None identified
<b>Pricing/Support</b>				
Price (\$)	2,595	2,595	1,495	1,275
Date of First Delivery	None identified	None identified	November 1988	January 1989
Standard Warranty	90 days	90 days	90 days	30 days
Service Supplied by	Vendor	Vendor	Vendor	Dealer; vendor
<b>Comments</b>	Price shown is for 8 users; 8-16 upgrade-\$1,700; 16-32 upgrade-\$1,000.	Price shown is for 8 users; 8-16 upgrade-\$1,700; 16-32 upgrade-\$1,000.		Provides PC LAN clients with access to asynchronous devices and hosts.

Vendor	AT&T	AT&T	Attachmate Corp.	Avatar Corp.
<b>Product</b>	<b>StarGROUP Software SNA Gateway</b>	<b>StarGROUP Software TCP/IP Access Program</b>	<b>3270 Gateway 1.31</b>	<b>MacMainFrame Coax Gateway</b>
<b>Characteristics</b>				
LANs Supported	Ethernet; Starlan; Token-Ring	Ethernet; Starlan; Token-Ring	Arcnet; Ethernet; NETBIOS-compatible LANs; Starlan; Token-Ring	AppleTalk
Protocols Supported	SNA; X.25	ISO; TCP/IP	BSC, SDLC; SNA	SNA
Host Systems Supported	IBM System/34/36/38	Digital VAX; Sun & T[HP]	IBM 43XX/30XX; IBM AS/400	IBM 43XX/30XX
Operation	Local; Remote	Local; Remote	Local; Remote	Local
Gateway Workstation Supported	AT&T 6386	AT&T 6386/UNIX	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	Apple Macintosh
Minimum Memory (bytes)	4M	4M	None identified	1M
Line Speeds Supported (bps)	19.2K; 4M; 56K; 9.6K	10M	64K	2.35M
API Support	DCA IRMA	None identified	IBM API	Apple; Proprietary API
<b>Pricing/Support</b>				
Price (\$)	1,695, max. price is 7,795	1,457	425	2,495
Date of First Delivery	January 1990	March 1989	August 1987	March 1990
Standard Warranty	30 days	30 days	90 days	1 year
Service Supplied by	Dealer; vendor	Dealer; vendor	Vendor	Vendor
<b>Comments</b>	Provides PC LAN clients with access to SNA hosts.	ISO-to-TCP/IP gateway.	Works with Extra! Connectivity Software to provide PC workstations on a LAN with access to an IBM mainframe. Program allows LAN workstations to run up to 4 host sessions each for a total of 128 available	Supports up to 5 host terminal, printer sessions simultaneously. Host graphics emulation available with optional MacMainFrame Graphics application software.

Vendor	Avatar Corp.	Avatar Corp.	CASE/Datatel, Inc.	CASE/Datatel, Inc.
<b>Product</b>	<b>MacMainFrame SDLC Gateway</b>	<b>MacMainFrame Token Ring Gateway</b>	<b>6320</b>	<b>6321</b>
<b>Characteristics</b>				
LANs Supported	AppleTalk; SDLC/SNA	AppleTalk; Token-Ring	AppleTalk; Ethernet	AppleTalk; Ethernet
Protocols Supported	SNA	SNA	DECnet; LAT; SDLC; SNA; TCP/IP; X.25	DECnet; LAT; SDLC; SNA; TCP/IP; X.25
Host Systems Supported	IBM 43XX/30XX	IBM 43XX/30XX	Digital VAX; IBM 43XX/30XX	Digital VAX; IBM 43XX/30XX
Operation	Remote	Local	None identified	None identified
Gateway Workstation Supported	Apple Macintosh	Apple Macintosh	Apple Macintosh; IBM PC/XT/AT or compatible; IBM PS/2	Apple Macintosh; IBM PC/XT/AT or compatible; IBM PS/2
Minimum Memory (bytes)	1M	1M	1M	1M
Line Speeds Supported (bps)	56K	4M	128K; 19.2K; 56K; 64K; 9.6K	128K; 19.2K; 56K; 64K; 9.6K
API Support	Apple; Proprietary API	Apple; Proprietary API	None identified	None identified
<b>Pricing/Support</b>				
Price (\$)	2,495, max. price is 6,495	2,495, max. price is 8,495	8,000	8,000
Date of First Delivery	September 1990	September 1990	December 1988	December 1988
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>			Price shown is base.	Price shown is base.

Vendor	Chi Corp.	Chi Corp.	Chi Corp.	Chi Corp.
<b>Product</b>	<b>GL5200</b>	<b>LinkUp 3270 Coax DFT Gatestation</b>	<b>Linkup 3270 Remote Gatestation</b>	<b>Linkup 3299 Coax Gatestation</b>
<b>Characteristics</b>				
LANs Supported	NETBIOS	Arcnet; Ethernet; Starlan; Token-Ring	Arcnet; Ethernet; Starlan; Token-Ring	Arcnet; Ethernet; Starlan; Token-Ring
Protocols Supported	UTS; Uniscope	SNA	BSC; NETBIOS interface; SNA	SNA
Host Systems Supported	Unisys 1100; Unisys 2200	Any host with a 3274 or 3174 attached; IBM 43XX/30XX	Any host with remote 3274 or 3174 connect; IBM 43XX/30XX	Any host with a 3274 or 3174 attached; IBM 43XX/30XX
Operation	Local; Remote	Local; Remote	Remote	Local; Remote
Gateway Workstation Supported	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above
Minimum Memory (bytes)	512K	256K	256K	256K
Line Speeds Supported (bps)	19.2K; 9.6K	None identified	19.2K; 9.6K	None identified
API Support	Proprietary API; Unisys STEP UP/F	DCA IRMA; IBM API; Proprietary API	DCA IRMA; IBM API; Proprietary API	DCA IRMA; IBM API; Proprietary API
<b>Pricing/Support</b>				
Price (\$)	2,195, max. price is 3,395	1,120	2,995	3,345
Date of First Delivery	June 1986	1988	1986	1989
Standard Warranty	90 days	1 year	1 year	1 year
Service Supplied by	Vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
<b>Comments</b>	Versions available for Novell IPX/SPX and Banyan VINES StreetTalk interface support; 43 and 64 session gateways available.	Windows 3.0 support available.	Emulates a remote 3174 providing 32 terminal sessions for the LAN; 10 session gateway available for \$1,495.00; Windows 3.0 version available.	Windows 3.0 support available.

Vendor	Chi Corp.	Commtext Inc.	Data Interface Systems Corp.	Datapoint Corp.
<b>Product</b>	<b>X.25 Linkup Multi-Protocol Gateway</b>	<b>CX-80 Data Exchange</b>	<b>DI3270</b>	<b>VistaGate</b>
<b>Characteristics</b>				
LANs Supported	Arcnet; Ethernet; Starlan; Token-Ring	Proprietary	Arcnet; Ethernet; NETBIOS LANs; Starlan; Token-Ring	Arcnet; Ethernet; Token-Ring
Protocols Supported	3270/QLLC; DEC/VT; UTS; X.25	SNA; X.25	BSC remote; SDLC; SNA	SNA; TCP/IP; X.25
Host Systems Supported	Digital VAX; IBM 43XX/30XX; Unisys 1100; Unisys 2200	Digital VAX; IBM 43XX/30XX; any asynchronous host	IBM 43XX/30XX; IBM 9370	Digital VAX; IBM 43XX/30XX; IBM System/34/36/38
Operation	Remote	Remote	Local, remote	Local; Remote
Gateway Workstation Supported	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	IBM PC/XT/AT or compatible	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	IBM PC/XT/AT or compatible; IBM PS/2 Model 30
Minimum Memory (bytes)	256K; 512K	Does not apply	200K	1M
Line Speeds Supported (bps)	19.2K; 56K; 64K; 9.6K	19.2K; 56K; 64K; 9.6K	19.2K; 56K; 64K; 9.6K	19.2K; 9.6K
API Support	IBM API; Proprietary API	Does not apply	APPC/LU6.2; IBM API; Proprietary API; SERPI	None identified
<b>Pricing/Support</b>				
Price (\$)	6,145	4,950	See comments	See comments
Date of First Delivery	October 1988	1980	January 1985	None identified
Standard Warranty	90 days	90 days	30 days	30 days
Service Supplied by	Vendor	Third party; vendor	Vendor	Vendor
<b>Comments</b>	Supports up to 254 sessions; 8 workstation (32 sessions) also available.	Price shown is base; enables a mix of up to 50 asynch ASCII, coax, and Type-A coax terminals/PCs to access up to 4 IBM, asynch, and X.25 hosts; features keystroke toggle of up to 5 concurrent sessions.	\$1,095-\$4,495 (software); \$240-\$995 (hardware); optimal environment-Novell-AT IPX level; contact vendor for pricing information.	Contact vendor for pricing information.

Vendor	Develcon Electronics Ltd.	Digital Communications Associates, Inc.	Digital Communications Associates, Inc.	Digital Communications Associates, Inc.
<b>Product</b>	<b>ING1064</b>	<b>IRMALAN 802.2 Gateway Server</b>	<b>IRMALAN DFT Gateway Server</b>	<b>IRMALAN SDLC Gateway Server</b>
<b>Characteristics</b>				
LANs Supported	Ethernet	AppleTalk; Arcnet; Ethernet; Starlan; Token-Ring	Arcnet; Ethernet; Starlan; Token-Ring	Arcnet; Ethernet; Starlan; Token-Ring
Protocols Supported	TCP/IP; X.25	SNA	SNA	SNA
Host Systems Supported	Any host supporting TCP/IP	IBM 43XX/30XX	IBM 43XX/30XX	IBM 43XX/30XX
Operation	Local; Remote	Local	Local	Remote
Gateway Workstation Supported	Standalone System	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above
Minimum Memory (bytes)	Does not apply	256K; 40K	256K	40K
Line Speeds Supported (bps)	128K	None identified	None identified	19.2K; 56K; 64K; 72K; 9.6K
API Support	None identified	IBM API	DCA IRMA; IBM API	DCA IRMA; IBM API
<b>Pricing/Support</b>				
Price (\$)	12,500	3,495, max. price is 6,995	1,495	1,295, max. price is 6,495
Date of First Delivery	None identified	October 1986	October 1986	October 1986
Standard Warranty	None identified	90 days	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Supports two X.25 interfaces.	Allows access to IBM SNA host through direct access via an IBM 3720, 3725, 3745 communications controller or IBM 3174 control unit; includes gateway and workstation software, file transfer, and API support.	Allows access to IBM SNA hosts; includes gateway coax hardware, gateway software, workstation software, 3287 printer emulation, file transfer and API support.	Allows access to IBM SNA host; includes gateway SDLC hardware, gateway software, workstation software, 3287 printer emulation, file transfer and API support.

Vendor	Digital Communications Associates, Inc.	Digital Communications Associates, Inc.	Digital Equipment Corp.	Eicon Technology Corp.
<b>Product</b>	<b>MACIRMALAN 802.2 Gateway Server</b>	<b>MACIRMALAN SDLC Gateway Server</b>	<b>DEC MicroServer Family</b>	<b>Access/QLLC</b>
<b>Characteristics</b>				
LANs Supported	AppleTalk	AppleTalk	Ethernet	Arcnet; Ethernet; NETBIOS-compatible LANs; Starlan; Token-Ring
Protocols Supported	SNA	SNA	DECnet; OSI; SNA; TCP/IP; X.25	SNA; X.25
Host Systems Supported	IBM 43XX/30XX	IBM 43XX/30XX	Digital VAX	Digital VAX; IBM 43XX/30XX; IBM AS/400
Operation	Local	Remote	Local; Remote	Local; Remote
Gateway Workstation Supported	Apple Macintosh	Apple Macintosh	Dedicated gateway-VAX-based	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above 640K
Minimum Memory (bytes)	256K	None identified	1M	
Line Speeds Supported (bps)	None identified	19.2K; 56K; 72K; 9.6K	1.544M; 56K	128K
API Support	DCA IRMA; Hypercard; IBM API	DCA IRMA; Hypercard; IBM API	None identified	APPC/LU6.2; IBM API; Proprietary API
<b>Pricing/Support Price (\$)</b>	3,995, max. price is 5,995	4,995, max. price is 6,495	13,230	1,295, max. price is 4,995
<b>Date of First Delivery</b>	October 1990	August 1990	None identified	1986
<b>Standard Warranty</b>	90 days	1 year	90 days	1 year
<b>Service Supplied by</b>	Vendor	Vendor	Vendor	Dealer; third party; vendor
<b>Comments</b>	Allows AppleTalk LAN access to IBM SNA host; includes gateway software for DOS system, workstation software for Macintosh's, file transfer, and API support.			Integrates 3270 & 5250 with X.25 communication, to communicate to hosts connected to an X.25 packet switched data network; uses an EiconCard to support up to 254 simultaneous sessions on any NetBIOS or N
Vendor	Eicon Technology Corp.	Eicon Technology Corp.	Eicon Technology Corp.	Eicon Technology Corp.
<b>Product</b>	<b>Access/SDLC</b>	<b>Access/TIC</b>	<b>Access/X.25</b>	<b>LAN Router/400</b>
<b>Characteristics</b>				
LANs Supported	Arcnet; Ethernet; NETBIOS-compatible LANs; Starlan; Token-Ring	Arcnet; Ethernet; NETBIOS; Starlan; Token-Ring	Arcnet; Ethernet; NETBIOS-compatible LANs; Starlan; Token-Ring	Arcnet; Ethernet; Starlan; Token-Ring
Protocols Supported	SNA	SNA	X.25	SNA; X.25
Host Systems Supported	IBM 43XX/30XX; IBM AS/400; IBM System/34/36/38	IBM 43XX/30XX; IBM AS/400	ASCII hosts; Digital VAX	IBM AS/400
Operation	Local	Local	Local; Remote	Local; Remote
Gateway Workstation Supported	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above 640K	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above 640K	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above 640K	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above 640K
Minimum Memory (bytes)				
Line Speeds Supported (bps)	128K	16M; 4M	128K	128K
API Support	APPC/LU6.2; IBM API; Proprietary API	APPC/LU6.2; IBM API; Proprietary API	APPC/LU6.2; Proprietary API	APPC/LU6.2; IBM API; Proprietary API
<b>Pricing/Support Price (\$)</b>	995, max. price is 3,495	See comments	995, max. price is 2,995	See comments
<b>Date of First Delivery</b>	1986	March 1990	1985	March 1990
<b>Standard Warranty</b>	1 year	1 year	1 year	1 year
<b>Service Supplied by</b>	Dealer; third party; vendor	Dealer; third party; vendor	Dealer; third party; vendor	Dealer; third party; vendor
<b>Comments</b>	Connects PCs, PS/2s, and compatibles to a variety of IBM hosts over dedicated or switched SDLC lines; uses an EiconCard to support up to 254 simultaneous sessions on any NETBIOS or NetWare LAN.	Supports background host printing, IND\$FILE file transfer, hot-key between emulation sessions to DOS, full 3270 Information Display System emulation, via EiconCard; contact vendor for pricing information	Connects a variety of non-IBM hosts over X.25 packet switched data networks; uses an EiconCard to support up to 254 simultaneous sessions on any NETBIOS or NetWare LAN.	Supports IBM AS/400 connections over SDLC or X.25 communications lines using EiconCard as the server; supports 128 conversations; contact vendor for pricing information.

Vendor	Frontier Technologies Corp.	Gateway Communications, Inc.	Gateway Communications, Inc.	Gateway Communications, Inc.
Product	AdCom3-I(AT) and Gateway Software	G/Async Gateway	G/Async II Gateway	G/X.25 Gateway
<b>Characteristics</b>				
LANs Supported	Ethernet	Arcnet; Ethernet; NetWare; Token-Ring	Arcnet; Ethernet; Token-Ring	Arcnet; Ethernet; Token-Ring
Protocols Supported	TCP/IP; X.25	Asynchronous	Asynchronous	X.25
Host Systems Supported	IBM System/34/36/38	Any host supporting async transmission; Digital VAX	None identified	See comments
Operation	Local; Remote	Local; Remote	Local; Remote	Remote
Gateway Workstation Supported	IBM PC/XT/AT or compatible	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	386 ISA; IBM PC/XT/AT or compatible; IBM PS/2 Model 30
Minimum Memory (bytes)	128K	256K	26K	256K
Line Speeds Supported (bps)	250K	19.2K	19.2K	19.2K
API Support	None identified	Proprietary API	Proprietary API	Proprietary API
<b>Pricing/Support</b>				
Price (\$)	4,995	1,595	1,595	1,895
Date of First Delivery	None identified	July 1986	April 1989	1985
Standard Warranty	90 days	1 year	1 year	1 year
Service Supplied by	Vendor	Dealer	Dealer	Dealer; vendor
<b>Comments</b>		Price shown is for 4-port version.	Price shown is average; supports third party terminal emulation including Crosstalk, Procomm, EM4010, Ascom IV, and Relay Gold.	Supports terminal emulation for ADDS, Data General, Datapoint, Hazeltine, HP, IBM, NCR, Tandem, Teletype, Honeywell, Zenith, Alpha Micro, and DEC.
Vendor	Gateway Communications, Inc.	Gateway Communications, Inc.	Harris Adacom	Hewlett-Packard Co.
Product	G/X.25 Gateway & Bridge	G/X.25 Gateway 64	9570 Strategy LAN Gateway	HP NS LAN Gateway
<b>Characteristics</b>				
LANs Supported	Arcnet; Ethernet; Token-Ring	Arcnet; Ethernet; NETBIOS LANs; Token-Ring	Ethernet; Token-Ring	Arcnet; Ethernet; Novell LANs; Omninet; Starlan; Token-Ring
Protocols Supported	X.25	X.25	SNA; TCP/IP; X.25	IPX; TCP/IP
Host Systems Supported	Digital VAX	See comments	IBM 43XX/30XX	HP 3000
Operation	Remote	Remote	Local; Remote	Local
Gateway Workstation Supported	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	IBM PC/XT/AT or compatible; IBM PS/2 Model 30	ASCII terminals; IBM PC/XT/AT or compatible; IBM PS/2	Compaq; Hewlett-Packard Vectra
Minimum Memory (bytes)	512K	512K	4M	640K
Line Speeds Supported (bps)	19.2K	56K; 64K	64K	10M
API Support	Proprietary API	Proprietary API	IBM API; Novell IPX	None identified
<b>Pricing/Support</b>				
Price (\$)	2,495	3,445	See comments	4,995
Date of First Delivery	September 1985	November 1989	None identified	September 1989
Standard Warranty	1 year	1 year	1 year	None identified
Service Supplied by	Dealer	Dealer	None identified	Vendor
<b>Comments</b>	Supports terminal emulation of ADDS, Data General, DEC, Hazeltine, Honeywell, IBM, HP, NCR, and Zenith.	Supports terminal emulation of ADDS, Data General, Datapoint, DEC, Esprit, Hazeltine, HP, Honeywell, IBM, NCR, Tandem, TeleVideo, and Zenith.	Contact vendor for pricing information; multiple LAN Gateway to an IBM host supports Ethernet Token Ring LAN.	Provides LAN-to-LAN connectivity between Novell NetWare networks and HP 3000 computers.

Vendor	ICOT	ICOT	ICOT	ICOT
<b>Product</b>	<b>OmniPATH DFT 20 LU Gateway</b>	<b>OmniPATH DFT 40 LU Gateway</b>	<b>OmniPATH DFT 5 LU Gateway</b>	<b>OmniPATH SDLC 128 LU Gateway</b>
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	Ethernet
Protocols Supported	SNA	SNA	SNA	SNA
Host Systems Supported	IBM 43XX/30XX	IBM 43XX/30XX	IBM 43XX/30XX	IBM 43XX/30XX
Operation	Local; Remote	Local; Remote	Local; Remote	Local; Remote
Gateway Workstation Supported	IBM PC/XT/AT or compatible; IBM PS/2 Model 30			
Minimum Memory (bytes)	256K	256K	256K	256K
Line Speeds Supported (bps)	56K	56K	56K	56K
API Support	IBM API; Proprietary API			
<b>Pricing/Support</b>				
Price (\$)	2,995	3,995	1,695	7,495
Date of First Delivery	June 1989	June 1989	June 1989	June 1989
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Workstation software requires only 51K of memory.	Workstation software requires only 51K of memory.	Workstation software requires only 51K of memory.	Workstation software requires only 51KB of memory.

Vendor	ICOT	ICOT	ICOT	ICOT
<b>Product</b>	<b>OmniPATH SDLC 253 LU Gateway</b>	<b>OmniPATH SDLC 32 LU Gateway</b>	<b>OmniPATH Token Ring 128 LU Gateway</b>	<b>OmniPATH Token Ring 253 LU Gateway</b>
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Token-Ring	Token-Ring
Protocols Supported	SNA	SNA	SNA	SNA
Host Systems Supported	IBM 43XX/30XX	IBM 43XX/30XX	IBM 43XX/30XX	IBM 43XX/30XX
Operation	Local	Local; Remote	Local; Remote	Local; Remote
Gateway Workstation Supported	IBM PC/XT/AT or compatible; IBM PS/2 Model 30	IBM PC/XT/AT or compatible; IBM PS/2 Model 30	IBM PC/XT/AT or compatible; IBM PS/2 Model 30	IBM PC/XT/AT or compatible; IBM PS/2 Model 30
Minimum Memory (bytes)	256K	256K	256K	256K
Line Speeds Supported (bps)	56K	56K	56K	56K
API Support	IBM API; Proprietary API	IBM API; Proprietary API	IBM API; Proprietary API	IBM API; Proprietary API
<b>Pricing/Support</b>				
Price (\$)	9,995	4,995	7,495	9,995
Date of First Delivery	June 1989	June 1989	March 1990	March 1990
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Workstation software requires only 51KB of memory.	Workstation software requires only 51KB of memory.	Workstation software requires only 51K of memory.	Workstation software requires only 51K of memory.

Vendor	ICOT	ICOT	ICOT	IDEAssociates, Inc.
<b>Product</b>	OmniPATH Token Ring 8 LU Gateway	OmniPath SDLC 8 LU Gateway	OmniPath Token Ring 32 LU Gateway	IDEAcomm 5250/Remote
<b>Characteristics</b>				
LANs Supported	Token-Ring	Ethernet	Token-Ring	NETBIOS-compatible LANs
Protocols Supported	SNA	SNA	SNA	SNA
Host Systems Supported	IBM 43XX/30XX	IBM 43XX/30XX	IBM 43XX/30XX	IBM AS/400; IBM System/34/36/38
Operation	Local; Remote	Local; Remote	Local; Remote	Remote
Gateway Workstation Supported	IBM PC/XT/AT or compatible; IBM PS/2 Model 30	IBM PC/XT/AT or compatible; IBM PS/2 Model 30	IBM PC/XT/AT or compatible; IBM PS/2 Model 30	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above
Minimum Memory (bytes)	256K	256K	256K	128K
Line Speeds Supported (bps)	56K	56K	56K	19.2K
API Support	IBM API; Proprietary API	IBM API; Proprietary API	IBM API; Proprietary API	None identified
<b>Pricing/Support</b>				
Price (\$)	2,995	2,995	4,995	395
Date of First Delivery	March 1990	June 1989	March 1990	1988
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Workstation software requires only 51K of memory.	Workstation software requires only 51KB of memory.	Workstation software requires only 51K of memory.	Software emulation package that allows an IBM PC to access IBM midrange systems form a remote location via synchronous modem; emulates 3180, 5251-11, 5291, or 5292-1 terminals; requires IDEAcomm 5250/rem
Vendor	IDEAssociates, Inc.	IDEAssociates, Inc.	IN-Net Corp.	Infotron Systems Corp.
<b>Product</b>	IDEAcomm 5251/Gateway AH	IDEAcomm 5251/Gateway Plus	FiberTalk 3000 CBU	Commix 32
<b>Characteristics</b>				
LANs Supported	NETBIOS-compatible LANs	NETBIOS-compatible LANs	Ethernet; FDDI	Ethernet
Protocols Supported	SDLC	Twinax	TCP/IP	LAT; TCP/IP; X.25
Host Systems Supported	IBM AS/400	IBM AS/400; IBM System/34/36/38	IBM 43XX/30XX	Digital VAX; IBM AS/400; UNIX
Operation	Local	Local	Local	Local; Remote
Gateway Workstation Supported	IBM PC/XT/AT or compatible; IBM PS/2 Model 30	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	Apple Macintosh; IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50	Proprietary platform
Minimum Memory (bytes)	None identified	128K	None identified	Does not apply
Line Speeds Supported (bps)	1.1M	1.1M	100M	19.2K; 56K; 64K; 9.6K
API Support	None identified	None identified	None identified	Does not apply
<b>Pricing/Support</b>				
Price (\$)	1,940	1,295	35,000	7,500
Date of First Delivery	None identified	None identified	1990	March 1989
Standard Warranty	1 year	1 year	1 year	90 days
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Allows access to IBM's PC support application on the AS/400; includes IDEAcomm Gateway Adapter Handler software which links any NetBIOS compatible LAN to the AS/400 with full PC support compatibility.	PCs attached to IBM Token Ring or NetBIOS compatible LAN can gain access to S/3X or AS/400; emulates 5251-11, 5291, and 5292-1 terminals, 5256, 5224, 5225, and 5219 printers; requires IDEAcomm 5251/Plus.		Supports up to 60 simultaneous connections at speeds up to 64Kbps and includes XXX PAD capability.

Vendor	Interlink Computer Sciences, Inc.	Interlink Computer Sciences, Inc.	International Business Machines Corp. (IBM)	Jupiter Technology, Inc./Intel Corp.
Product	SNS Network Integration Family	SNS/SNA Gateway	3172 Model 001	Mail View X.400 Gateway
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet; Token Bus; Token-Ring	AppleTalk; Ethernet
Protocols Supported	SNA; TCP/IP	DECnet; SNA	DECnet; MAP 3.0; TCP/IP	OSI; TCP/IP; X.25
Host Systems Supported	Any host supporting TCP/TP; IBM 43XX/30XX	Digital VAX; IBM 43XX/30XX	9370; IBM 43XX/30XX	None identified
Operation	Local; Remote	Local, remote	Local	Local
Gateway Workstation Supported	Does not apply	Does not apply	Not available	IBM PC/XT/AT or compatible
Minimum Memory (bytes)	Does not apply	Does not apply	None identified	640K
Line Speeds Supported (bps)	1.544M; 19.2K; 56K; 64K; 9.6K	19.2K; 56K; 64K; 9.6K	None identified	None identified
API Support	Proprietary API	APPC/LU6.2; DEC	IBM API	None identified
<b>Pricing/Support</b>				
Price (\$)	42,900	39,500	25,000	49,500
Date of First Delivery	March 1990	September 1984	September 1990	First Quarter, 1989
Standard Warranty	90 days	90 days	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Price shown is base.	Price shown is base.	Price includes hardware & software; DEC support requires SNS/SNA gateway product from Interlink Computer Sciences on S/370 host.	Includes Mail Integration Services and Gateway Server Software for popular LAN base email systems.
Vendor	McData Corp.	Mitek OpenConnect Systems, Corp.	Multi-Tech Systems, Inc.	National Semiconductor Corp.
Product	6100E	M2030/M2133/M2933/OCS II	MC3270/GCP	LAN Micronode
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet; Token-Ring	NETBIOS LANs	Arcnet; NETBIOS; Starlan; Token-Ring
Protocols Supported	LAT; SNA; TCP/IP	SNA; TCP/IP	SNA	SDLC; SNA; X.25
Host Systems Supported	IBM 43XX/30XX; UNIX	Digital VAX; IBM 43XX/30XX; IBM System/34/36/38	IBM 43XX/30XX	IBM 43XX/30XX
Operation	Local	Local; Remote	Remote	Remote
Gateway Workstation Supported	None identified	IBM PC/XT/AT or compatible; IBM RISC/6000	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	IBM PC/XT/AT or compatible
Minimum Memory (bytes)	Does not apply	1M	640K	256K
Line Speeds Supported (bps)	None identified	19.2K; 256K; 56K; 64K; 9.6K	9.6K	19.2K
API Support	None identified	APPC/LU6.2; IBM API; NetView - Proprietary API; Proprietary API	IBM API	IBM API
<b>Pricing/Support</b>				
Price (\$)	23,000	11,400	1,999	2,495
Date of First Delivery	None identified	April 1986	April 1990	April 1985
Standard Warranty	13 months	90 days	2 years	1 year
Service Supplied by	Vendor	Dealer; third party; vendor	Vendor	Dealer; third party; vendor
<b>Comments</b>	Provides IBM host access for users on up to 6 Ethernet LANs via LAT terminal servers, TCP/IP terminal servers, and the LinkMaster 4174 Model 44R establishment controller; user workstations supported incl	Price shown is base.		

Vendor	National Semiconductor Corp.	Netlink, Inc.	Network Software Associates, Inc.	Novell, Inc.
Product	QNX Micronode	SNA - Hub	AdaptSNA LAN Gateway	NetWare 5250 Twinax Gateway
Characteristics LANs Supported	QNX NET	Token-Ring	Arcnet; Ethernet; Token-Ring	Arcnet; Ethernet; SPX-compatible LANs; Token-Ring
Protocols Supported	SDLC; SNA	SNA	IPX; NETBIOS interface; SNA; SPX; XNS	SNA
Host Systems Supported	IBM 43XX/30XX	IBM 43XX/30XX; Tandem, Fujitsu	IBM 43XX/30XX	IBM AS/400
Operation	Remote	Remote	Local; Remote	Local
Gateway Workstation Supported	IBM PC/XT/AT or compatible; IBM PS/2 Model 30	None identified	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above; Systems 866K	IBM PC/XT/AT or compatible; IBM PS/2 Model 30
Minimum Memory (bytes)	256K	None identified	866K	140K
Line Speeds Supported (bps)	19.2K	19.2K; 56K; 64K; 9.6K	16M; 64K	None identified
API Support	Proprietary API	None identified	APPC/LU6.2; IBM API	IBM API
Pricing/Support Price (\$)	2,495	8,250, max. price is 11,500	1,495, max. price is 5,995	1,450
Date of First Delivery Standard Warranty	April 1986 1 year	None identified 36 months	January 1989 1 year	March 1990 1 year
Service Supplied by	Dealer; third party; vendor	Third party; vendor	Vendor	Dealer; third party; vendor
Comments	\$3,495 (16 LUs); \$4,495 (32 LUs).	Optional multihost routing feature enables a token-ring attached device to switch between 1 or more different upstream hosts.		Requires Novell Twinax Adapter or Micro Integration's Micro Channel Twinax Adapter.

Vendor	Novell, Inc.	Novell, Inc.	Novell, Inc.	Novell, Inc.
Product	NetWare Asynchronous Communications Server	NetWare SNA Gateway	NetWare SNA Gateway ELS	NetWare X.25 Gateway
Characteristics LANs Supported	Arcnet; Ethernet; Token-Ring	Arcnet; Ethernet; NetWare LANs; Token-Ring	Arcnet; Ethernet; NetWare LANs; Token-Ring	Arcnet; Ethernet; Starlan; Token-Ring
Protocols Supported	Async	IPX; NETBIOS interface; SPX	IPX; NETBIOS interface; SPX	IPX; NETBIOS interface; SPX; X.25
Host Systems Supported	Asynchronous hosts	IBM 43XX/30XX	IBM 43XX/30XX	X.25 hosts
Operation	Local; Remote	Local, remote	Local, remote	Remote
Gateway Workstation Supported	IBM PC/XT/AT or compatible; IBM PS/2 Model 30	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above
Minimum Memory (bytes)	256K	232K	238K	256K
Line Speeds Supported (bps)	19.2M; 300	1.2K; 19.2K; 56K; 64K; 9.6K	19.2K; 9.6K	64K
API Support	NASI	APPC/LU6.2; DCA IRMA; IBM API; Proprietary API	APPC/LU6.2; DCA IRMA; IBM API; Proprietary API	INT 14; Proprietary API
Pricing/Support Price (\$)	1,495	2,995	595	1,195
Date of First Delivery Standard Warranty	March 1987 1 year	December 1988 1 year	December 1988 1 year	June 1988 1 year
Service Supplied by	Dealer; third party; vendor	Dealer; third party; vendor	Dealer; third party; vendor	Dealer; third party; vendor
Comments	Requires the WNIM+ hardware adapter.	Requires one of five hardware adapters depending on connectivity option (coax, coaxmux, synchronous, synchronous high speed, token-ring).	Requires one of two hardware adapters depending on connectivity option (coax, synchronous).	Access to host computer used by async hosts such as CompuServe; requires X.25 Adapter for PC or X.25 Adapter for PS/2.

Vendor	NTI Group, Inc.	ParaData Computer Networks, Inc.	ParaData Computer Networks, Inc.	ParaData Computer Networks, Inc.
<b>Product</b>	NTI 2500 Gateway	HoneyLAN Asynchronous Gateway	HoneyLAN Synchronous Gateway	PACs Plus
<b>Characteristics</b>				
LANs Supported	DES Net; Ethernet	Arcnet; Ethernet; FDDI; NETBIOS-compatible LANs; SPX; Starlan; Token-Ring	Arcnet; Ethernet; FDDI; NETBIOS-compatible LANs; SPX; Starlan; Token-Ring	Arcnet; Ethernet; FDDI; NETBIOS-compatible LANs; SPX; Starlan; Token-Ring
Protocols Supported	HDLC; TCP/IP; X.25	NETBIOS interface; OSI; SPX; TCP/IP; X.25; XNS	NETBIOS interface; OSI; SPX; TCP/IP; X.25; XNS	NETBIOS interface; OSI; SPX; TCP/IP; X.25; XNS
Host Systems Supported	None identified	Any Bull GCOS host	Any Bull GCOS host	Async host or modem; Digital VAX
Operation	Local; Remote	Local; Remote	Local; Remote	Local; Remote
Gateway Workstation Supported	IBM PC/XT/AT or compatible	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above
Minimum Memory (bytes)	1M	256K	256K	256K
Line Speeds Supported (bps)	1.544M; 56K; 64K; 9.6K	19.2K; 38.4K; 9.6K	19.2K; 56K; 9.6K	19.2K; 38.4K; 9.6K
API Support	Proprietary API	NETBIOS; Proprietary API; SPX	NETBIOS; Proprietary API; SPX	NETBIOS; Proprietary API; SPX
<b>Pricing/Support</b>				
Price (\$)	See comments	2,995	2,995, max. price is 4,995	3,795
Date of First Delivery	1990	June 1989	June 1988	February 1990
Standard Warranty	1 year	1 year; 90 days	1 year; 90 days	1 year; 90 days
Service Supplied by	Vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
<b>Comments</b>	Contact vendor for pricing information.	Connects PC LANs to Bull GCOS systems via standard VIP asynchronous connections.	Connects PC LANs to Bull GCOS systems via standard VIP synchronous connection.	PACs Plus is a dial-out/dial-in asynchronous comm server. It connects PC LANs to asynchronous hosts, connects remote users to LANs, and allows modem sharing for all LAN users. Dial-out and dial-in only v
Vendor	Passport Communications, Inc.	Rabbit Software Corp.	Rabbit Software Corp.	Rabbit Software Corp.
<b>Product</b>	Gateway Exchange	RabbitGATE II SNA	RabbitGATE II DFT/3299	RabbitGATE II DFT
<b>Characteristics</b>				
LANs Supported	Starlan	Arcnet; Ethernet; NETBIOS; Starlan; Token-Ring	Arcnet; Ethernet; NETBIOS; Starlan; Token-Ring	Arcnet; Ethernet; NETBIOS; Starlan; Token-Ring
Protocols Supported	SNA	SDLC; SNA	SNA	SNA
Host Systems Supported	IBM 43XX/30XX	IBM 43XX/30XX	IBM 43XX/30XX	IBM 43XX/30XX
Operation	Remote	Remote	Local; Remote	Local; Remote
Gateway Workstation Supported	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above
Minimum Memory (bytes)	256K	51K; 85K	180K; 85K	85K; 96K
Line Speeds Supported (bps)	19.2K	64K	19.2K; 56K; 64K; 9.6K	19.2K; 56K; 64K; 9.6K
API Support	IBM API	IBM API; Proprietary API	IBM API; Proprietary API	IBM API; Proprietary API
<b>Pricing/Support</b>				
Price (\$)	1,495, max. price is 1,795	2,395, max. price is 7,995	5,995	1,695
Date of First Delivery	August 1987	1989	1989	1989
Standard Warranty	90 days	1 year	1 year	1 year
Service Supplied by	Vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
<b>Comments</b>	Integrates both 3270 emulation and multi session 3770 RJE emulation on a NETBIOS network.	Prices shown range from 8-64 sessions; enables workstations on a LAN to access data on an IBM mainframe through a remote connection to a 37X5 or compatible host FEP using SNA.	Price shown is for 40 sessions; enables workstations on a LAN to access data on an IBM mainframe through a 3299 port on a 3X74 controller coaxially connected to the LAN using SNA.	Price shown is for 5 sessions; enables workstations on a LAN to access data on an IBM mainframe through a DFT connection to a 3X74 controller using SNA.

Vendor	Rabbit Software Corp.	Rabbit Software Corp.	Racal InterLan	Racal InterLan
<b>Product</b>	RabbitGATE II BSC	RabbitGATE Token-Ring	TCP Gateway for Netware	TCP Server for Netware
<b>Characteristics</b>				
LANs Supported	Arcnet; Ethernet; NETBIOS; Novell IPX; Starlan; Token-Ring	Arcnet; Ethernet; NETBIOS; Starlan; Token-Ring	Arcnet; Ethernet; Ethernet TCP/IP backbone; NetWare subnet; Starlan; Token-Ring	Arcnet; Ethernet; Ethernet TCP/IP backbone; NetWare subnet; Starlan; Token-Ring
Protocols Supported	BSC	SNA; Token-Ring (802.2)	TCP/IP	TCP/IP
Host Systems Supported	IBM 43XX/30XX	IBM 43XX/30XX	Any host supporting TCP/IP	Any host supporting TCP/IP
Operation	Remote	Local; Remote	Local	Local
Gateway Workstation Supported	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	DOS workstations; IBM PC/XT/AT or compatible; IBM PS/2	DOS workstations; IBM PC/XT/AT or compatible; IBM PS/2
Minimum Memory (bytes)	51K; 85K	256K; 85K	512K	512K
Line Speeds Supported (bps)	9.6K	16M; 4M	None identified	None identified
API Support	IBM API; Proprietary API	IBM API; Proprietary API	TCP/IP Berkley sockets	TCP/IP Berkley sockets
<b>Pricing/Support</b>				
Price (\$)	2,395, max. price is 5,995	4,995, max. price is 6,995	3,995	5,995
Date of First Delivery	1989	1990	1986	November 1990
Standard Warranty	1 year	1 year	1 year	1 year
Service Supplied by	Dealer; vendor	Dealer; vendor	Dealer; vendor	Dealer; vendor
<b>Comments</b>	Prices listed range from 8 to 32 sessions; enables workstations on a LAN to access data on an IBM mainframe through a remote connection to a 37x5 or compatible host front-end processor using BSC.	Enables workstations on a LAN to access data on an IBM mainframe which is TIC connected to a token-ring network. Prices listed are for 40, 128 sessions respectively.	Installs in Netware 286 file server allowing Netware DOS client on any Netware subnet type to access TCP/IP hosts on Ethernet; supports Telenet, FTP, SMTP, R-utilities, FTP, and SMTP.	Installed in standalone PC; supports Netware 286 and 386 file servers; provides access to TCP/IP hosts on Ethernet; supports Telenet, FTP, SMTP, R-utilities.
<b>Vendor</b>	Retix	The Santa Cruz Operation, Inc.	Shiva	Shiva
<b>Product</b>	OpenServer 400	uniPath SNA-3270	EtherGate	FastPath
<b>Characteristics</b>				
LANs Supported	AppleTalk; Arcnet; Ethernet; Starlan; Token-Ring	Ethernet; Starlan; Token-Ring	AppleTalk; Ethernet	AppleTalk; Ethernet
Protocols Supported	OSI; X.25	SNA	AppleTalk; TCP/IP	AppleTalk; DECnet; SNMP; TCP/IP
Host Systems Supported	Digital VAX; IBM 43XX/30XX; IBM System/34/36/38	IBM 43XX/30XX	None identified	None identified
Operation	Local; Remote	Remote	Local; Remote	Local
Gateway Workstation Supported	Apple Macintosh; IBM PC/XT/AT or compatible; IBM PS/2	IBM PC/XT/AT or compatible; IBM PS/2 Models 50 and above	Does not apply	Does not apply
Minimum Memory (bytes)	640K	2M	Does not apply	Does not apply
Line Speeds Supported (bps)	64K	19.2K	19.2K; 56K; 64K; 9.6K	Does not apply
API Support	APIA X.400 Gateway API	Proprietary API	Does not apply	Does not apply
<b>Pricing/Support</b>				
Price (\$)	4,050, max. price is 6,000	795, max. price is 2,295	2,399	2,795
Date of First Delivery	None identified	November 1986	October 1989	1986
Standard Warranty	90 days	30 days	1 year	1 year
Service Supplied by	Dealer; third party; vendor	Vendor	Vendor	Vendor
<b>Comments</b>	X.400 message handling system; gateway between MHS, SMTP, and PC EMail systems; Gateway and OpenServer 400 support DOS, UNIX, NetWare 386, OS/2, and interface to hosts via Ethernet or X.25.		Has a thick and thin Ethernet port and 2 ports that can be configured for connections to serial devices or LocalTalk networks; allows combinations of local and remote Ethernet/LocalTalk routing, dial-in.	Ethernet/LocalTalk that supports AppleTalk, TCP/IP, and DECnet protocols. Can be used to enhance the performance of LocalTalk networks by connecting them to a high-speed Ethernet backbone.

Vendor	Symcicon, Inc.	Symcicon, Inc.	TDT Group Inc.	TDT Group Inc.
<b>Product</b>	Symgate-N	Symgate-S	Honeybunch	SIX/25
<b>Characteristics</b>				
LANs Supported	NETBIOS	Arcnet; Ethernet; Token-Ring	Arcnet; Ethernet; NETBIOS; Starlan; Token-Ring	Arcnet; Ethernet; Starlan; Token-Ring
Protocols Supported	OSI; SNA; X.25	OSI; SNA; X.25	SDLC; SNA; X.25	SNA; X.25
Host Systems Supported	Digital VAX; IBM 43XX/30XX	Digital VAX; IBM 43XX/30XX	Honeywell	Digital VAX; IBM 43XX/30XX; IBM System/34/36/38
Operation	Remote	Remote	Local; Remote	Remote
Gateway Workstation Supported	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above
Minimum Memory (bytes)	512K	512K	640K	512K
Line Speeds Supported (bps)	19.2K; 2.048M; 56K; 64K; 9.6K	19.2K; 2.048M; 56K; 64K; 9.6K	19.2K; 9.6K	24K; 9.6K
API Support	IBM API; Proprietary API	IBM API; Novell NASI; Proprietary API	Proprietary API	Proprietary API
<b>Pricing/Support</b>				
Price (\$)	1,680	1,680	See comments	See comments
Date of First Delivery	June 1989	May 1990	None identified	None identified
Standard Warranty	1 year	1 year	90 days	90 days
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	X.25 card for PC or PS/2 and gateway software; supports most NetBIOS-based LAN operating systems and 3270 and VT-100 emulation.	X.25 card for PC or PS/2, and gateway software; supports NetWare 2.15 rev.C or later, 3270 and VT-100 terminal emulation and Novell's NASI interface.	Contact vendor for pricing information.	3270 emulation; contact vendor for pricing information.
<b>Vendor</b>	<b>3Com Corp.</b>	<b>3Com Corp.</b>	<b>3Com Corp.</b>	<b>Tri-Data Corp.</b>
<b>Product</b>	<b>3+ Open Maxess</b>	<b>GS/X.25</b>	<b>Maxess</b>	<b>N1000AEX</b>
<b>Characteristics</b>				
LANs Supported	Ethernet	Ethernet	Ethernet	AppleTalk
Protocols Supported	X.25	OSI; TCP/IP; X.25	X.25	SNA
Host Systems Supported	IBM 43XX/30XX	Does not apply	IBM 43XX/30XX	IBM 43XX/30XX
Operation	Local, remote	Remote	Local, remote	Local; Remote
Gateway Workstation Supported	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	Apple Macintosh; IBM PC/XT/AT or compatible
Minimum Memory (bytes)	6M	None identified	100K	512K
Line Speeds Supported (bps)	64K	64K	64K	19.2K
API Support	HLLAPI, APPC/PC	Not applicable	HLLAPI, APPC/PC	None identified
<b>Pricing/Support</b>				
Price (\$)	3,995, max. price is 5,995	6,000	4,995	3,995
Date of First Delivery	March 1989	1985	March 1989	May 1985
Standard Warranty	1 year	1 year	1 year	120 days
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Supports line speeds of 4M or 16M bps on token-ring LANs.	Software for XNS protocols: \$2,000; software for IP protocols: \$2,000; software for OSI protocols: \$2,000; 90-day warranty software.	Supports line speeds of 4M or 16M bps on token-ring LANs.	Supports up to 16 sessions accessing the host at speeds up to 19.2Kbps via LocalTalk.

Vendor	Tri-Data Corp.	Ungermann-Bass, Inc.	Unisync Inc.	Wall Data Inc.
Product	NetWay 2000	BR7100	Unilinc LAN Gateway Server	Datagate/LAN 3270
<b>Characteristics</b>				
LANs Supported	AppleTalk; Ethernet; FDDI; Token-Ring	Ethernet	Ethernet; Token-Ring	NETBIOS LANs; Token-Ring
Protocols Supported	AppleTalk; IPX; SNA	X.25	Burroughs; DECnet; Honeywell; IBM Bisync; SNA; TCP/IP; Univac; X.25	BSC; SDLC; SNA
Host Systems Supported	IBM 43XX/30XX	None identified	Burroughs; Digital VAX; Honeywell; IBM 43XX/30XX; IBM System/34/36/38; Univac	IBM 43XX/30XX
Operation	Local; Remote	Local	Local; Remote	Remote
Gateway Workstation Supported	Apple Macintosh; IBM PC/XT/AT or compatible; IB PS/2	Apple Macintosh; IBM PC/XT/AT or compatible; IBM PS/2	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above
Minimum Memory (bytes)	512K	1M	640K	256K
Line Speeds Supported (bps)	19.2K; 56K	64K	1.544M; 19.2K; 56K; 64K; 9.6K	19.2K; 9.6K
API Support	Proprietary API	X.3-X.28, X.29	IBM API; Proprietary API; UNIX Streams	IBM API
<b>Pricing/Support</b>				
Price (\$)	4,995, max. price is 14,995	9,700	1,695	1,595
Date of First Delivery	June 1989	June 1988	November 1990	1986
Standard Warranty	120 days	90 days	1 year	1 year
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>	Utilizes the 10 MIPS SPARC CPU supporting up to 128 sessions, 4 serial ports, LocalTalk, Ethernet, and Token-Ring interface adapters.	Ungermann-Bass X.75 Gateway allows networked PCs, Macintosh, & terminals to communicate to X.75 resources such as Tymenet, Telenet, or X.75-based hosts.	Supports multiple simultaneous terminal emulations to different host vendors (IBM, Burroughs, Honeywell, Univac, DEC); price shown is base.	
Vendor	Wall Data Inc.	Wang Laboratories, Inc.	Wang Laboratories, Inc.	Wang Laboratories, Inc.
Product	Datagate/LAN 5250	OFFICE/DISOSS Gateway	OFFICE/PROFS Gateway	OFFICE/SMTP Gateway
<b>Characteristics</b>				
LANs Supported	NETBIOS LANs	Ethernet	Ethernet	Ethernet
Protocols Supported	SDLC; SNA	SNA; X.25	SNA	TCP/IP
Host Systems Supported	IBM AS/400	IBM 43XX/30XX	IBM 43XX/30XX	Wang VS Systems
Operation	Remote	Remote	Remote	Local; Remote
Gateway Workstation Supported	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above
Minimum Memory (bytes)	256K	None identified	None identified	512K
Line Speeds Supported (bps)	19.2K; 9.6K	19.2K; 56K; 64K; 9.6K	19.2K; 56K; 64K; 9.6K	19.2K; 56K; 64K; 9.6K
API Support	IBM API	APPC/LU6.2	None identified	None identified
<b>Pricing/Support</b>				
Price (\$)	1,595	2,000, max. price is 26,000	6,500, max. price is 36,500	1,500, max. price is 19,500
Date of First Delivery	1987	None identified	1984	August 1989
Standard Warranty	1 year	90 days	90 days	90 days
Service Supplied by	Vendor	Vendor	Vendor	Vendor
<b>Comments</b>		Provides EMail exchange between Wang OFFICE and IBM DISOSS.	Provides EMail gateway between Wang OFFICE and IBM PROFS.	Allows mail interchange and other TCP/IP services (FTP, Telenet) between VS and other TCP/IP hosts.

Vendor	Wang Laboratories, Inc.	Waterloo Microsystems Inc.	Waterloo Microsystems Inc.	Waterloo Microsystems Inc.
Product	OFFICE/X.400 Gateway	PORT Asynchronous Internet Gateway	PORT Backbone Internet Gateway	PORT X.25 Server
Characteristics				
LANs Supported	Ethernet	Arcnet; Token-Ring	Arcnet; Token-Ring	Arcnet
Protocols Supported	OSI; X.25	X.25	Proprietary	X.25
Host Systems Supported	Wang VS Systems	None identified	None identified	None identified
Operation	Remote	Local	Local	Local
Gateway Workstation Supported	Wang VS Systems	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above	IBM PC/XT/AT or compatible; IBM PS/2 Model 30; IBM PS/2 Models 50 and above
Minimum Memory (bytes)	2M	512K	512K	512K
Line Speeds Supported (bps)	19.2K; 56K; 64K; 9.6K	24K	Does not apply	64K
API Support	None identified	None identified	None identified	Proprietary API
Pricing/Support Price (\$)	1,350, max. price is 17,550	595	2,995	3,662
Date of First Delivery	July 1989	None identified	None identified	None identified
Standard Warranty	90 days	None identified	None identified	None identified
Service Supplied by	Vendor	Dealer; vendor	Dealer; vendor	Vendor
Comments		Allows the connecting of two or more Waterloo PORT LANs to communicate via phone lines.	Allows and Arcnet or Token Ring network to serve as a backbone for internetworking one or more Waterloo PORT LANs.	Allows the Waterloo PORT LAN to communicate with multiple hosts via an X.25 packet-switched network.

# User Ratings of LAN Operating Systems

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**Note:** Reprints of this User Ratings report or the raw data used to compile the published results may be purchased through Datapro's Reprint Department. For placing orders or further information, call the Reprint Department at (800) DATAPRO or (609) 764-0100, ext. 2723.

## Report Highlights

- Consistent with several industry studies, Datapro's survey shows that Novell controls the market for LAN operating systems. Novell garnered 60% of the total number of LAN operating systems used by the network professionals that responded to the survey. IBM finished a distant second with 18%, followed by Digital Equipment (12%), 3Com (11%), Microsoft (8%), Banyan (7%), and Apple (6%).
- In terms of specific operating system versions, Novell NetWare 3.11 proved the most popular with a 21% share of all installations. NetWare 386 (19%), NetWare 2.2 (19%), and Advanced NetWare (14%) are also in heavy use. The most popular non-Novell operating system was IBM OS/2 LAN Server (11%).
- Apple AppleShare received the highest overall satisfaction rating—4.0 on a five-point scale. Digital Equipment PCSA (3.8), Novell NetWare 386 (3.6), and Novell NetWare 3.11 (3.6) also received high marks for overall satisfaction.
- Of the respondents who rated their LAN operating systems, 92% of Apple AppleShare users indicated that they would recommend the operating system to a colleague. Ninety percent of Novell NetWare 3.11 and Advanced NetWare users stated they would recommend those operating systems; 89% of SFT NetWare users would give positive recommendations for that operating system.
- Coaxial cable remains in widespread use, despite current trends toward the use of unshielded twisted-pair (UTP) and fiber cabling. Fifty-eight percent of the respondents are using coax. UTP came in second at 29%, followed by shielded twisted-pair (27%) and fiber (18%).
- Ethernet was the LAN technology of choice for survey respondents—65%

have Ethernet LANs. Token-ring (29%), Arcnet (15%), and LocalTalk (13%) are also in widespread use. By contrast, only 3% of the respondents have implemented FDDI.

- When selecting a LAN operating system, users indicated that they weigh heavily the vendor's reputation/support services, and the LAN OS's workstation support and network management capabilities.

## Analysis

### Executive Summary

In September 1991, Datapro conducted a nationwide survey among users of LAN operating systems. This study was designed to provide the industry with information on LAN operating systems currently installed and to provide an overall user profile of these systems. Networking professionals reported on the features they look for when selecting a LAN operating system (LAN OS), in addition to the subject areas of acquisition, maintenance, and installation. We also asked the users to rate their operating systems on a number of selection, usage, and service/technical support criteria. This report presents our findings.

The survey supports several other independent industry studies that show Novell with a dominant share of the LAN operating system market. Most of these studies place Novell's share of the market at or around 60%, and Datapro's study indicates that exactly 60% of the survey respondents are using some version of Novell NetWare. A distant second place, IBM is present in

18% of the respondents' installations with OS/2 LAN Server and PC LAN Program. The current (Microsoft) and former (3Com) champions of LAN Manager have a smaller presence. Microsoft's LAN Manager is present in 8% of the installations; 3Com has an 11% response share, but only half of those are using LAN Manager-based 3+ Open, while the others run the older 3+ product, based on Microsoft Networks (MS-Net).

Apple's AppleShare received only a 6% share of the total responses, but Apple users are very satisfied with the operating system. AppleShare scored consistently high in the user ratings; its overall satisfaction score of 4.0 (on a five-point scale) was the top score among the eight versions that were broken out for analysis. Digital Equipment showed up in 12% of the respondents' installations with its PCSA and PathWorks products. A relative newcomer, Artisoft, made a strong showing with a 4% share. Artisoft is the current leader in the market for peer-to-peer LAN operating systems, and is growing its business significantly. Another very active vendor, Banyan, has begun to aggressively promote its VINES product; Banyan showed up in 7% of the respondents' sites.

## Data Analysis

### Current Installations

The network professionals participating in this LAN Operating Systems survey identified a total of 23 vendors whose products are currently in use at their installations. Of those, only 12 vendors were mentioned by at least four respondents. In addition to the eight vendors identified previously, Sun (2%), Sitka (1%), Hewlett-Packard (1%), and Ungermann-Bass (1%) also had operating systems installed.

### LAN Operating Systems Evaluated

The network professionals were then asked to indicate the manufacturer and version of the LAN operating system that they would be evaluating for the remainder of the survey. Eight LAN operating systems were judged to have a sufficient number of responses to break out for analysis. These operating systems are:

- Novell NetWare 3.11
- Novell NetWare 386
- Novell NetWare 2.2
- Novell Advanced NetWare
- IBM OS/2 LAN Server
- Novell SFT NetWare
- Digital Equipment PCSA
- Apple AppleShare

For the most part, the respondents who indicated they had these eight operating systems installed also chose to rate them for the remainder of the study.

Manufacturer/ Version	% of Respondents with System Installed	% of Respondents Rating this System
Novell NetWare 3.11	21	14
Novell NetWare 386	19	11
Novell NetWare 2.2	19	10

Manufacturer/ Version	% of Respondents with System Installed	% of Respondents Rating this System
Novell Advanced NetWare	14	9
IBM OS/2 LAN Server	11	6
Novell SFT NetWare	9	5
Digital Equipment PCSA	8	6
Apple AppleShare	6	4

## Acquisition, Installation, and Maintenance

### Acquisition

Forty percent of the respondents purchased their LAN operating systems from a dealer, reseller, or distributor. Another 37% bought their LAN OSs directly from the vendor. Of the remaining respondents, 11% bought their operating systems from a third-party LAN vendor (e.g., bundled with network interface cards), and 8% purchased the product from a system integrator or VAR (value-added reseller).

### Installation

The largest percentage of respondents (25%) indicated that their LAN operating systems have been installed for two to four years. Another 23% stated that their LAN OSs have been installed for one to two years. Meanwhile, 20% indicated that their operating systems have been in place for six months or less, and 16% have been using the product between 7 and 12 months. Of the true veterans, 6% have had their LAN OSs between four and six years, and 5% for more than six years. Four percent were novices, with operating systems in use for less than a month.

The study indicates that the majority of LAN operating systems are being installed by in-house staff; 66% of the respondents indicated that they had done the installation themselves. Of the remaining participants, 18% had used a third-party installer, while 13% enlisted the LAN OS vendor for installation.

### Maintenance

The majority (74%) of respondents maintain their LAN OSs themselves. Just 13% use the services of a third-party firm, while only 8% entrust service to the vendor.

### Selection Criteria

Using a five-point scale where 5 = "extremely important" and 1 = "not at all important," the network professionals participating in this survey were asked to indicate the level of importance of various criteria when selecting a LAN operating system.

Vendor reputation/support received the highest rating (4.1). This would seemingly be good news for the dominant LAN OS vendors—Novell and IBM—which have the largest LAN OS installed base and a strong service and support organization. However, the user ratings show that Digital Equipment PCSA gained the strongest score for vendor reputation/technical support (4.2), while IBM OS/2 LAN Server scored the lowest (3.6). Novell's scores for this criterion ranged from a low of 3.7 (Advanced NetWare) to a high of 4.1 (NetWare 2.2 and NetWare 3.11).

Workstation support (DOS, OS/2, Macintosh, UNIX, etc.) and network management capabilities each scored

## Methodology

The 1991 LAN Operating System study was based on a questionnaire mailed in August 1991 to approximately 2,500 network professionals throughout the United States. These network professionals were chosen at random from the IDG Communications, Inc. LAN database. The following item was excluded from the list: manufacturers of computer-related products.

The survey consisted of a cover letter, three-page questionnaire, a pre-paid business return envelope, and a one dollar bill used as the incentive to respond. A follow-up mailing consisting of a duplicate questionnaire, thank you card, and pre-paid business return envelope was sent to the same respondents approximately one week after the first mailing; no incentive was included in the follow-up mailing.

Respondents were asked to provide information on the manufacturers and versions of the LAN operating systems installed at their location. Respondents who listed multiple manufacturers of LAN operating systems were asked to identify the manufacturer and version they

were planning to evaluate in this study. Respondents were then asked to rate the manufacturer and version on the following criteria:

- Selection/purchase
- Usage
- Service/technical support

By the cut-off date of September 26, 1991 Datapro had received 752 responses, or a 30.1% response rate. Of these, 175 surveys were judged to be invalid and are broken into the following categories: 91 respondents had no LAN operating system installed at their locations; 59 respondents returned incomplete or blank surveys; and 25 respondents identified an invalid manufacturer of their LAN operating systems. The total mailing (2,500) minus invalid responses (175) and undeliverables (46) equals the valid total mailing (2,279). Of the 752 surveys returned, 577 of those are valid responses; this represents a 25% valid response rate. The following would cause a survey to be judged invalid:

- No LAN operating system installed at their location
- No system identified for the rating section

- System identified was not a LAN operating system
- Incomplete questionnaire

The 577 valid questionnaires were coded, and data was entered by Datapro's Marketing Planning Department and then sent to Microtab, Inc. (Atlanta, GA) for data cleaning and tabulation.

The questionnaire listed five manufacturers and 15 versions with a space provided for write-in mentions. Respondents were asked to rate their systems on various attributes using a five-point scale where 5 = Excellent and 1 = Poor. Respondents were also asked to identify the applications they run on the network, what protocols the systems support, and what LAN technologies are used on the LAN operating systems. Of the various manufacturers and versions, the following were judged to have a sufficient number of responses to break out on an individual basis for tabulation purposes:

- Novell Advanced NetWare
- Novell SFT NetWare
- Novell NetWare 386
- Novell NetWare 2.2
- Novell NetWare 3.11
- IBM LAN Server
- Apple AppleShare
- Digital Equipment PCSI

Some of the manufacturers and versions that did not have a sufficient number of responses to break out for cross tabulation include:

- Novell ELS NetWare I and ELS NetWare II
- Microsoft LAN Manager
- 3Com 3+ Open and 3+
- Banyan VINES/286, VINES/386, and VINES/486
- IBM PC LAN Program
- Artisoft LANtastic
- Digital Equipment Pathworks
- Sun NFS
- Ungermann-Bass Net/One LAN Manager
- Hewlett-Packard Office-Share II
- Sitka TOPS

**Note:** The 1991 LAN operating system user rating survey was mailed to 2,500 persons; there were 577 valid responses. The ratings contained therein may, accordingly, not be statistically valid due to the small number of respondents rating each of the manufacturers surveyed. These survey results are qualitative in nature and should provide insight into user attitudes. However, these results may not be reflective of the overall market for the manufacturers surveyed.

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4.0, as did client/server application support. Security features (3.9), internetworking support (3.8), price (3.8), and application development support (3.7) rounded out the selection criteria.

### User Ratings

#### Selection Criteria

Using a five-point scale where 5 = "excellent" and 1 = "poor," respondents were asked to rate their LAN operating system with regard to the eight selection criteria mentioned in the previous section:

- Application development support
- Client/server application support

- Internetworking support
- Network management capabilities
- Price
- Security features
- Vendor reputation/support
- Workstation support

Datapro has examined the results of the user ratings for LAN OSs in two ways. First, we compiled a composite overview based on total responses for all eight selection criteria, and we computed an overall satisfaction rating based on the criteria. Second, we compiled individual ratings for the eight LAN OSs judged to have a sufficient number of responses to break out for analysis.

**Table 1. Mean Summary Scores of Selection Criteria**

Criteria	All Systems	Novell Advanced NetWare	Novell SFT NetWare	Novell NetWare 386	Novell NetWare 2.2
Application Development Support	3.5	3.3	3.7	3.8	3.6
Client/Server Application Support	3.6	3.4	3.8	3.8	3.5
Internetworking Support	3.6	3.5	3.4	3.8	3.3
Network Management Capabilities	3.5	3.3	3.6	3.8	3.4
Price	3.3	3.0	3.1	3.2	3.2
Security Features	3.6	3.4	3.7	3.8	3.5
Vendor Reputation/Support	3.9	3.7	4.0	4.0	4.1
Workstation Support	3.7	3.4	3.8	3.9	3.6
Overall Satisfaction for Selection Criteria	3.6	3.4	3.6	3.8	3.5

Mean summary table based on a 5-point scale where 5 = "excellent" and 1 = "poor." Mean scores have been rounded to the nearest tenth. Overall satisfaction is computed as the mean score of all selection attributes.

**Table 1. Mean Summary Scores of Selection Criteria (Continued)**

Criteria	All Systems	Novell NetWare 3.11	IBM OS/2 LAN Server	Apple AppleShare	Digital PCSA
Application Development Support	3.5	3.9	3.3	3.8	3.6
Client/Server Application Support	3.6	3.7	3.2	3.8	4.2
Internetworking Support	3.6	3.7	3.5	4.0	3.8
Network Management Capabilities	3.5	3.6	3.4	3.1	4.0
Price	3.3	3.0	3.2	4.2	3.4
Security Features	3.6	3.9	3.2	3.1	3.9
Vendor Reputation/Support	3.9	4.1	3.6	4.0	4.2
Workstation Support	3.7	3.8	3.3	4.0	3.9
Overall Satisfaction for Selection Criteria	3.6	3.7	3.4	3.8	3.9

Mean summary table based on a 5-point scale where 5 = "excellent" and 1 = "poor." Mean scores have been rounded to the nearest tenth. Overall satisfaction is computed as the mean score of all selection attributes.

The selection criteria overall satisfaction score based on total respondents in the survey is 3.6. Individually, Digital Equipment PCSA rated highest in selection criteria overall satisfaction at 3.9, followed by Apple AppleShare (3.8), and Novell NetWare 386 (3.8). Table 1 details system ratings for individual criterion within the selection criteria category.

#### Usage Factors

Datapro also asked survey respondents to rate their LAN operating systems on the following six usage factors:

- Documentation
- Ease of installation
- Ease of reconfiguration
- Memory usage (workstation/server)
- Printer sharing
- User interface

Using the five-point scale described above, the usage factors overall satisfaction score based on total respondents for LAN operating systems in the survey is 3.4. Apple's AppleShare received the highest rating of the eight specified products (4.4). Digital Equipment PCSA (3.6), Novell NetWare 3.11 (3.5), and Novell NetWare 386 (3.5) each received high scores. Table 2 provides system ratings for individual criterion within the usage factors category.

#### Service/Technical Support

The network professionals surveyed were also asked to rate their operating systems with regard to five service/technical support criteria:

- Documentation
- Effectiveness
- Responsiveness
- Service representative
- Troubleshooting

On the five-point scale, the overall satisfaction rating for the service/technical support category based on total respondents for LAN OSs is 3.3. Of the eight products specified, Digital Equipment PCSA scored the highest (3.8). Apple AppleShare (3.7), and Novell NetWare 386 (3.6) also received high scores for service/technical support. Table 3 lists the ratings for individual criterion within the service/technical support category.

#### Overall Satisfaction

When the ratings for the previous three categories are averaged, Apple AppleShare achieves the highest overall satisfaction rating (4.0), followed by Digital Equipment PCSA (3.8), Novell NetWare 386 (3.6), and Novell NetWare 3.11 (3.6). Overall satisfaction ratings for all eight specified operating systems are found in Figure 1.

### Operating System Recommendations

Apple AppleShare users are most satisfied with their LAN operating system. Ninety-two percent of the AppleShare users surveyed said they would recommend that product to a colleague. By contrast, users were least satisfied with IBM OS/2 LAN Server; 20% indicated that they *would not* recommend the product.

**Table 2. Mean Summary Scores of Usage Factors**

Criteria	All Systems	Novell Advanced NetWare	Novell SFT NetWare	Novell NetWare 386	Novell NetWare 2.2
Documentation	3.3	3.1	3.5	3.6	3.2
Ease of Installation	3.3	2.6	3.0	3.4	3.1
Ease of Reconfiguration	3.3	2.8	2.8	3.4	3.0
Memory Usage	3.3	3.1	3.1	3.3	3.3
Printer Sharing	3.5	3.0	3.0	3.6	3.3
User Interface	3.5	3.4	3.4	3.6	3.3
Overall Satisfaction for Usage Factors	3.4	3.0	3.1	3.5	3.2

Mean summary table based on a 5-point scale where 5 = "excellent" and 1 = "poor." Mean scores have been rounded to the nearest tenth. Overall satisfaction is computed as the mean score of all usage attributes.

**Table 2. Mean Summary Scores of Usage Factors (Continued)**

Criteria	All Systems	Novell NetWare 3.11	IBM OS/2 LAN Server	Apple AppleShare	Digital PCSA
Documentation	3.3	3.4	3.1	3.8	3.5
Ease of installation	3.3	3.5	3.1	4.7	3.5
Ease of Reconfiguration	3.3	3.5	3.1	4.7	3.6
Memory Usage	3.3	3.6	2.9	4.1	3.4
Printer Sharing	3.5	3.7	3.4	4.5	3.9
User Interface	3.5	3.4	3.3	4.8	3.7
Overall Satisfaction for Usage Factors	3.4	3.5	3.1	4.4	3.6

Mean summary table based on a 5-point scale where 5 = "excellent" and 1 = "poor." Mean scores have been rounded to the nearest tenth. Overall satisfaction is computed as the mean score of all usage attributes.

Manufacturer/ Model	Yes, Would Recommend (%)	No, Would Not Recommend (%)	Unsure or No Answer (%)
Apple AppleShare	92	0	8
Novell NetWare 3.11	90	2	6
Novell Advanced NetWare	90	0	10
Novell SFT NetWare	89	7	4
Novell NetWare 386	87	0	13
Digital Equipment PCSA	83	3	14
Novell NetWare 2.2	73	5	22
IBM OS/2 LAN Server	58	20	22

**Operating System Capabilities**

Respondents reported on the capabilities of each LAN OS with regard to the following areas of inquiry:

- Number of end-user nodes
- LAN technology
- LAN media used
- Protocol support
- Internetworking
- File server operating systems
- Geographical coverage

**End-User Nodes**

The size of the networks reported on in this survey varied. The largest percentage of respondents (24%) indicated small networks of ten nodes or less. The percentages decreased as the number of end-user nodes increased, and then increased again for the largest network size identified.

**Number of Nodes Connected Respondents (%)**

11 to 20	19
21 to 50	19
51 to 100	16
101 to 150	8
151 to 200	2
More than 200	12

Likewise, the size of networks based on the eight specified LAN OSs varies widely with no pattern emerging. The study indicated that Novell NetWare 2.2 has the largest percentage of small networks; 34% of NetWare 2.2 users have ten nodes or less. The largest percentage of Apple AppleShare users (32%) indicated networks between 11 and 20 nodes. Twenty-five percent of Novell Advanced NetWare users have networks in the 51-to-100 node range, while another 25% are in the 11-to-20 node range. Digital Equipment PCSA has a similar breakdown: 25% in the 51-to-100 range, 20% in the 11-to-20 range. Digital Equipment PCSA also has 22% in the more than 200 range.

**LAN Technology**

The vast majority (65%) of the respondents in this survey are using Ethernet as their LAN technology. Token-ring ranks a distant second with 29%. Many of the users have more than one LAN technology at their LAN OS installation.

**Table 3. Mean Summary Scores of Service/Technical Support**

Criteria	All Systems	Novell Advanced NetWare	Novell SFT NetWare	Novell NetWare 386	Novell NetWare 2.2
Documentation	3.3	3.0	3.0	3.6	3.1
Effectiveness	3.4	3.2	3.2	3.6	3.1
Responsiveness	3.3	2.9	3.2	3.6	3.2
Service Representative	3.3	2.8	3.1	3.5	3.0
Troubleshooting	3.2	2.7	3.1	3.6	3.0
Overall Satisfaction for Service/Technical Support	3.3	2.9	3.1	3.6	3.1

Mean summary table based on a 5-point scale where 5 = "excellent" and 1 = "poor." Mean scores have been rounded to the nearest tenth. Overall satisfaction is computed as the mean score of all service/technical support attributes.

**Table 3. Mean Summary Scores of Service/Technical Support (Continued)**

Criteria	All Systems	Novell NetWare 3.11	IBM OS/2 LAN Server	Apple AppleShare	Digital PCSA
Documentation	3.3	3.4	3.1	3.9	3.7
Effectiveness	3.4	3.5	3.3	4.0	3.7
Responsiveness	3.3	3.4	3.3	3.6	3.8
Service Representative	3.3	3.3	3.3	3.4	3.9
Troubleshooting	3.2	3.2	3.2	3.6	3.9
Overall Satisfaction for Service/Technical Support	3.3	3.4	3.2	3.7	3.8

Mean summary table based on a 5-point scale where 5 = "excellent" and 1 = "poor." Mean scores have been rounded to the nearest tenth. Overall satisfaction is computed as the mean score of all service/technical support attributes.

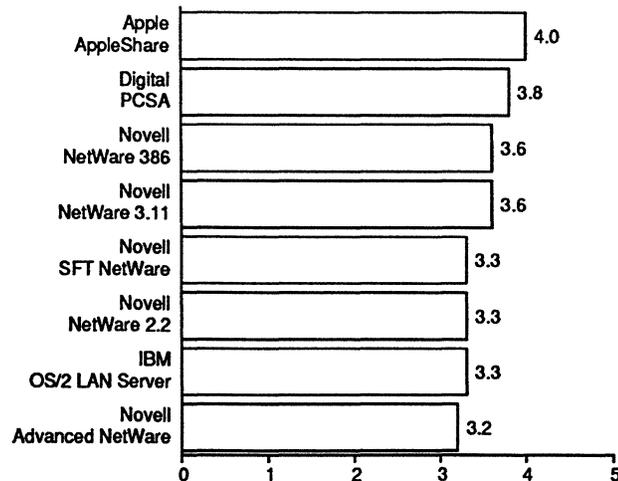
LAN Technology	Respondents (%)
Ethernet	65
Token-Ring	29
Arcnet	15
LocalTalk	13
FDDI	3
Broadband	1

**LAN Media**

Despite the current industry trend toward the use of unshielded twisted-pair (UTP) wire, the survey shows that the majority of the respondents (58%) are still running their LANs over coaxial cable. Meanwhile, optical fiber, the LAN medium of the future, has a low penetration (18%) in the sites studied. As with LAN technology, many of these users have mixed media over which their networks operate.

LAN Media	Respondents (%)
Coaxial Cable	58
Unshielded Twisted-Pair	29
Shielded Twisted-Pair	27
Optical Fiber	18

Figure 1. Overall Satisfaction



Using a five-point scale where 5 = "excellent" and 1 = "poor," respondents to this survey were asked to rate their LAN operating systems.

Interestingly, optical fiber had its largest penetration (31%) in IBM OS/2 LAN Server and Digital Equipment PCSA (31%) sites. As could be expected, shielded twisted-pair (STP) also had its largest penetration (44%) in OS/2 LAN Server sites, given IBM's past reliance on that media for its Token-Ring Network. UTP showed up the most (64%) in AppleShare networks. Coaxial cable was strong with all versions of NetWare, particularly SFT NetWare (78%), and it was also expectedly strong in Digital Equipment PCSA sites (78%).

**Protocol Support**

Despite the dominance of Novell NetWare in this study, NETBIOS showed up in more installations (47%) than IPX/SPX (36%). TCP/IP also made a strong showing (31%).

Protocol Supported	Respondents (%)
NETBIOS	47
IPX/SPX	36
TCP/IP	31
AppleTalk	19
DECnet	5
LAT	2
XNS	1
Other	2

### Internetworking

Respondents were asked whether they currently had internetworking devices (bridges, routers, gateways) installed, or if they had plans to install them. Fifty-one percent indicated that they already had some form of internetworking device on their network. Surprisingly, 22% said that they do not have any internetworking devices installed and that they have no plans to install them in the future.

Status	Respondents (%)
Installed now	51
Plan to Install within 6-12 Months	19
Plan to Install within 12-18 Months	4
Plan to Install within 18-24 Months	2
Plan to Install in more than 24 Months	2
No Plans to Install	22

Respondents were also asked to specify the type of inter-network connection they have or plan to install.

Connection Type	Respondents (%)
LAN-to-LAN	65
LAN-to-WAN	38

### File Server Operating System

As expected, DOS is the dominant operating system in use on the network file server, with 80% of all installations. UNIX made a strong showing, appearing in 21% of all installations. Many installations run multiple file server operating systems.

Operating System	Respondents (%)
DOS	80
OS/2	22
UNIX	21
VMS	19
AppleShare	5
NetWare	1
Other	2

OS/2 is most prevalent in networks using IBM OS/2 LAN Server, as can be expected. UNIX showed up most in Digital Equipment PCSA (25%) and Novell NetWare 3.11 (24%) networks. DOS was dominant for all versions of NetWare, ranging from a low of 89% (NetWare 386) to a high of 97% (NetWare 2.2).

### Geographical Coverage

Most users' LANs (61%) are contained within a single building. The majority of the remainder (22%) have networks that span two or more buildings in a campus environment.

Coverage Area	Respondents (%)
Single Building	61
Multiple Buildings within Campus	22
Within the U.S. or Canada	8
One Metropolitan Area	6
Outside of North America	3

### Operating System Applications

LANs are used for a variety of applications. Most of the major LAN operating systems on the market today support the full range of applications that users desire. The respondents to this survey chose word processing (82%) most frequently. Database management is a key application for most (74%) users. Spreadsheets (70%) are also in use on most of the respondents' networks.

Application	Respondents (%)
Word Processing	82
Database Management	74
Spreadsheets	70
Communication Gateways	59
Application Development	51
Accounting/Billing/Order Processing	44
Desktop Publishing	43
Financial/Budgeting	41
Presentation Graphics	41
Inventory Management	30
Sales Management	18
Engineering	4

### Respondent Demographics

#### Type of Industry

Respondents to the LAN Operating Systems survey represent a variety of industries. In total, network professionals employed in 19 industries participated in this survey. The largest percentage of respondents came from the government (19%). Manufacturing firms (excluding those that make computers and/or communications products) made up 14% of the total response.

Industry	Respondents (%)
Government	19
Manufacturers (Excluding Computers and Communications)	14
Business/Professional Services/Consulting	11
Education	10
VARs/Distributors of Computers and Communications Products	6
Wholesale/Retail Trade	5
Health Care	5
Manufacturers of Computers and Communications Products	4
Transportation/Utilities	4
Agriculture/Mining/Construction	3
Banking	3
Insurance	3
Finance	2
Publishing	2
Communications Carriers/Interconnects	1
Research & Development	1
Engineering	1
Real Estate	1
Non-Profit Organizations	1
Other	2
Not Specified	2

### Number of Employees

Respondents were asked how many people were employed at their location and in their entire company.

No. of Employees	Respondents' Location (%)	Respondents' Entire Company (%)
Under 100	37	18
100 to 249	19	10
250 to 499	14	9
500 to 999	9	8
1,000 to 2,499	11	10
2,500 to 4,999	5	9
5,000 to 9,999	2	7
10,000 or More	1	26
No Answer	1	5

### Sales Volume

Due to the large number of government and education respondents, 22% of those responding to this survey indicated that they are non-profit organizations. The next largest percentage (17%) indicated annual sales of \$1 billion or more, while another 16% showed sales under \$10 million per year.

Annual Sales	Respondents (%)
Non-Profit	22
Under \$10 Million	16
\$10 to \$24.9 Million	10
\$25 to \$49.9 Million	6
\$50 to \$99.9 Million	5
\$100 to \$249.9 Million	5
\$250 to \$499.9 Million	5
\$500 Million to Under \$1 Billion	7
Over \$1 Billion	17
No Answer	7

### Budget for LAN Expenditures

The respondents were asked to provide their 1991 budget for LAN-related expenditures, as well as their estimated budget for 1992.

Budget	Respondents' 1991 (%)	Respondents' Estimated 1992 (%)
Under \$10,000	24	18
\$10,000 to \$49,999	24	24
\$50,000 to \$99,999	13	14
\$100,000 to \$249,999	11	14
\$250,000 to \$499,999	7	7
\$500,000 to Under \$1 Million	5	4
\$1 Million to \$4.9 Million	5	5
\$5 Million or More	2	4
No Answer	8	10

Despite the recessionary economy, these numbers show a slight increase in local area network spending for 1992. Those with the largest budgets (\$5 million and up) showed an increase from 2% to 4% of all respondents. Government budgets are among the highest. The average government LAN budget for 1991 was \$706,000; the average rose to \$787,400 for 1992. This compares to a 1991 LAN budget of \$387,800 for all respondents, which increased to \$484,200 for 1992. ■

# Asynchronous Communications Software: Market Overview

## In this report:

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Trends and Issues .....	-103

## Synopsis

### Editor's Note

This report examines the current status of the asynchronous communications market. For information on the technology behind these products, see the technology overview (Report 531-201). In the comparison columns (Report 531-301), we provide detailed information on products currently available from asynchronous communications vendors.

### Market Highlights

Communications software can be used for a variety of applications. Unlike applications programs (e.g., word processing and spreadsheets), communications programs provide tools to accomplish specific tasks. Each communications solution works best only for certain tasks, and users should make their selection based on a careful definition of their needs. This report focuses on the current market for asynchronous communications software for the desktop computer. It discusses the market leaders and the trends and issues driving market development.

The first section of this report, Market Leaders, takes a brief look at the history and major product offerings of the top vendors in the asynchronous communications software market. Included are brief profiles of such industry leaders as DCA/Crosstalk, Hayes Microcomputer Products, and Microcom Software Division. The report also looks at lesser known but competitive vendors such as Hilgraeve.

The other section of this report, Trends and Issues, discusses key factors in the growth of the current market. Issues covered here include the continuing move toward greater functionality (particularly in the market's high end), the fragmentation and specialization occurring within the market, and the impact of graphical user interface operating environments on new product development.

—By *Dave Hickey*  
Staff Writer

# Analysis

## Market Leaders

### DCA/Crosstalk

In October 1986 Digital Communications Associates (DCA) acquired Microstuf, Inc., which now operates as DCA's Crosstalk division. The company offers a wide variety of asynchronous communications products, competing in both the low and high ends of the general asynchronous communications market, as well as remote control software. DCA/Crosstalk's Crosstalk XVI is the company's entry in the low-end market. Introduced in 1983, the product now claims an installed base of more than 900,000, making it a dominant player in its market. In addition, DCA/Crosstalk has enjoyed considerable success with its high-end Crosstalk Mk.4 package and its Remote2 remote control software. In an effort to increase an already strong position and capitalize on the growing popularity of Microsoft's Windows 3.0, the company has also introduced Crosstalk for Windows.

### Datastorm Technologies, Inc.

Since its inception, Datastorm Technologies has specialized in producing data communications software. The company made its first market inroads with its original ProComm software, which it offered as shareware through electronic bulletin boards. The company followed the success of this package with the introduction of its enhanced ProComm Plus in late 1987. Since that time, ProComm Plus has become one of the most widely installed programs on the market. Though lacking a few features of some other high-end packages, the software maintains high functionality while carrying a price tag of only \$119. Datastorm Technologies has demonstrated consistent growth since its introduction of ProComm Plus, with sales increasing from \$1.7 million in 1987 to \$6.14 million in 1989.

### Microcom Software Division

Microcom Software Division is the result of the acquisitions, by Microcom, Inc., of Meridian Technology and Relay Communications, both of which already enjoyed a good deal of success in the asynchronous communications market. In fact, the reputation of these companies has made Microcom Software Division an immediate market leader. The company's two main products are Relay Gold and Carbon Copy Plus, a high-end asynchronous communications package and remote control program, respectively. Carbon Copy Plus is currently the company's top product. It boasts an installed base of approximately 750,000 and is perhaps the most widely recognized remote control program in a steadily growing market. Like DCA/Crosstalk, Microcom is also attempting to take advantage of the success of the Windows interface and has recently introduced its Relay Gold for Windows communications program.

### Hayes Microcomputer Products, Inc.

Hayes is best known as the leading manufacturer of microcomputer modems and as such has been able to use a different strategy in establishing itself in the asynchronous communications market. The company currently produces several data communications packages, including Smartcom II for the Macintosh, Smartcom EZ, and Smartcom Exec. Hayes' top product, though, is its Smartcom III program, a highly functional, easy-to-use communications package. Hayes' ability to bundle this software with its popular V-series modems provides a unique distribution channel not available to other vendors and has allowed the company to establish Smartcom III as a top communications program.

### Dynamic Microprocessor Associates

A small, privately held company, Dynamic Microprocessor Associates, has (like Datastorm Technologies) concentrated on the development of software for PC communications. The company's founder and current president, Lee Rautenberg, developed DMA's original offerings, Ascrom and pcAnywhere. Since its inception, the company has remained on the leading edge of the industry with products that have consistently won critical acclaim as innovative, dependable, and cost effective. DMA's current products include pcAnywhere IV, a leading remote control program; pcMacterm

II, a program that lets Macintosh users access and control DOS-based PCs; and Ascom IV, a high-end asynchronous communications program.

#### **Hilgraeve, Inc.**

Hilgraeve, a small privately held company, has recently been receiving very high marks for its HyperAccess/5 product, an extremely functional, intuitive, simple to understand communications product designed specifically to take advantage of the OS/2 operating system. The program also offers DOS compatibility and is making some inroads in this area. But as OS/2 begins to gain acceptance, it is likely to find itself in a commanding position in that segment of the market, as it currently faces little if any competition on the OS/2 front.

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### **Trends and Issues**

The processing power, speed, and efficiency of desktop computer systems have made them very popular in most corporations. Whether retrieving sales or personnel data from the corporate mainframe, accessing stock prices from an online service, or exchanging reports and memos within a corporation, users need access to corporate information to use microcomputers effectively and fulfill the promise of the "Information Age."

The entire communications industry has grown up around the need to share information among computers. The emphasis on information as a corporate resource, as well as the need to integrate PCs into the corporate computer system, will continue to drive this market growth. The increasing popularity of portable and laptop computers adds fuel to this growing market, since portability applies not just to the system, but also to the information on the system.

#### **Functionality**

The basic technology governing asynchronous communications stabilized several years ago. Therefore, product introductions in the asynchronous market generally reflect user demands for packages that are more sophisticated and yet easier to use. Purchasing decisions should reflect a combination of concerns, such as price/performance, compatibility with existing systems, ease of use, ability to customize for special applications, and

vendor support policies. Some packages offer specialized functions or increased functionality, and many are less expensive than the market leaders.

More sophisticated communications packages, such as Crosstalk Mk.4, Relay Gold, Smartcom III, and HyperAccess/5, offer a variety of features. These include multitasking operation, multiple communications sessions, extended terminal emulation and modem support, sophisticated programming languages (often called script languages), and support for more error-checking protocols (e.g., Kermit, X.PC, and the extended versions of xmodem). Some newer programs even allow the user to custom install external protocols for greater compatibility. For example, if users need to communicate with a system that only supports a specific version of Kermit, they could install that version in their program.

Other features that make even sophisticated programs easier to use include automatic installation programs, menu-driven configuration, preset modem and system parameters, automatic logons for online services, learn facilities that record keystrokes as they are typed and create script programs automatically, and telephone directories that save individual access configurations for later recall (often using only a single keystroke to establish the connection).

#### **Fragmentation**

One obvious trend in the asynchronous communications market has traditionally been its fragmentation. While general asynchronous packages continued to dominate the market, highly specialized packages, designed to accomplish specific tasks, have become popular because users often do not want to purchase more functionality than they need. Packages such as electronic mail and remote access/control packages support limited functions geared toward their specific area. Remote access/control packages, such as Microcom's Carbon Copy Plus or Norton-Lambert's Close Up, allow a remote PC to call into a host PC and access its programs as if the remote user were seated at the host PC's keyboard. Recently, however, some remote computing packages, such as DCA/Crosstalk's Remote2 and Triton Technologies' CO/Session, have also begun offering such features as TTY terminal emulation and xmodem protocol support, allowing them to provide basic asynchronous communications capabilities.

Electronic mail packages are designed to send electronic messages. They often support access to a specific electronic mail service such as MCI Mail, Easylink, or AT&T Mail. Another segment of the asynchronous market includes programs designed specifically for PC-to-PC communications. Programs such as Traveling Software's LapLink simplify the transfer of data between any two locally connected systems, although their target audience is laptop owners.

### **Windows and OS/2**

The recent success of Microsoft's new Windows 3.0 operating environment has created renewed interest in graphical user interfaces (GUIs). Though vendors will obviously continue to enjoy a highly profitable market for DOS applications in the foreseeable future, some are already beginning to introduce products designed to take advantage of the Windows GUI. Most notable among these products are Crosstalk for Windows and Relay Gold for Windows.

In contrast to Windows, however, OS/2 has been slow in gaining support in the communications arena. Though seen by many as the next logical step from Windows, there are currently few

packages that offer OS/2 compatibility. Part of this may be due to the fact OS/2 includes communications functions, through its Communications Manager, as an integral part of the operating system. When fully delivered, OS/2 should make it easier to integrate transparent communications between desktop systems and other systems, host and desktop.

Currently, however, the Communications Manager feature of OS/2 is very basic and lacks the functionality to which users of high-end asynchronous communications packages have become accustomed. As a result, feature-rich packages such as HyperAccess/5, which are compatible with OS/2, are still likely to find a highly receptive market for their products. The impact of OS/2 on the asynchronous communications market, however, remains to be seen. Until the Communications Manager is fully delivered, it is not certain how other vendors' products will add value to, enhance, or replace the IBM offering. Meanwhile, MS-DOS products will continue to play a large part in this market for several years to come. ■

# Asynchronous Communications Software: Technology Overview

## In this report:

Technology Basics .....	-202
Matching Products with Applications .....	-204

## Synopsis

### Editor's Note

This report looks at the technology driving the asynchronous communications marketplace. For a detailed list of available asynchronous communications products and their capabilities, see the comparison columns (Report 531-301). For a more complete look at the state of the market, see the market overview (Report 531-101).

### Technology Highlights

The first section of this report, Technology Basics, examines the technology behind asynchronous communications. It discusses the basic aspects of establishing a physical connection, including asynchronous modems and the RS-232-C interface. In addition, the report looks at asynchronous transmission, serial data transfers, and the ASCII and EBCDIC data codes.

Also in this section is a detailed discussion of error detection/correction protocols, perhaps the most important aspect of asynchronous transmission. This section also examines the parity and CRC methods of error detection and how they work to ensure data integrity during asynchronous transfers.

The final part of this report, Matching Products with Applications, looks at some general functions offered by various asynchronous communications programs, as well as matching these functions with the types of users most likely to require them. Among the areas covered here are user interface, terminal emulation, programming features, and security.

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—By *Dave Hickey*  
Staff Writer

# Analysis

## Technology Basics

Asynchronous communications involves two computers, two software programs, two modems, and the telephone line between them. Its complexities stem from coordinating this system. To establish a connection to a remote system, the PC requires communications software and a physical connection to the remote system. The physical connection consists of an asynchronous modem sending data over telephone lines. Asynchronous modems can be internal or external; internal modems are add-in boards, while external modems are standalone devices cable-connected to the standard RS-232-C serial interface. A null modem cable can connect local systems directly. At its most basic, the communications software accesses the serial port, dials the phone, formats data for transmission, and decodes data received. For communications to occur, certain parameters of the sending and receiving systems must match.

## Physical Interface

The interface is the physical link between data circuit-terminating equipment (DCE) and data terminal equipment (DTE). Modems are DCEs; microcomputers are DTEs. Most asynchronous communications use the RS-232-C interface. Interface standards define the electrical, mechanical, and physical specifications for connecting data processing equipment. The RS-232-C interface uses a pin-per-function approach to define circuit functions and their corresponding pin assignments. Each pin is assigned a particular task; e.g., RS-232-C pin 8 performs carrier detection (for a complete breakdown of pin assignments, see Table 1). The RS-232-C interface is used for both asynchronous and synchronous serial transmission at data rates up to 20K bps, in half- or full-duplex mode. It is also known as the serial port.

Whether internal or external, most asynchronous modems used with PCs are smart modems or

Hayes-compatible modems. Smart modems can use commands from the communications software to automatically answer the phone, dial a phone number, and hang up the connection. Hayes-compatible modems, sometimes called AT-compatible modems, use the de facto standard AT command set, developed by Hayes Microcomputer Products, to control modem functions. All modem commands are preceded by AT; for example, the command to dial is ATDT5554444, and the command to hang up is ATH.

## Asynchronous Transmission

Asynchronous transmission refers to data transmission in spurts—delays are possible between

**Table 1. RS-232-C Pin Assignments**

Pin Number	Description
1	Protective ground
2	Transmitted data
3	Received data
4	Request to send
5	Clear to send
6	Data set ready
7	Signal ground
8	Received line signal detector
9	Reserved for data set testing
10	Reserved for data set testing
11	Unassigned
12	Secondary received line signal detector
13	Secondary clear to send
14	Secondary transmitted data
15	Transmission signal element timing
16	Secondary received data
17	Receiver signal element timing
18	Unassigned
19	Secondary request to send
20	Data terminal ready
21	Signal quality detector
22	Ring indicator
23	Data signal rate selector
24	Transmitted signal element timing
25	Unassigned

bytes of data. The other form of data transmission is synchronous. In synchronous transmission, a group of characters is sent in a continuous bit stream; data transfer is controlled by a timing device, called the clock, initiated at the sending device. Microcomputers normally transmit asynchronously. This works well with irregular data input rates, such as those associated with interactive communications. Synchronous transmission is more efficient, but it is also more expensive because it requires additional hardware, either in the modem or internally installed in the PC. PC-to-PC and PC-to-Digital Equipment Corp. minicomputer communications is primarily asynchronous. PC-to-IBM mainframe system communications is primarily synchronous.

### **Serial Data Transfer**

Asynchronous communications uses serial data transfer. Transmission is bit by bit rather than parallel. To transmit serially, parallel codes (data characters) must be converted to a serial bit stream to travel over the communications line. Therefore, the serial bit stream must be broken up into individual characters, from five to eight bits in length. These characters are defined by adding start and stop bits (see Figure 1).

### **Data Codes**

All data on a computer exists in coded format. A code is a standard format for ordering binary digits (bits), i.e., 1s and 0s, for transmission. The most common codes in use today are the American Standard Code for Information Interchange (ASCII) and the Extended Binary-Coded Decimal Interchange Code (EBCDIC). All microcomputers are ASCII based. ASCII defines 128 characters; codes 32 to 127 are standard printable characters such as ?, A, B, and c. The codes 0 to 31 are characters that control line feed, vertical tab, and backspacing. Extended ASCII includes codes 128 to 256; these are not standardized. A text file uses only printable ASCII codes plus four of the ASCII control codes: carriage return (CR), line feed (LF), form feed (FF), and horizontal tab (HT).

All characters are represented by seven bits, binary 1s and 0s; an eighth bit can be added for parity checking. Most communications programs allow the user to select character length, set stop and start bits, and set parity. These settings must be the same on both the sending and receiving

computers. One of the most commonly used settings between PCs is eight bits, one start bit, one stop bit, and no parity. Each online service has a specific required setting.

EBCDIC defines 256 characters, each represented by eight bits. All IBM networks use the EBCDIC code, and it is important in PC-to-host communications.

### **Error Controls/Protocols**

The most critical element in transferring data between two systems is to ensure integrity. Telephone lines are an inefficient medium for transferring digital data. A communications line carrying a serial datastream is subject to interference from storms, cross talk, echoes, and other lines. It can also be subject to delays, especially across satellite networks. This interference destroys data integrity and propagates errors. There is no way to prevent error transmission, especially over long distances.

Protocols, however, do allow error correction. A protocol is a standard set of procedures for establishing and controlling communications. Protocols group data into envelopes, called frames or blocks. These envelopes comprise start and stop bits, error detection sequences, and methods for retransmitting blocks of data containing errors. Transferring text files is possible using only the start and stop bits, because the ASCII codes are transparent and can be passed through the communications system. Exchanging binary files (e.g., some word processing, spreadsheet, or database files), however, requires a protocol because binary files contain nonstandard bit patterns. The same protocol must be implemented at both the sending and receiving computers.

Many protocols divide the data to be transmitted into blocks. Each block is then checked for its correct transmission; a positive acknowledgment (ACK) is sent if it is correct, and a negative acknowledgment (NAK) and request for retransmission is sent if it is incorrect. The size of each data block depends on the protocol. Xmodem defines 256K bytes to a block, but some versions allow the block size to be adjusted up to 1,024K bytes. The more bytes per block, the more efficient the file transfer will be. The difference in transfer time can be considerable. For example, take a 5,000K-byte file. At 1 minute per block, 256K blocks will take about 20 minutes; 1,024K blocks will take about 5 minutes. High block sizes work

best over relatively clean lines and good connections. The exact method of error detection depends on the protocol being used. Many employ some variation of cyclic redundancy checking (CRC).

Parity is the simplest form of error detection. With parity, a bit is appended to each character, and the receiving system verifies the number of bits in each character according to the parity setting. For example, if odd parity is selected, the parity bit is set to 1 or 0 so that the total number of 1s, excluding the stop and start bits, is always odd. Parity can be set to odd, even, or none. If none is selected, no parity bit is added (see Figure 1). Different online services require different parity settings. The parity setting must be the same at both the receiving and sending computers. Cyclic redundancy checking is a more powerful error-checking technique that employs polynomially generated check characters. With CRC, the entire block of data is considered to be one long binary number divided by another standard binary number. After the quotient is discarded, the remainder is transmitted as one- or two-block check characters that are checked at the other end.

Asynchronous communications packages offer both proprietary and public domain protocols. Since the same protocol must be implemented on the sending and the receiving system, proprietary protocols, such as Communications Research Group's Blast, must be running on both systems. Commonly used access public domain protocols, such as xmodem and Kermit, allow file transfer with a wide variety of remote systems. Xmodem remains the most popular and widely implemented protocol. Kermit, a system developed at Columbia University, is increasingly popular because it runs on microcomputers, minicomputers, and mainframes. X.PC is an asynchronous protocol from Tymnet that supports a maximum of 15 simultaneous sessions.

### Transmission Modes

There are three transmission modes: simplex, half duplex, and full duplex. Simplex transmission is in one direction only. Half duplex transmits in one direction at a time. Full-duplex transmission occurs in both directions at once. Full duplex is the most efficient, since data can be sent in one direction while ACKs and NAKs can be sent in the other. Some protocols are full duplex, e.g., Kermit and X.PC; xmodem is half duplex. Users should be

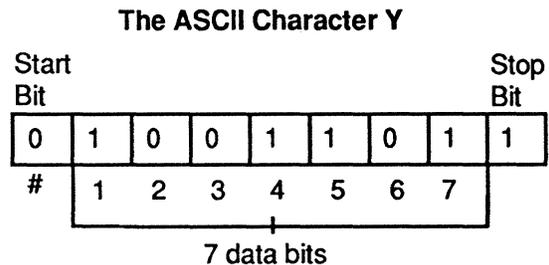
careful to distinguish full- and half-duplex transmission from full- and half-duplex terminal modes. These are also known as local echo. This setting determines whether characters typed at the local keyboard are echoed to the local screen.

### Matching Products with Applications

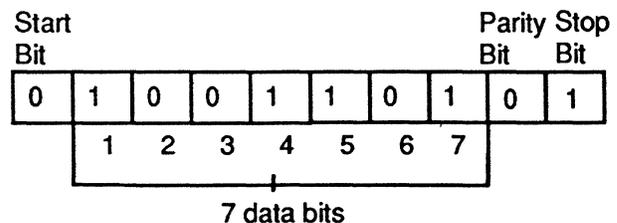
The various functions offered by each package determine its suitability for a particular application. For example, the user who wants to exchange files with another PC or access an online service or public BBS needs a basic communications package with file transfer and error-correcting protocols. A basic communications package also should support the industry-standard Hayes AT command set, which controls intelligent modems.

In addition, many users, especially novices, prefer communications packages that are easy to use. Certain features make a package simpler to learn and use. One of the most important of these is a Help facility. Help facilities can be simple (an

Figure 1.  
The ASCII Character Y



**The ASCII Character Y With Parity Bit Added.**



Note: Parity was set to even. This means that the total number of 1s will be even. The character Y includes 4 1s: therefore, the parity bit is set to 0.

ASCII character codes representing the letter Y, both with and without parity bit added.

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# Electronic Mail for Microcomputers: Market Overview

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## Synopsis

### Editor's Note

Electronic mail (E-Mail) is generally classified as a portion of the overall electronic messaging market which also includes the entire fax business, EDI, Telex, voice mail, and other ancillary products. Overall, the picture for vendors in the E-Mail market is bright. The growing acceptance of standards and the ever-growing number of microcomputers—whose users are increasingly sophisticated and networked—together create a fertile market for a variety of products running in many different environments.

E-Mail is increasingly seen as a tool for enhancing productivity and as a platform for further application development, ever-deepening its necessity in the modern information processing environment. Public messaging systems increasingly act as central message clearinghouses for messaging across incompatible systems, in addition to serving as value-added services for message distribution. Standard message exchange protocols and user directories, developed under the OSI model, further stimulate new products that will serve to build a global E-Mail network that will one day rival or

perhaps surpass the telephone network in its extensiveness.

This report provides an overview of E-Mail products available in the microcomputer environment. We examine the results of our annual vendor survey, and look at an industry news digest. A thorough overview of E-Mail technology can be found in the technology overview, report number 535-201. Complete comparison column information is in report number 535-301.

# Analysis

## The State of the Market

The micro-specific E-Mail package market is vital because of the LAN market's dynamism and growth. Major market research firms such as IDC, among others, uniformly predict 100-plus percent growth rates for LAN products in the period from 1988 to 1990. E-Mail is one of the key applications that is developing in the LANs environment, as it opens the door to enhancing productivity through improved communications. The rudimentary messaging capabilities included with most LAN operating system software suits some, but many require the fuller-featured products that our vendor survey includes.

The market for E-Mail products and packages consists of numerous submarkets and niches that reflect the variety of user demands and host environments. Two niche E-Mail markets with fast growth rates can be used to project the future of the entire E-Mail and messaging market.

According to EMMS, LAN-based E-Mail software was expected to grow at a 50 percent rate in

1989, approaching a \$25 million market. Successful vendors, such as CC:Mail expect their installed base to grow five times in just this year alone. And given the growth rate in the LAN market, the E-Mail market will likely ride on its coattails to close to \$100 million in revenue by 1992.

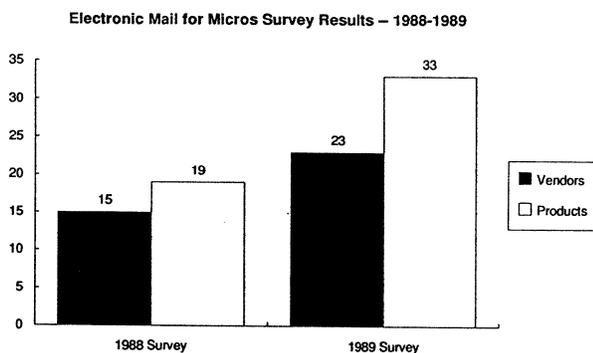
According to EMMS, the market for microcomputer-based dial-up software to public E-Mail services is one of the fastest growing in the entire messaging marketplace. These packages provide users with options to move through the connection and sign-on procedures, to move through the system's menus, to read any new messages, and to perform other functions. The microcomputer market continues to grow rapidly; access to public E-Mail networks has become increasingly attractive due to the expansion of the services available. These software packages, such as Lotus Express for MCI Mail, automate the connection process that otherwise would require users to dial the service through a modem and establish a session.

## Industry Trends

For LAN-based packages, the trend is entirely upward, but the path to consistent success for vendors is clouded by the confusing and quickly shifting microcomputer market. Networking in the microcomputer market will boom for the foreseeable future. New, unforeseen factors, such as a growing preponderance of UNIX-based systems, have complicated the picture with regard to standard operating and networking environments. OS/2 still presents a quandary; the first important application for OS/2 is expected to use networks in some way, but OS/2 will not live up to its potential until a full 32-bit version arrives sometime in 1990, or more likely, in 1991.

IBM's OfficeVision announcement signals renewed emphasis on integrated office automation software systems. Providing integrated cross-platform communication tools and a consistent interface across platforms, OfficeVision predicts the design of office automation software for years to come. With its emphasis on enterprise networking and its extensive LAN support, IBM has challenged the industry to provide similar functionality and interoperability. The fallout from the IBM announcement will take several years to sort out; for now it is sufficient to say that IBM has thrown

Figure 1.  
Survey Results



The dynamic growth of the E-Mail for Micros market can be seen in the growth of the number of vendors and products from last year to the present.

**Table 1. Electronic Mail Marketplace,  
1988**

Market Segment	U.S. Revenue (estimates in \$ millions)	Growth Rate (%)
Facsimile	3,966	120
CBMS	574	28
Telex	505	-16
Voice Mail	355	39
EDI	180	64
Alpha Pagers	50	67
Other	190	-7
Total	5,820	69

down the gauntlet with its OfficeVision tools, and the rest of the industry will no doubt follow suit in some fashion.

The Macintosh market continues to grow steadily and continues to generate more than its share of excitement by serving as the bed for most innovative applications. The Macintosh's integrated networking capabilities are used more and more in the building of ever-larger networks. Innovative E-Mail package features often debut in the Macintosh environment. The Macintosh's growing acceptance in the corporate marketplace and Apple's ties to Digital Equipment Corporation for internetworking tools promise a bright future for E-Mail vendors skillful enough to take advantage of these developments.

Most LAN control packages include some sort of mail facility. Novell's NetWare, the market leader, comes with a messaging component that does a solid, if unspectacular, job of enabling users connected to a network to send and receive messages. Some LAN software vendors, notably 3Com include a more-fully-featured store-and-forward component. If LAN vendors decide to add features to their mail components to make them more attractive, they may squeeze third-party vendors out of the market. At the same time, some mail package developers have bundled their programs with LAN hardware and software packages. This strategy builds in an outlet for the developers and brings more features to the mail portion of LAN packages.

## Survey Results

Although the E-Mail for microcomputers market is small, thus not easily tracked by traditional market research methods, comparing the results of this year's survey with those from last year's inaugural survey yields some insight into the market's dynamism. The number of vendors represented in the survey is up 53 percent and the number of products represented is up 74 percent. Clearly this indicates booming vendor interest driven, no doubt, by user demand.

Connection to outside services and protocol observance seems to be emerging as one of the most important competitive factors in this market. Most of the products surveyed are full-featured, and package pricing falls within a fairly narrow range. Users, however, face an increasingly interconnected environment, and the ability to connect a LAN-based mail system to a mainframe-based, SNA-compliant mail network running IBM's PROFS is increasingly important. Thus we broke down the connectivity capabilities of the various packages.

Protocol or Outside Service Support	Mainframe, Mini, & Dedicated Indicating (%)	Microcomputer-Based Indicating (%)
ALL-IN-1	29	38
DISOSS/PROFS	57	41
FAX	52	62
Internet	10	15
MHS	0	12
SMTP	0	9
Telex	57	35
X.400	52	33

The other survey results are no surprise: MS-DOS dominates the market, although Macintosh support is strong, and growing; OS/2 is nowhere to be found; system resource requirements are increasing; and Novell's NetWare garners the most support of the LAN operating environments mentioned.

## Major Vendors

We present a sketch of the activities and strategies of some of the most important vendors in the E-Mail industry. These firms have the most important products in their respective markets, and are also generally the sales leaders. We have focused

**Table 2. Electronic Messaging  
Marketplace, 1988**

Market Segment	U.S. Revenue (estimate in \$ millions)	Growth Rate (%)
<b>Computer-Based Message Systems</b>		
Public E-Mail Network Service	†330	15
Host E-Mail MHS Software	165	38
LAN E-Mail MHS Software	15	50
Microcomputer UA Software	35	130
Host Gateway Software		
Proprietary Protocols	25	79
X.400-Based Gateways	4	300
<b>Electronic Data Interchange</b>		
EDI Network Service	100	65
EDI Software	80	60
<b>Alphanumeric Pagers</b>		
Receiver Equipment	20	100
Message Delivery Service	30	50
<b>Telex, TWX, &amp; Teletex Network Service</b>		
Domestic	110	-27
U.S. to International	340	-11
Hardware & Supplies	55	-31
<b>Facsimile</b>		
Fax Machine Sales & Rentals	1,650	220
Long-Distance Fax Calls	2,250	125
PC Fax Boards & Software	11	57
Service Bureaus	55	21
<b>Voice Mail</b>		
Equipment Sales	320	42
Service Bureaus	35	17
<b>Other</b>		
Postal, Courier Deliveries	150	-6
Private Wire Services	40	-12

more on the strategic importance of products than on sales, as this is a market in its infancy with relation to its ultimate predicted outcome.

The microcomputer mail market is wide-open, and divided in two natural camps: MS-DOS/Intel (IBM PC-compatibles) and Apple Macintosh. Some of the leading vendors and their recent activities include the following.

- Action Technology—released Version 2.0 of its Coordinator groupware package, featuring a reworked interface, and continued to extend the applicability its MHS message handling protocol.
- cc:Mail—has established itself as the major E-Mail contender in the MS-DOS-based LAN messaging market. cc:Mail continues to be upgraded, with interoperability across MS-DOS, Macintosh, and OS/2 networks in the announced stage.
- CE Software—continued enhancing its Quick-Mail product, which is popular in the Apple Macintosh environment.
- Da Vinci Systems—received funding from LAN industry titan Novell, and has impressed users with its unique DDE (dynamic data exchange) feature that its package, running under MS Windows, allows users to transfer data in real time from Windows applications into and out of the Mail application.
- Microsoft—released Version 2.0 of its Mail package for AppleTalk networks. Microsoft is working to establish itself as a major mail vendor with this product.
- Retix. Retix is the acknowledged leader in the X.400 gateway product market and has continued to extend the range of its products across multiple environments.

### Industry News

The following digest of E-Mail industry news from the first three quarters of 1989 confirms some of the trends that we have reported previously.

**3Com Corp.** Announced 3PlusOpen Mail E-Mail system, and 3PlusOpen Internet, which uses telephone lines for communications among multiple 3PlusOpen networks. Both are for MS-DOS, Macintosh, and OS/2 workstations and cost \$1,190 and \$1,500, respectively.

**Banyan Systems Inc.** Announced the Vines Version 3.10 network operating system, which includes the Vines Applications Toolkit for developing E-Mail gateways, network administration tools, and calendaring systems.

**Cbis Inc.** Introduced Network-OS EMAIL, a communications software package that combines E-Mail plus conferencing for Network-OS and other DOS-based LANs, which provides a bulletin board, private memos, and group conferencing and costs \$395.

**cc:Mail Corp.** Announced a rollout strategy for the cc:Mail LAN Package for the Macintosh and has plans to ship an interface to VMSmail, Digital's E-Mail system for VAXes. It also demonstrated its E-mail systems' full multimedia capabilities across the Macintosh, DOS, and OS/2 platforms.

**CE Software Inc.** Announced the following: QM Remote 2.0 software which provides dial-in access to QuickMail, creates new messages, sends QuickMail-created messages, and transmits files or applications; the QM-Connect Bridge which lets QuickMail users access the CONNECT Professional Information Network or MacNet, sends up to 16 files per message, and costs \$99.95; and the QM-Database Bridge, which lets QuickMail users access data files on the network, and costs \$149.95 per server. It also began shipping QuickMail 2.0, its Macintosh E-Mail product, through its dealer/distributor channel. The software offers store and forward technology, realtime conferencing, and a mail log for tracking, retrieving, and unsending messages.

**Coker Electronics.** Announced tPOST Forms, a form filler program designed to speed the filling out and electronic mailing of business forms.

**Consumers Software Inc.** Enhanced its Network Courier E-Mail software with Version 2.0, which runs on IBM PCs and compatibles operating on LANs and offers more than 60 new features, including the ability to create a personal address list. Prices start at \$295.

**Fischer International Systems Corp.** Introduced the Personal Emc<sup>2</sup>/TAO LAN program, which provides E-Mail and information management services for networked PCs operating in a standalone environment.

**Hewlett-Packard.** Introduced HP Advance-Mail III, a PC-based electronic mail product which lets users transmit and receive text, graphics, video and sound.

**IBM.** Introduced OfficeVision, a suite of SAA-compliant applications for OS/2 which is made up of software that performs document preparation, filing, E-Mail, and calendar scheduling.

**Microsoft Corp.** Introduced Microsoft Mail Version 2.0 for AppleTalk networks, an E-Mail product which features support for the Macintosh and AppleTalk networks and permits Macintoshes to communicate with IBM PCs across networks; cost—\$395.

**Novell Inc.** Acquired a minority interest in Da Vinci Systems, an E-Mail developer.

**Pacer Software Inc.** Announced PacerPost, a software package that enables a Digital VAX system running the VMS operating system to function as a Microsoft Mail compatible server and gateway. Prices start at \$2,000.

**Retix.** Introduced OSIX, which is an OSI line of hardware and software products that let users on UNIX-based systems access E-Mail and file-transfer applications.

**Soft Switch Inc.** Along with Microsoft Corp., announced the SNADS Gateway/MSMail which enables Macintosh users to exchange electronic messages, documents, and files transparently with other interconnected E-Mail networks. It costs \$4,995.

**Sun Microsystems.** Its Tops division announced that users of its recently acquired InBox product will be able to interconnect with UNIX Mail and IBM PROFS E-Mail systems via two gateway products scheduled to ship in the fourth quarter.

**Simpact Associates Inc.** Introduced Securit-E-Mail, electronic mail application software, which allows PC users on a Novell LAN to send and receive information with greater security than offered by standard electronic mail applications, and is priced at \$7,500.

**Touch Communications Inc.** Announced an agreement with Microsoft Corp. under which Touch will develop an X.400 gateway capability enabling Microsoft Mail users to send messages outside of their local workgroup to any other messaging system that supports X.400.

**Waterloo Microsystems.** Announced its PORT Lite Mail E-Mail messaging option to be used with the PORT Lite entry-level LAN system.

**Western Union Corp.** Introduced OfficeAccess software, which is designed to run on Wang,

Digital, and IBM PCs and allows users to send E-Mail over Western Union's EasyLink E-Mail network.

Also of interest: The **Electronic Mail Association**, Suite 555, 1555 Wilson Boulevard, Arlington, Virginia 22209; telephone (703) 522-7111, serves as a clearinghouse for industry and technical information. ■

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## Synopsis

### Editor's Note

Electronic mail is transforming office communications. The growth of standard interchange methods such as the X.400 standard promises to eliminate the barriers to message interchange erected by proprietary vendor strategies. The growth of microcomputer-based networks continues to establish Local Area Networks (LANs) as the key office communications platform. New applications are making E-Mail a crucial technology for information resource sharing. This report explores the variety of technologies and communications methodologies that together comprise E-Mail for microcomputers.

The explosive growth of the microcomputer industry and the increasing number of Local Area Networks (LANs) are factors in electronic mail growth. The nature of intraoffice communications is being reshaped by the ability to communicate on departmental LANs. The expansion of the microcomputer's role as both a terminal and as a desktop tool has expanded the market for electronic mail products. This report presents a technology overview, an outline of market trends, and the chief characteristics of available products.

This report sketches all of the E-Mail's technical aspects. A market overview is contained in report 535-101. Comparison columns detailing specifications for 33 computer-based messaging systems from 23 vendors follow the comprehensive vendor list on page 505-301.

# Analysis

## The New Face of E-Mail

Electronic mail (E-Mail), once a peripheral communications technology with limited uses, has moved to the center of many office automation strategies. Spurred by the growth of desktop computing, data communications, and application software standardization, electronic mail has shifted from a standalone resource used by small groups to an important technology for information processing, resource sharing, and group coordination.

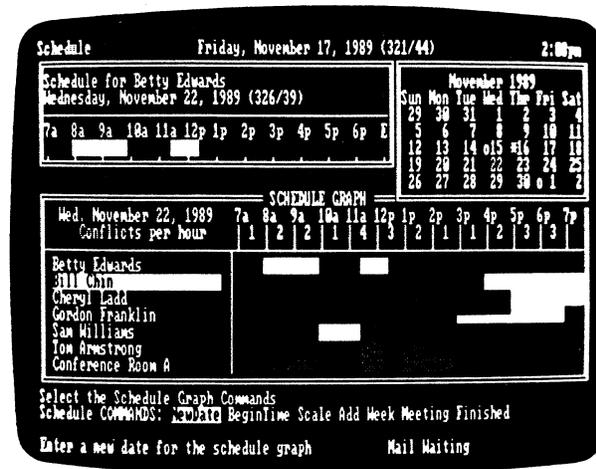
No longer considered simply an alternative to conventional mail services, E-Mail has become an entirely new way of sharing documents, graphics, and applications. Using E-Mail and applications integrated with it, office workers can adopt a new style of direct communications with one another. Managers gain extraordinary tools for referencing and recalling information and monitoring subordinates' communications. These developments point toward increased personal and departmental productivity.

### What Is Electronic Mail?

The term electronic mail encompasses various technologies that support electronic transmission of text and graphics. E-Mail technology, in its broadest sense, encompasses all types of electronic messaging, including facsimile, telex, mailgrams, and voice. In recent years, however, E-Mail has increasingly been used more narrowly to describe messages transmitted between users of networked computers.

According to the Electronic Mail Association, electronic mail is the generic name for noninteractive communication of text, data, image, or voice messages between a sender and designated recipients by systems using telecommunications links. Information deliverable via E-Mail can generally also be sent by such conventional means as:

- The public postal service,



*E-Mail packages continue to add features to extend their usefulness as Office Automation tools. Enable Software's Higgins package is among a new breed of packages that add group scheduling to store-and-forward messaging capabilities.*

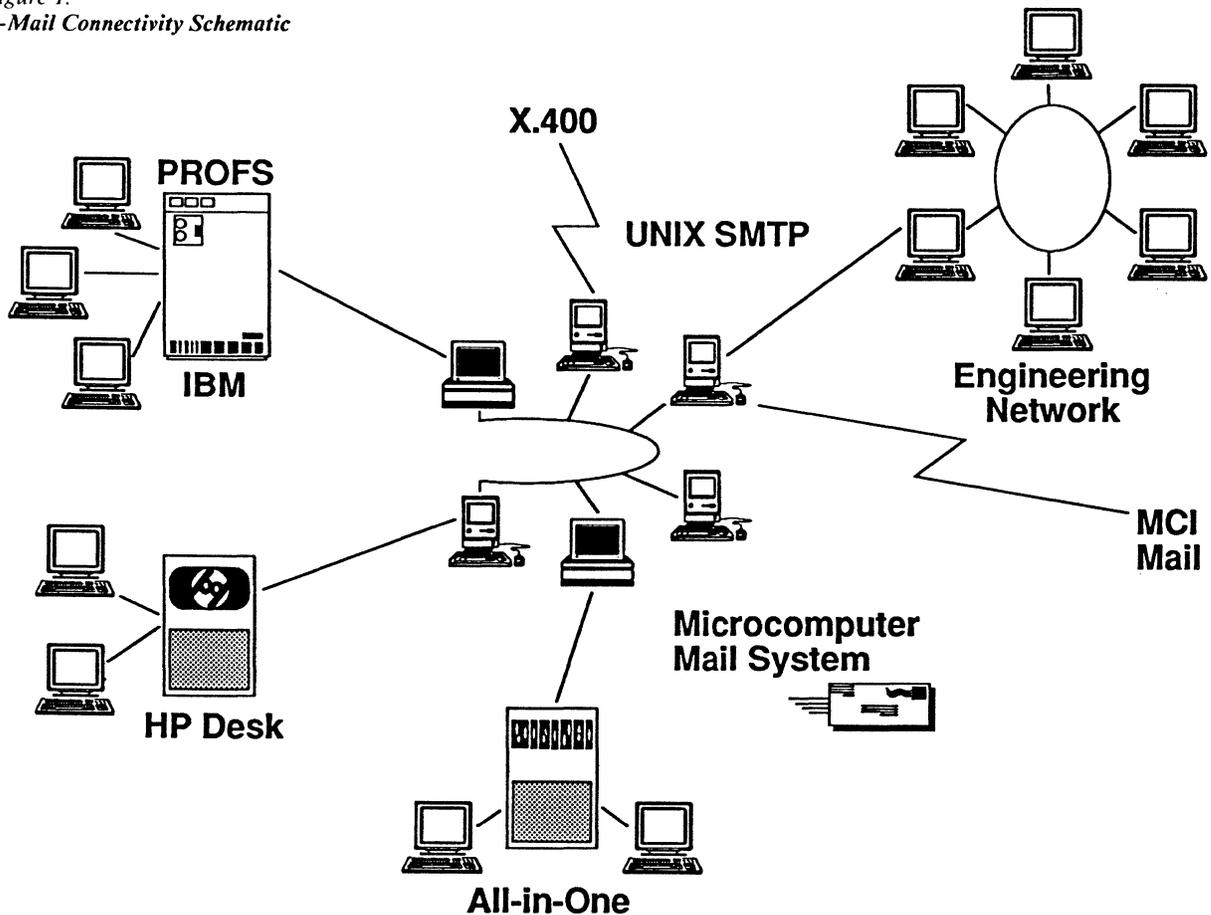
- A special courier service (e.g., Federal Express, Purolator),
- Inter- or intracompany mail, and
- Telephone voice messages.

The decision whether to use E-Mail or one of these conventional means turns primarily on the *time factor*. A message's priority determines how much time there is to deliver it. Priority, in turn, restricts the possible methods for getting the material to its intended location on time when using conventional services. It is in this area—delivering messages rapidly while preserving the option of hard copy—that E-Mail offers its greatest advantages.

Increasingly, E-Mail is hailed as an important "enabling technology" for office communications. By combining electronic messaging systems with other applications, information workers obtain tools to disseminate information for comment quickly, coordinate meetings and scheduling, hold meetings on-line electronically, and design applications that use messaging features to automate such office processes as requisitioning supplies.

As E-Mail becomes increasingly integrated with a host of other office automation tools, it becomes easier and more cost effective to add value to information quickly and route it in any form desired. In organizations with a strategic vision for

Figure 1.  
E-Mail Connectivity Schematic



*E-Mail gateways provide broad connectivity by allowing the microcomputer-based mail system to communicate with other messaging systems—both internal and external.*

managing information resources, E-Mail can become a platform for swift, value-added information processing involving many individuals.

### **Electronic Mail Technology**

E-Mail is not a technology in and of itself. It combines software and hardware invoked at a given place and time for communication. E-Mail software, which provides the ability to transmit and receive messages, is useless without the necessary hardware to create, receive, and transmit messages. Thus, it is difficult to isolate software and hardware from the overall perspective of message creation and transmission.

### **Basic Technology**

Regardless of operating environment, E-Mail systems share some basic technologies that support

message creation, transmission, and reception. The individual E-Mail applications provide these technologies. The network that supports this application carries out the communication functions. E-Mail systems do not necessarily use all of the following technologies, but most full-featured mail systems include provisions for each of them.

**Mailboxes.** Most currently available E-Mail systems provide user mailboxes for message reception. A mailbox is a work space provided by the E-Mail application where users manage correspondence. The functions for managing the mailbox range from a simple read function through menu-driven cutting and pasting of stored messages to formulate responses.

**Editors.** Most E-Mail systems today provide at least a simple text editor for message creation.

Not all systems are integrated with an editor, however. Some systems still require users to create a text message separately before using E-Mail to transmit it.

**Store and Forward.** E-Mail systems based on this technology send messages to a central storage point or repository. The addressee is then notified of the pending message and reads the message from the central repository into his or her work space. Store-and-forward messaging eliminates the need for receiving parties to be connected to the system when mail is routed to them. The system stores the message and notifies the recipient when he or she logs on.

Most mail systems use store-and-forward technology. Only rudimentary messaging systems require direct connection between the sender and receiver, as in telephone communications.

**Directories.** Most E-Mail systems employ a user directory to simplify message addressing. The directory lists all accessible user names or numbers and their logical address on the network. The user can call up the directory and choose the intended receiving party(ies) from the list. As mail systems become more widespread, a universal E-Mail address, similar to a telephone number—accessible from almost all points—has emerged as a goal. The CCITT's X.500 series of recommendations specify standards for such a universal directory.

**Distribution Lists.** These lists go hand-in-hand with directories. Distribution lists allow users to group recipients into lists and forward messages automatically to all users on a chosen list. Some systems include carbon copy and blind carbon copy facilities to automatically forward message copies to other involved parties.

**Bulletin Boards.** Another distribution technology, bulletin boards provide access to common communicating areas that allow each user to read the messages stored there. Bulletin boards provide a more interactive means for communicating among members of a group than do traditional, individually routed messaging methods.

**Message Headers.** Each E-Mail system uses its own method to identify outgoing and incoming messages. The header is the initial information that a recipient views about a given message. Some E-Mail systems give users control over a variety of available header contents. Others simply provide a time and date stamp. Some message headers indicate appropriate follow-up actions such as response

requested; other headers generate a receipt record for receipt-requested messages.

**Message Storage.** Once a message is received, most E-Mail systems provide some facility for storing it for further reference. Storage may be automatic or require executing a command. Some systems also provide tools for managing stored messages. These range from simple acknowledgment functions to sophisticated text retrieval functions involving Boolean operators.

**Security.** The features that E-Mail systems provide for security vary greatly. Some systems make few security provisions; anyone could walk up to a terminal and read a user's mail. Other systems provide password access to the mail application. Still others support separate definitions of read and write access levels. The E-Mail system security features must be placed in the context of overall communications security, which may involve encrypting or scrambling message transmissions to thwart unauthorized access.

**Access to Outside Systems.** Optimally, an electronic mail system allows users to access all messages addressed to them and send mail to whomever they want. For users in large organizations, this implies that the local mail system must be connected to other systems to supply complete electronic access. Many packages now include gateways to various on-line services, facsimile, and popular Integrated Office Systems such as IBM's DISOSS and PROFS and Digital's ALL-IN-1.

### Message Agent Software

Third-party software to automate the linking process has also flourished with the emergence of wide demand for on-line access. This microcomputer software allows customized "scripts" that instruct telecommunications software how to establish an on-line link. Such packages are not absolutely necessary; in most cases any asynchronous communications program can make the necessary connection.

Costs for establishing access to these networks are generally low. The major expenses begin after the initial investment in communications hardware and software. The major cost is the constantly metered connect-time fees that these services charge. Rates are based on amount of use, time of day, initial connection fees, and special information resources accessed during the on-line session. This report does not cover these packages.

### **In-House Systems**

The potential for running E-Mail applications on microcomputer local area networks (LANs) is becoming ever greater because of increasingly sophisticated hardware and software. Microcomputer LAN applications now include some of the best features of larger implementations.

A special type of in-house system, the integrated office system, uses centralized and/or networked computing resources to provide a set of office applications. All these systems feature E-Mail, often as a cornerstone application used to tie other applications together. The emergence of new, network-based office tools, such as IBM's recently announced OfficeVision, signals a new round of interest in these integrated tools.

Integrated office systems combine departmental computing technology with office software applications. In addition to E-Mail, these systems combine other support functions such as word and data processing, graphics/image processing, and voice processing. They provide a consistent user interface to all these facilities. This consistency implies an ease of use that makes them attractive for linking office workers.

The E-Mail component of these systems usually incorporates features that simulate business communications. Options include forms simulating memos such as "While You Were Out" slips, distribution lists, and carbon copies. Message receipts are easily logged. In addition, third-party and user-developed add-ons extend E-Mail functionality by combining the messaging functions with graphics or financial analysis tools to automate certain processes. Other systems support on-line conferencing that allows meetings to be held with the participants never leaving their offices. Many integrated office systems also combine electronic messaging with an interface to voice-based messaging.

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### **System Components**

E-Mail technology depends on two fundamental hardware components: a terminal or user workstation and a communications network. Workstations on LANs are most typically desktop PCs, capable of executing E-Mail software locally. The other part of the E-Mail system resides on a *server*, which is usually a centrally placed computer running the

LAN operating system, and which serves as a central repository for E-Mail and other applications. The E-Mail software provides an application-level interface between the user and the workstation.

### **Workstations**

Microcomputers are by far the most prevalent communications device available for electronic mail input and output. Microcomputers are used as terminals for connection to remote computing services and to in-house systems, and electronic mail is a vital application in the burgeoning market for microcomputer LAN applications. The concepts underlying the development of LAN mail software are on the cutting edge of the evolution of the electronic office. Mail software enables people using a departmental LAN to share documents, graphs, and even applications. The design of these applications draws on new understanding about the nature of communications in the information-age workplace.

Professionals with personal computers are most likely to take advantage of the benefits of electronic mail. Microcomputers are used throughout the workplace and run a variety of applications besides electronic mail. Today, microcomputers are networked, connected to mainframes, minis, and to each other in all conceivable arrangements, and they can be equipped to emulate most standard communicating terminals. Virtually all the major office automation vendors provide microcomputers that act both as standalone application processors and workstations for their mini- or mainframe-based integrated office software which includes the electronic mail application.

Printers for creating hard copy are another vital part of the workstation picture. Other peripheral devices, such as modems to connect workstations to on-line services, image scanners, fax machines, and host gateways or LAN interfaces, are among the components that define the E-Mail workstation.

### **Communications Network**

The communications network that transmits messages is the largest variable in electronic mail. The physical medium and communications controller can be the public telephone system, a private or semiprivate data communications or telecommunications network, a hard-wired connection to a host mainframe, a collection of small networks in a

wide area network (WAN) connected by a dedicated backbone, or a single local area network (LAN) with its own wiring and connections. A system-level provision for communicating over the network is necessary. E-Mail software interfaces with this system-level communications control resource to transmit messages. For more information of Local Area Network Technology, see report CM23-005-901, *All About Local Area Networks*.

Hierarchical networks, which were the initial environment for electronic mail implementation, are now being supplemented with departmental systems based on local network technology. The key component in a hierarchical network is often the communications processor, a computer dedicated to the control of electronic data and text traffic in a company's data communications network. This communication processor generally handles the operations of the electronic mail application. In a distributed network, some of this controlling power may be decentralized, but the function of the communications processors is the same.

A communications processor comprises the processor itself, an interface to the host computer, a communications multiplexer for the control of incoming and outgoing information, interfaces to terminals and peripherals, storage facilities, and control software. The primary functions of a communications processor are line control, character and message assembly, data and protocol conversion, error control, message switching, and application-oriented functions programmed by the user. Communications processors can be limited to data transmission in a computer network or can be more general devices, such as digital PBXs, that support both voice and data traffic.

Communications processors or switches often employ store-and-forward message switching. In order to add electronic mail, the following considerations are important:

- Can the code conversion capabilities of the communications processor be upgraded to handle a wider variety of workstation types, as well as telex terminals and facsimile?
- Can the on-line storage capability of the host computer or intelligent workstations be upgraded and linked to the communications processor to provide additional electronic filing space for mailboxes and records?

A local area network serving the electronic mail application obviates the need for a communications processor. Several LANs of the same type can be connected via bridges or combined with other types of networks (foreign LAN, SNA, X.25, X.400) via gateways to create a larger area of service. Electronic mail software can be maintained and distributed from one system designated for this purpose. This system can range from a PC on a departmental LAN to a minicomputer on several bridged LANs to mainframe host systems on an SNA network. Of course, the larger the network, the more complicated it is to implement and maintain. One of the advantages of LAN processing is the inherent advantage of distributed systems—eliminating the possibility of total network failure.

### Messaging Standards and Gateways

One reason E-Mail is coming to occupy a more important place in business communications is that the work of standards committees has come to fruition in the past few years. Two major E-Mail standards exist: X.400 and AT MHS.

**X.400.** The Consultative Committee on International Telephony and Telegraphy (CCITT) formally approved its Recommendation X.400 for Message Handling Systems (MHSs) in 1984. The goal of the recommendation was to specify a set of standards that users and vendors alike could adopt and thereby ensure global compatibility for electronic mail and other message-oriented information exchanges. Among its desired effects is a uniformity in communications protocols that would break down barriers imposed by varying standards used by different software vendors.

Most major computer system vendors have already announced or demonstrated basic high-level interconnectivity based on X.400 protocols. Even IBM has dropped its former proprietary stance and announced X.400 capability for its PROFS office system product. In addition, a growing number of domestic network facilities vendors have added X.400 interfaces to their set of basic product offerings in anticipation of new user demand. Together, these developments have provided network managers and integration specialists with enough functionality to construct private, multivendor networks for electronic mail exchange.

For devices to communicate, they must be compatible on various levels. These levels are outlined in the International Organization for Standardization (ISO) Open Systems Interconnection (OSI) reference model for data communications, which consists of a seven-layer hierarchy that defines the electrical characteristics, communications standards, and software applications for computer systems. This model does not define a single system and should not be regarded as a specification for any data communications system. Rather, it is a reference point for the establishment of a data communications system.

**AT MHS.** Action Technology's Message Handling System (MHS) has achieved near-standard status as a result of Novell's adoption of it as the messaging protocol for its market-leading NetWare LAN operating system. MHS is defined as a platform for the development and operation of groupware products, integrated Material Requirements Planning (MRP) in manufacturing, and other communications applications. MHS provides standard X.400 gateways, a centralized store-and-forward architecture, application program interfaces (APIs) for building on the MHS services, standardized addressing conventions, and communicating bridges (e.g., to SNADS or MCI Mail).

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### **Advanced Features and Applications**

In addition to the basic set of technologies that facilitate electronic messaging, the emergence of advanced features has paralleled the growing sophistication of all application software. The twin trends toward increased ease of use and increasing numbers of added features have transformed E-Mail packages into sophisticated applications. Also, the demands of the emerging office of tomorrow have produced new classes of software to organize and manage office communications. This has further extended the concept of E-Mail as a modern office technology.

**Application Programming Interfaces (APIs).** APIs provide tools for extending E-Mail software by accessing the underlying communications and filing technology employed by the package. "Open" APIs imply that a package can be extended either by sophisticated end users capable of programming, or by third-party developers, who can use the E-Mail package as a platform for further

development. APIs have especially important implications for building bridges among heterogeneous networks, providing the same application functionality for a package across multiple platforms.

**Attachments.** Another popular E-Mail feature allows users to attach files to messages or otherwise include information available at the user's workstation in a message. Advanced systems allow inclusion of binary (program) files, and others allow attachment of graphics to messages which can then be viewed at the recipient's workstation.

**Bulletin Boards.** Another distribution technology, bulletin boards allow users to access common communicating areas and provide a more interactive means for communicating.

**Document Interchange.** E-Mail can be used for document interchange, and some E-Mail systems conform to the emerging document interchange specifications. E-Mail is much more widely established in the communications infrastructure than are some data and document interchange standards. One can foresee a marriage between E-Mail and Electronic Data Interchange (EDI) formats, for example, as a natural outgrowth of E-Mail's use.

**Facsimile.** Another significant electronic messaging technology, facsimile, has become widespread to the point of being nearly universal in the business environment. Fax interfaces to E-Mail systems are natural extensions of both sets of installed bases. E-Mail packages with fax interfaces allow an electronic message to be sent to any fax machine, combining timeliness with immediate hard copy.

**Forms.** An emerging E-Mail feature is the ability to create and use custom forms for messaging. Office work often revolves around managing forms, and using an in-place E-Mail network for forms transmission is a natural application. Forms-based applications are widely touted as an application of the future, and integrating form creation with the ability to transmit them electronically is an idea in its infancy, but spreading fast.

**Gateways.** The growth of internetworking technology to extend links between heterogeneous systems has opened a market for both standard and dedicated gateways among these systems. Providing the means to simply exchange messages is a basic application and one that has generated an entire submarket for internetwork message passing

products. As the X.400 standard spreads, more gateway products will appear.

**Graphical User Interfaces (GUIs).** Apple's Macintosh began the GUI revolution in earnest, changing the face of microcomputer applications, and ultimately all applications. Naturally, E-Mail packages running on the Macintosh use a GUI, as do others that run under Microsoft Windows. Eventually, most applications will evolve away from text orientation and use graphical elements in their interface with users.

**Interprocess Communications.** Another extraordinary concept in modern applications is the sharing of data by two or more applications running either at a single workstation or at more than one workstation. An emerging concept, multiuser interprocess communications will allow users to use the same file simultaneously, with the communications handled transparently to the user. This concept is part of the OS/2 operating system and of Apple's System 7.0 for the Macintosh.

**Memory Residence.** Memory residence, primarily in reference to microcomputers, implies that the E-Mail application runs as a background task, while the user runs another application in the foreground. Users can then call the mail application and send messages while the foreground application continues to run, and the mail application is available to receive mail and then notify the user when a message is received.

#### **Computer Supported Cooperative Work**

Computer supported cooperative work (CSCW) is an emerging concept based, like E-Mail, on communications resources. The software tools that implement this concept, generally referred to as "groupware," consist of products that provide the means to create and share information as well as some framework for managing and documenting its interchange.

Groupware tools, at minimum, automate the logging of a document's movement from one worker to another. Some groupware tools provide on-line group calendars that allow meetings to be scheduled when the entire group is available. Most groupware applications include store-and-forward E-Mail modules.

Some groupware products are specifically intended for use in design environments. Designs in process are circulated among group members. The package manages the movement of documents

from one step to another and automatically creates an audit trail that indicates what was done at each step in the design.

Other groupware products are designed for editorial environments and include tools for critiquing and editing text documents. Still others manage office communications, providing a framework for exchanging information and allowing managers to monitor this exchange.

Implementing groupware entails some risks. Privacy issues must be resolved, since the flow of information in groupware applications is public. If used too strongly for group control, groupware may inhibit group creativity and teamwork. The public nature of groupware also entails security risks. Breaking into another user's calendar and changing a schedule would undermine the cooperation that groupware can provide. A manager must ensure that all group members are trustworthy before granting them access to groupware tools.

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### **Electronic Mail's Advantages and Restrictions**

When properly implemented, E-Mail has measurable advantages over alternative messaging methods such as:

**Telephones**—The telephone is a poor substitute for E-Mail. It is very unreliable as a means for delivering high-priority messages. A telephone conversation is not concrete enough to consummate many business transactions because it lacks hard copy and thus cannot document verbal agreements. Voice communications content is much less compact than text communications. Reading a 10-page document over the phone for someone to copy by hand would take much longer than sending it through some form of E-Mail or by courier service.

**The Postal Service**—The initial motivation for developing E-Mail sprang from dissatisfaction with the postal service. The postal service is designed to handle mail of low priority by today's standards. The age of electronic telecommunications has vastly increased our expectations concerning the speed of information delivery. E-Mail is popular because it satisfies this emerging need for instant delivery of information.

**Courier Services**—Local, regional, and national couriers often transport packages of information that must be delivered overnight. A

combination of airplanes and trucks is usually employed for the swift movement of packages from city to city. While these services have proven reliable and swift by conventional standards, they are costly and cannot usually provide anything better than overnight delivery in most city-to-city situations. For companies engaged in the regular, heavy use of couriers, the cost of E-Mail can usually be justified by the elimination of the courier costs. Even so, when E-Mail is not possible between two points, services such as Federal Express, Purolator, or the U.S.P.S. Express Mail service can be effective delivery tools.

**Intracompany Mail**—The delivery of messages and documents within an organization can sometimes be the most aggravating bottleneck of all. Stories about interoffice mail taking days to circulate in some large companies abound and, once it gets there, no guarantee exists that the recipient will immediately look at it. Internal E-Mail systems seek to eliminate this problem by sending messages instantly and by notifying the recipient that a message has arrived.

A growing body of experience and a booming market testify to E-Mail's potential benefits. In a business environment increasingly fixated on speed, E-Mail builds rapid message turnaround into an organization's information infrastructure.

### **Restrictions**

Despite the allure of E-Mail as a strategic information management and communications tool, it is not a panacea. E-Mail's restrictions involve the following issues:

- The network's scope. The network should serve mail to a sufficient number of people so that the timeliness advantage is not overshadowed by the number of inaccessible people. Often, where some sort of mail network is in place, not everyone may be connected, and not all who are connected may use the network for mail. Electronic mail is not likely to be as universally accepted as the telephone until the next century.
- Ease of use. A great majority of people can use a telephone and mail a letter. The same cannot be asserted for computers and related networks. Because extensive user training is usually required, the goal of universal electronic mail remains far in the future.
- Cost. Certainly the cost of a microcomputer connected to a network is greater than that of a telephone or the postage necessary for one person's correspondence. Can efficiency gains justify the large start-up costs implied by microcomputer-based messaging systems? Because the microcomputer has uses other than for mail, the benefits of the mail component must be separated and stated explicitly.
- Security. Threats to individual privacy are great with the widespread introduction of computer technology. Once a computer is connected to a network, the information stored by an individual becomes accessible by others, and control over this access is generally out of that individual's hands. All electronic mail applications must make some provision for security.

### **Cost Justification**

Traditional cost justification methods miss the mark in the case of E-Mail. Defining the up-front costs on a per-user basis does not account for the possible traffic volume, and focusing on message volume does not factor in the intangible benefits of enhanced communications. An accounting of both per-user and message volume costs still neglects *value added* to information work. Thus justifying E-Mail is difficult in terms of traditional methods. Not having it, however, is now practically impossible to justify. Why is this so?

The time savings offered by E-Mail are of central importance to its justification in an organization. E-Mail facilitates a new kind of work, one that allows users to create and receive messages while in the midst of other tasks. Ideas shared electronically in a workgroup can accelerate quickly, and all of the intermediate steps in the creation process are documented automatically. Actual time spent in the E-Mail process is usually negligible. Thus messaging becomes an extension of the *thinking* process as opposed to the automation of some process otherwise handled in some other medium (such as face-to-face or telephone communications). This is where users realize the real benefits of E-Mail.

It must be recognized that any benefits are in direct proportion to their planning. Thus, in a situation where implementing E-Mail is considered a cost rather than as an investment, the benefits are likely to be marginal. Alternatively, where the system's expected benefits are carefully planned from

the outset, then the system is likely to take on a life of its own and to benefit the organization in positive, unforeseen ways.

Those responsible for information systems justification are developing their own special set of tools. Surveying user needs and opinions provides a starting point for determining actual benefits. Once perceived benefits are stated explicitly, users can establish the means to test and measure the perceptions. By treating and managing E-Mail as

an investment and an asset, strategic payoffs—in terms of productivity gained and value added—can be far greater than explicit benefits such as decreased courier costs. This is the perspective required to make E-Mail pay off many times the amount invested in it. ■

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# Electronic Mail for Microcomputers: Comparison Columns

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**Synopsis****Editor's Note**

This report contains comparison tables that provide key characteristics for electronic mail packages for microcomputers. Recent trends in the market for this technology are presented in the Market Overview (Report 535-101). A separate Technology Overview (Report 535-201) describes the technology and its applications.

This report presents 34 electronic mail for microcomputers packages from 23 vendors. The survey was conducted in August and September of 1989. Datapro mailed product inquiries to 34 vendors and followed each request with telephone calls. Datapro's editorial staff greatly appreciates the cooperation of the vendors that responded to the survey.

We believe these columns represent a comprehensive overview of the current voice mail market. *The absence of a company or a product from the comparison columns indicates the company failed to respond to our repeated requests for information, the product is no longer actively marketed, or the company is no longer in business.*

Since last year's survey, the number of vendors is up 53 percent, and the number of products is up 74 percent. These statistics underscore the rapid growth this market is experiencing.

# Vendors

**Action Technology, Inc.**

2200 Powell Street  
Emeryville, CA 94608 (415) 654-4444

**AT&T**

55 Corporate Drive  
Room 34A16  
Bridgewater, NJ 08807 (201) 658-6000

**Cappcomm Software, Inc.**

26 Journal Square  
Suite 1003  
Jersey City, NJ 07306 (201) 795-1500

**CC:Mail, Inc.**

385 Sherman Avenue  
Palo Alto, CA 94306 (415) 321-0436

**CE Software**

1854 Fuller Road  
P.O. Box 65580  
West Des Moines, IA 50265 (515) 224-1995

**Coker Electronics**

1430 Lexington Avenue  
San Mateo, CA 94402 (415) 573-5515

**Consumers Software, Inc.**

73 Water Street  
Vancouver, BC, Canada V6B 1A1 (604) 688-4548

**Cross Information Co.**

1881 9th Street  
Suite 311  
Boulder, CO 80302 (303) 444-7799

**Da Vinci Systems**

P.O. Box 5427  
Raleigh, NC 27650 (919) 839-2000

**Data Access Corp.**

14000 SW 119th Avenue  
Miami, FL 33186 (305) 238-0012

**Dayna Communications**

50 S. Main Street  
Suite 530  
Salt Lake City, UT 84144 (801) 531-0600

**Emissary Systems**

130 Bloor Street, West  
Suite 1002  
Toronto, ON, Canada M5S 1N5 (416) 920-9001

**Enable Software**

Northway Ten, Executive Park  
Ballston Lake, NY 12019 (518) 877-8600

**Fischer International Systems, Inc.**

4073 Mercantile Avenue  
Naples, FL 33942 (813) 643-1500

**LanQuest Group**

1251 Parkmoore Avenue  
San Jose, CA 95126 (408) 727-9446

**Microsoft Corp.**

16011 NE 36th Way  
Box 97017  
Redmond, WA 98073 (206) 882-8080

**NBI, Inc.**

3450 Mitchell Lane  
P.O. Box 9001  
Boulder, CO 80301 (303) 444-5710

**Retix Corp.**

2644 30th Street  
Santa Monica, CA 90405 (213) 399-2200

**Telenet Communications Corp.**

12490 Sunrise Valley Drive  
Reston, VA 22096 (703) 689-6000

**3COM Corp.**

3165 Kifer Road  
Santa Clara, CA 95052 (408) 562-6400

**Tops, A Sun Microsystems Co.**

950 Marina Village Parkway  
Alameda, CA 94507 (415) 769-9669

**Verimation, Inc.**

P.O. Box 154  
Northvale, NJ 07047 (201) 767-4795

**Waterloo Microsystems Inc.**

3597 Parkway Lane  
Suite 200  
Norcross, GA 80092 (404) 441-9252

## Electronic Mail for Microcomputers Comparison Column Entry Descriptions

The following definitions are a guide to the computer-based messaging system comparison column entries that follow the vendor listing.

The **Vendor Name** and **Product Name/Version** identify the vendor/manufacturer and the name of the specific computer-based messaging system.

**Operating Environments.** This refers primarily to the host operating system and/or network operating system under which the messaging software runs as a process or application.

**Type.** There are a number of classifications for the types of messaging systems listed. We have concentrated on **LAN-based messaging packages** which run as separate applications on LANs and at the host workstations. **LAN mail software with extensions** reflect products that carry out store-and-forward functions on LANs and that also have other features such as group calendaring.

**Bridges** between LANs and mainframes provide interconnection between microcomputer-based

messaging systems and messaging systems based on other centralized resources.

### **Messaging Prompting.**

This refers to the system's capability to step a user through a specific task.

**Editing.** Editing refers to the ability to alter a message before it is sent to a recipient.

**Help Facility.** This describes the different system commands and how to use them.

**Withdraw.** This function permits a user to cancel a message that has been sent but not received (read) by the recipient.

**Message Length Restriction.** This is generally expressed in lines or characters.

**Distribution.** Once a message has been composed, the user must determine to whom the message is to be sent. In general, messages can be sent to specific individuals, to groups of individuals, and/or to yourself. Some systems offer other variations including the ability to send messages to persons not on the system.

**Scan the Mailbox for Incoming Messages.** This refers to the ability to enter the mail application to view cursory information about pending messages.

**Scan the Mailbox for the Status of Previously Sent Messages.** Some systems allow the user to view the status information available about previously sent messages (those messages sent but not read by the recipient).

**Registered Messages.** This feature provides the user with confirmation that a message so designated has in fact been received.

**Acknowledges the Message Receipt.** Some systems acknowledge the receipt of every message sent.

**Message Status.** This refers to the type of information the system provides about each message prior to reading the actual text of the message. Some possible responses include message header (providing details such as the name of the originator, the subject of the message, and the date and time it was sent), urgency, and the privacy level of the message.

### **Filing**

**Directory.** A directory provides a listing of the users available to message on the system.

**Message Storage.** This specifies the time period that previously read and filed messages are stored on the system. Storage can be for an indefinite period of time and/or for a specified period of time in

which case the files are purged automatically of any messages stored longer than the time allowed by the system (e.g., 180 days).

**Text Retrieval.** This refers to the way in which messages can be searched for in the system (i.e., key word, full search, subject category, author, date sent, originator).

**Tickler File.** Tickler files are maintained to provide reminders to the user that are triggered by certain conditions, such as matching the date.

**Electronic Wastebasket.** Most systems provide users with an area where unwanted messages can be sent. There is usually a specified period of time during which the message is stored in this area before it is purged from the system.

### **Features**

**Security.** This refers to the methods provided to users to secure message access, and to system-level methods to protect messages in transit or in storage.

**Management Tracking.** This feature provides management reports such as the total number of messages sent on a particular day, how many messages a certain originator sent, etc. Some systems even track message traffic from one user to another.

**Able to Access Outside Services and Outside Services Accessed.** Most systems are designed to allow users to access certain outside services. The

outside services include public messaging services and networks (e.g. X.400), widely implemented messaging systems (e.g., IBM PROFS), and other device standards, such as Group 3 facsimile.

**Protocols Observed.**

Many mail systems observe some standard message exchange or communication protocol that facilitates message exchange.

**Customization.** Developers make the source code to the E-Mail application available to users or other developers to allow the extension of the systems and the tailoring of certain features to meet its particular needs.

**Configuration**

**RAM Required on Server.** Many mail systems run as applications on the LAN server. How much memory, in bytes, does the E-Mail application occupy?

**RAM Required on Workstation.** E-Mail software also runs as an application resident at the user's workstation. How much memory, in bytes, does the E-Mail application occupy on the workstation?

**Maximum Number of Nodes/Workstations.**

Some packages limit the number of users to which mail service can be provided.

**Pricing**

We have attempted to provide pricing information on all of the various operating environments for which packages are available. We also requested that vendors include a per workstation price that includes all hardware and software costs necessary to implement the messaging system. GSA contract availability has been indicated where applicable.

Vendor	Action Technology, Inc.	AT&T Bell Labs	AT&T	AT&T Bell Labs
Product	The Coordinator 2.0	Premises Message Exchange/PC (PMX/PC) 2.01	Premises Message Exchange/Starmail (PMX/Starmail) 2.1	Premises Message Exchange/Term (PMX/Term) 2.02
Operating Environments	MS-/PC-DOS, NetWare, IBM PC UNIX/Xenix LAN, MS-nets such as 3Com		MS-/PC-DOS, NetWare, IBM PC UNIX/Xenix LAN, 10Net, UNIX/Xenix, 3COM 3 Plus	
Type	LAN-based messaging package, bridge between LAN & remote computing service, LAN mail software with extensions, bridge between LAN & mini/mainframe, standalone	For 80386 processors	LAN-based messaging package, bridge between LAN & mini/mainframe	For 80386 processors
<b>Messaging</b>				
Help Facility	Vendor did not specify	None	None	None
Withdraw	Vendor did not specify	Standard	Standard	Standard
Message Length Restriction	Vendor did not specify	None	None	None
Distribution	To individual, groups, self, persons not logged on to system	To individual, groups, self, bulletin board, global, persons not logged on to system, U.S. Postal Service, FAX, Telex, Overnight Courier Serv.	To individual, groups, self, bulletin board, global, persons not logged on to system, U.S. Postal Service, FAX, Telex, Overnight Courier Serv.	To individual, groups, self, bulletin board, global, persons not logged on to system, U.S. Postal Service, FAX, Telex, Overnight Courier Serv.
Scan Mailbox for Incoming Message	Standard	Standard	Standard	Standard
Scan Mailbox for Status of Previously Sent Messages	Standard	Standard	Standard	Standard
Registered Messages	None	Standard	Standard	Standard
Acknowledges Message Receipt	None	Standard	Standard	Standard
Message Status	Originator, date/time, message header, scan summary, response requested, response required	Originator, date/time, urgency, message header, length, IDs message as text, binary, form or multipart	Originator, date/time, urgency, message header, length, IDs message as text, binary, form or multipart	Originator, date/time, urgency, message header, length, IDs message as text, binary, form or multipart
<b>Filing</b>				
Directory	Vendor did not specify	Standard	Standard	Standard
Message Storage	Vendor did not specify	Indefinite	Indefinite	Indefinite
Purging	Vendor did not specify	User/supervisor defined	User/supervisor defined	User/supervisor defined
Text Retrieval	Subject, date, date ranges, originator, keyword, destination, respond by/due by date, copied-in	Subject, date, originator, keyword, destination	Subject, date, originator, keyword, destination	Subject, date, originator, keyword, destination
Tickler File	Standard	None	None	None
Electronic Wastebasket	Standard	Standard	Standard	Standard
<b>Features</b>				
Security	Password, access codes, database controlled, answerback verification	Password, encryption	Password, encryption	Password, encryption
Management Tracking	Standard	None	None	None
Access to Outside Services	Standard	Standard	Standard	Standard
Outside Services Accessed	TELEX, MCI Mail, CompuServe, DISOSS/PROFS, ALL-IN-1	TELEX, MCI Mail, DDD, DISOSS/PROFS, FAX, X.400 networks	TELEX, MCI Mail, DDD, DISOSS/PROFS, FAX, X.400 networks	TELEX, MCI Mail, DDD, DISOSS/PROFS, FAX, X.400 networks
Protocols Observed	MHS, SAA CUA	X.400	X.400	X.400
Customization	Vendor did not specify	Definable object types (attachments) known to PMX; automatically invokes an application program	Definable object types (attachments) known to PMX; automatically invokes an application program	Definable object types (attachments) known to PMX; automatically invokes an application program
Other Features	Append text, binary files, sorts and files mail, reminds you of due dates	Public and private network; multi-vendor connectivity; consistent, user-friendly interface; heterogeneous workgroup connectivity; background mail notification	Public and private network; multi-vendor connectivity; heterogeneous workgroup connectivity; personal and organizational directories; human-name addressing	Public and private network; multi-vendor connectivity; consistent, user-friendly interface; heterogeneous workgroup connectivity
<b>Configuration</b>				
RAM Required on Server (bytes)	Minimum requirement	256K	384K	Vendor did not specify
RAM Required on Workstation (bytes)	640K	256K	384K	Vendor did not specify
Max. Number Nodes/Workstations	Unlimited	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Pricing</b>				
Package Price (\$)	495 - standalone; 995 - 10 user; 1,995 - 30 user	995	995	1,295
Price per User/Node (\$)	Less than 100	85 - 150	Vendor did not specify	Vendor did not specify
GSA Contract	No	Vendor did not specify	Vendor did not specify	Vendor did not specify

Vendor	Cappcomm Software, Inc.	Cappcomm Software, Inc.	CC:Mail, Inc.	CE Software
<b>Product</b>	<b>Mail Call - EM</b>	<b>Mail Call - VMS</b>	<b>Cc:mail</b>	<b>QuickMail</b>
<b>Operating Environments</b>	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS, TOPS, NetWare, IBM PC LAN, 10Net, OS/2 LAN Manager	Macintosh OS
<b>Type</b>	PC Front-End to ALL-IN-1	PC front end to VMS mail	LAN-based messaging package, bridge between LAN & remote computing service, LAN mail software with extensions, bridge between LAN & mini/mainframe, server-to-server	LAN-based messaging package, bridge between LAN & remote computing service, LAN mail software with extensions, bridge between LAN & mini/mainframe
<b>Messaging</b>	Standard	Standard	Standard	Standard
Help Facility	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Withdraw	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Message Length Restriction	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Distribution</b>	To individual, groups, self, global, persons not logged on to system	To individual, groups, self, global, persons not logged on to system	To individual, groups, self, bulletin board, global, persons not logged on to system, printers and other peripherals	To individual, groups, self, bulletin board, persons not logged on to system
Scan Mailbox for Incoming Message	Standard	Standard	Standard	Standard
Scan Mailbox for Status of Previously Sent Messages	Standard	Standard	None	Standard
Registered Messages	Standard	Standard	Standard	Optional
Acknowledges Message Receipt	Standard	Standard	Standard	Optional
Message Status	Message header, response requested, response required, receipt requested	Message header, response requested, response required, receipt requested	Originator, date/time, length, receipt requested, type of file	Originator, date/time, urgency, message header, scan summary, privacy level, confidential, receipt requested
<b>Filing</b>	Standard	Standard	Standard	Standard
Directory	Optional periodic purging	Vendor did not specify	Indefinite	Indefinite
Message Storage	Vendor did not specify	Automatic periodic purging	User/supervisor defined	User/supervisor defined
<b>Purging</b>	Vendor did not specify	Automatic periodic purging	User/supervisor defined	User/supervisor defined
<b>Text Retrieval</b>	Subject, date, date ranges, originator, destination, filename or number	Subject, date, date ranges, originator, destination, filename or number	Subject, date, date ranges, originator, keyword, destination, filename or number	Subject, date, date ranges, originator
<b>Tickler File</b>	Vendor did not specify	Vendor did not specify	None	Standard
Electronic Wastebasket	None	None	Standard	Optional
<b>Features</b>	Password, encryption	Password, encryption	Password, encryption, database controlled	Password
<b>Security</b>	Password, encryption	Password, encryption	Password, encryption, database controlled	Password
Management Tracking	Vendor did not specify	Vendor did not specify	Standard	Standard
Access to Outside Services	Vendor did not specify	Standard	Optional	Standard
Outside Services Accessed	DDD, ALL-IN-1	DDD	TELEX, DDD, Internet, DISOSS/PROFS, ALL-IN-1, FAX, Telemail, Easylink	MCI Mail, CompuServe, FAX, Genie
<b>Protocols Observed</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Customization</b>	Tailored screen layout, message headers, functionality	Tailored screen layout, message headers, functionality	API available	Custom forms, options selectable
<b>Other Features</b>	Tailoring for organizations as needed, on-going support with source code available	Tailoring for organizations as needed, on-going support with source code available	Graphics editor, bulletin boards	Conferencing, third-party bridges to outside systems
<b>Configuration</b>	RAM Required on Server (bytes)	512K	None	512K
	RAM Required on Workstation (bytes)	512K	280K	512K
	Max. Number Nodes/Workstations	Vendor did not specify	65,000	100,000
<b>Pricing</b>	Package Price (\$)	500 - 30,000	695 for first 25; 595 for additional 65,000	300 for 10 users
	Price per User/Node (\$)	30 - 60 per user	Vendor did not specify	Vendor did not specify
	GSA Contract	Vendor did not specify	Vendor did not specify	No

Vendor	Coker Electronics	Coker Electronics	Coker Electronics	Coker Electronics
Product	PC tPost	tPost Central	tPost FAXforward	tPost Forms
Operating Environments	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS	MS-/PC-DOS
Type	E-mail for standalone PLS	E-mail for standalone PCs	E-mail to FAX for standalone PCS	Electronic forms mailing via tPost E-M
<b>Messaging</b>				
Help Facility	Standard	Standard	Standard	Standard
Withdraw	Standard	Standard	Standard	Standard
Message Length Restriction	None	None	None	400 lines
Distribution	To individual, groups, self, bulletin board, global	To individual, groups, self, bulletin board, global	To individual, groups, global, persons not logged on to system, Group 3 FAX	To individual, groups, self, bulletin board, global, persons not logged on to system, FAX
Scan Mailbox for Incoming Message	Standard	Standard	None	None
Scan Mailbox for Status of Previously Sent Messages	Standard	Standard	Standard	Standard
Registered Messages	None	None	None	None
Acknowledges Message Receipt	Standard	Standard	Standard	Optional
Message Status	Originator, date/time, message header, length	Originator, date/time, message header, length	Originator, date/time, message header	Originator, message header
<b>Filing</b>				
Directory	Standard	Standard	Standard	Standard
Message Storage	Vendor did not specify	Optional periodic purging	Vendor did not specify	Vendor did not specify
Purging	User/supervisor defined	Vendor did not specify	User/supervisor defined	User/supervisor defined
Text Retrieval	Originator, destination, filename or number	Filename or number	Filename or number	Filename or number
Tickler File	None	None	None	None
Electronic Wastebasket	Standard	Standard	Standard	Standard
<b>Features</b>				
Security	Password, access codes	Password, access codes, answerback verification	Password, access codes	Security built in to tPost E-Mail soft
Management Tracking	Standard	Standard	Standard	Standard
Access to Outside Services	None	None	Optional	Optional
Outside Services Accessed	Not applicable	Not applicable	FAX	FAX
Protocols Observed	Not applicable	Not applicable	Group 3 CCITT	Vendor did not specify
Customization	Vendor did not specify	Customizable through application interface	Vendor did not specify	Vendor did not specify
Other Features	Electronic Mailbox software for modem equipped laptop or desktop PCs; PC-tPOST allows compositions addressing, sending, receipt, and management of electronic mail	Host post office for system of remote standalone laptop and desktop PCs running remote module; runs unattended	Allows remote tPost users to send E-mail to FAX machines utilizing share FAX modem at tPost; central automatic coversheet generated, delivery confirmation, FAX	Form-filler utility for use with the tPost E-Mail system; creates forms database; math functions, time and date stamp, user defined data key, multiple line fields
<b>Configuration</b>				
RAM Required on Server (bytes)	640K	640K	640K	128K
RAM Required on Workstation (bytes)	256K	Vendor did not specify	Vendor did not specify	128K
Max. Number Nodes/Workstations	200 per server	200 each	Unlimited	Unlimited
<b>Pricing</b>				
Package Price (\$)	129	229	129	49
Price per User/Node (\$)	99 for 2 or more	99	Installed on server only	49
GSA Contract	No	No	Vendor did not specify	No

Vendor	Coker Electronics	Consumers Software, Inc.	Cross Information Company	Da Vinci Systems
Product	tPost LAN	The Network Courier 2.0	Cross & Point 5.10	Da Vinci eMAIL
Operating Environments	MS-/PC-DOS	MS-/PC-DOS, NetWare, Microsoft Windows, IBM PC LAN, 10Net, OS/2 LAN Manager	MS-/PC-DOS, TOPS, NetWare, IBM PC LAN, 10Net, Vines	MS-/PC-DOS, TOPS, NetWare, Microsoft Windows, IBM PC LAN, 10Net
Type	LAN-based messaging package, LAN mail software with extensions	LAN-based messaging package, bridge between LAN & remote computing service, LAN mail software with extensions, bridge between LAN & mini/mainframe	LAN-based messaging package, bridge between LAN & remote computing service, LAN mail software with extensions, bridge between LAN & mini/mainframe	LAN-based messaging package, LAN mail software with extensions
<b>Messaging</b> Help Facility Withdraw Message Length Restriction Distribution Scan Mailbox for Incoming Message Scan Mailbox for Status of Previously Sent Messages Registered Messages Acknowledges Message Receipt Message Status	Standard Standard None To individual, groups, self, bulletin board, global, persons not logged on to system, FAX Standard Standard None Standard Originator, date/time, message header	Standard None None To individual, groups, self, bulletin board, global Standard Standard Standard Originator, date/time, urgency, message header, confidential, receipt requested	Standard None None To individual, groups, bulletin board, global, persons not logged on to system Standard Standard None None Originator, date/time, urgency, message header, scan summary, length, privacy level, confidential, response requested, response required	Vendor did not specify Vendor did not specify Vendor did not specify To individual, groups, self, persons not logged on to system, bulk mail server Standard Standard Optional Standard Originator, date/time, urgency, message header, response requested, response required
<b>Filing</b> Directory Message Storage Purging Text Retrieval Tickler File Electronic Wastebasket	Standard Optional periodic purging User/supervisor defined Originator, filename or number None Standard	Standard Indefinite User/supervisor defined Subject, keyword None None	Standard Indefinite User/supervisor defined Subject, originator, keyword, filename or number Standard None	Standard Indefinite User/supervisor defined Subject, date, date ranges, keyword, carbon copy, blind carbon copy Optional None
<b>Features</b> Security Management Tracking Access to Outside Services Outside Services Accessed Protocols Observed Customization Other Features	Password, access codes, answerback verification Standard Optional FAX, tPOST remote users Xmodem, CRC Add-ons available LAN E-mail with built-in gateway for linking to other LANs and remote standalone PCs; optional FAX forward module allows workstations to send text E-mail to Group 3 FAX	Password, encryption, database controlled Standard Standard MCI Mail, DISOSS/PROFS, FAX, X.400 networks X.400, SNADS, SAA CUA Vendor did not specify	Password, encryption, access codes Standard Standard MCI Mail, CompuServe, Internet, FAX Not applicable Available Vendor did not specify	Password, encryption, 2-level access codes Vendor did not specify Vendor did not specify ALL-IN-1, X.400 networks MHS Communications API is in public domain Appends text, binary files, graphics
<b>Configuration</b> RAM Required on Server (bytes) RAM Required on Workstation (bytes) Max. Number Nodes/Workstations	488K (640K recommended) 224K (512K recommended) 100 per server	256K Vendor did not specify Vendor did not specify	140K 140K Unlimited	250K 384K DOS; 512K Windows Unlimited
<b>Pricing</b> Package Price (\$) Price per User/Node (\$) GSA Contract	495/5 stations; 695/25 stations; 995/100 stations Bundled (as package price) No	995 each 995 each No	Contact vendor Vendor did not specify Vendor did not specify	295 - 5 users; 795 - 20 users Vendor did not specify No

Vendor	Data Access Corp.	Dayna Communications	Emissary Systems	Enable Software
<b>Product</b>	Office Works	DaynaMail	Herald Mail	Higgins
<b>Operating Environments</b>	MS-/PC-DOS, NetWare, IBM PC LAN, 10Net, Vines, NETBIOS-compatible network	MS-/PC-DOS, Macintosh OS, TOPS, NetWare, MultiFinder, OS/2 LAN Manager, DaynaNET	MS-/PC-DOS, NetWare, IBM PC LAN, OS/2 LAN Manager	MS-/PC-DOS, NetWare, IBM PC LAN, Vines, OS/2 LAN Manager, all MS-DOS networks
<b>Type</b>	LAN mail software with extensions, group productivity software	LAN-based messaging package, LAN mail software with extensions	LAN-based messaging package, LAN mail software with extensions, bridge between LAN & mini/mainframe	LAN mail software with extensions, LAN office system
<b>Messaging</b>				
Help Facility	Standard	Vendor did not specify	Standard	Standard
Withdraw	Standard	Vendor did not specify	Vendor did not specify	None
Message Length Restriction	4 pages - 4,200 characters	Vendor did not specify	Vendor did not specify	21 lines plus attachments
Distribution	To individual, groups, self	To individual, groups, self, persons not logged on to system	To individual, groups, self	To individual, groups, self, global, persons not logged on to system, fax, printer output, wide-area network
Scan Mailbox for Incoming Message	Standard	Standard	Standard	Standard
Scan Mailbox for Status of Previously Sent Messages	None	None	Standard	Standard
Registered Messages	Standard	Standard	Standard	Standard
Acknowledges Message Receipt	Standard	Standard	Standard	Standard
Message Status	Originator, date/time, urgency, privacy level, confidential	Originator, date/time, urgency	Originator, date/time, urgency, message header, receipt requested, document profile, recipient list	Originator, date/time, urgency, message header, meeting request, meeting confirmation
<b>Filing</b>				
Directory	Standard	Standard	Standard	Standard
Message Storage	Indefinite	Indefinite	Indefinite	Indefinite
Purging	User/supervisor defined	User/supervisor defined	Vendor did not specify	User/supervisor defined
Text Retrieval	Subject, date, date ranges, originator, keyword, destination, filename or number, location, reference	Subject, date, date ranges, originator	Date, date ranges, originator, keyword, destination	Keyword
Tickler File	Standard	Vendor did not specify	None	Optional
Electronic Wastebasket	Vendor did not specify	Vendor did not specify	None	None
<b>Features</b>				
Security	Password	Password	LAN-supplied security	Password, encryption, 2-levels of passwords
Management Tracking	None	Standard	Standard	Standard
Access to Outside Services	Standard	Optional	Standard	Optional
Outside Services Accessed	TELEX, FAX	MCI Mail, CompuServe, DISOSS/PROFS, ALL-IN-1,	DISOSS	MCI Mail, DISOSS/PROFS; FAX, X.400 networks, via Softswitch to other
Protocols Observed	Not applicable	MHS	SNADS, APPC/LU6.2, DIA, DCA	X.400, MHS, SNADS
Customization	Vendor did not specify	Vendor did not specify	Vendor did not specify	API for custom programming and gateways
Other Features	Calendar module for time management and group meetings, telephone messaging system, on-line tutorial	Vendor did not specify	Vendor did not specify	Available as a standalone application, integrated with groupware and scheduling functions
<b>Configuration</b>				
RAM Required on Server (bytes)	Vendor did not specify	Vendor did not specify	640K	640K
RAM Required on Workstation (bytes)	365K available	Vendor did not specify	512K	640K
Max. Number Nodes/Workstations	Unlimited	Vendor did not specify	Unlimited	Index
<b>Pricing</b>				
Package Price (\$)	195 - single system license (standalone); 495 - entry level license (6 user ID max.); 1,395 - unlimited	Contact vendor	6,995, volume pricing available	695
Price per User/Node (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	87
GSA Contract	Yes	Vendor did not specify	No	Yes

Vendor	Fischer International Systems, Inc	Fischer International Systems, Inc	LanQuest Group	Microsoft Corp.
Product	Personal EMC2/TAO LAN	Personal EMC2/TAO	Lan: Mail Monitor	Microsoft Mail 2.0
Operating Environments	MS-/PC-DOS, IBM PC LAN	MS-/PC-DOS	MS-/PC-DOS, TOPS, NetWare, IBM PC LAN, 10Net, Vines, OS/2 LAN Manager, any NETBIOS-based NOS	MS-/PC-DOS, Macintosh OS, TOPS, MultiFinder, VAX VMS 5.0 (for Mail Server)
Type	LAN-based messaging package, bridge between LAN & mini/mainframe	PC-to-host-based EMC2/TAO	LAN-based messaging package, LAN mail software with extensions, LAN-to-LAN; PC remote-to-LAN	LAN-based messaging package, bridge between LAN & remote computing service, LAN mail software with extensions, bridge between LAN & mini/mainframe
<b>Messaging</b>				
Help Facility	Standard	Standard	Standard	Standard
Withdraw	Standard	Standard	Standard	Standard
Message Length Restriction	None	None	None	32K
Distribution	To individual, groups, self, bulletin board, global	To individual, groups, self, bulletin board, global, persons not logged on to system	To individual, groups, self, global, persons not logged on to system, remote PCs, remote LANs	To individual, groups, self, global, persons not logged on to system
Scan Mailbox for Incoming Message	Standard	Standard	Standard	Standard
Scan Mailbox for Status of Previously Sent Messages	Standard	Standard	Standard	None
Registered Messages	Vendor did not specify	Vendor did not specify	None	Standard
Acknowledges Message Receipt	Vendor did not specify	Vendor did not specify	Standard	Standard
Message Status	Vendor did not specify Originator, date/time, message header	Vendor did not specify Originator, date/time, message header	Originator, date/time, message header, privacy level, response requested	Originator, date/time, urgency, message header, msg. type, file attachmnt., read/unread
<b>Filing</b>				
Directory	Standard	Standard	Standard	Standard
Message Storage	Indefinite, optional periodic purging	Indefinite, optional periodic purging	Indefinite	Indefinite
Purging	Vendor did not specify	Vendor did not specify	User/supervisor defined	User has to delete messages
Text Retrieval	Subject, date, filename or number	Subject, date, filename or number	Subject, date, date ranges, originator	Vendor did not specify
Tickler File	Vendor did not specify	Vendor did not specify	Vendor did not specify	None
Electronic Wastebasket	Standard	Vendor did not specify	Vendor did not specify	Standard
<b>Features</b>				
Security	Password, access codes, database controlled	Password, access codes, database controlled	Password, encryption, database controlled	Password, message stored in message database
Management Tracking	Vendor did not specify	Vendor did not specify	Standard	Standard
Access to Outside Services	Standard	Standard	Standard	Optional
Outside Services Accessed	TELEX, DISOSS/PROFS, ALL-IN-1, FAX, X.400 networks	TELEX, DISOSS/PROFS, ALL-IN-1, FAX, X.400 networks, Wang Office, AT&T Mail	Remote PCs & remote LAN	MCI Mail, Internet, DISOSS/PROFS, ALL-IN-1, FAX, X.400 networks, UNIX SMTP, GE Quik Comm
Protocols Observed	Vendor did not specify	X.400, SNADS	Vendor did not specify	X.400 & SNADS supported
Customization	Vendor did not specify	Vendor did not specify	Vendor did not specify	Gateway SDK for writing cust. gateways from MS Mail, Appl. SKD for integrating Mac applic. w/MS Mail & SDK for Hypercard for intrgr w/MS Mail
Other Features	File folders, display attribute configuration, script language, hot-key access to DOS, keystroke macro definition, edit key configuration	File folders, display attribute configuration, script language, hot-key access to DOS, keystroke macro definition, edit key configuration	Available in English, French or German	Supports enterprise-wide, multi-vendor connectivity; global directory support, support for Mac & PC clients & Mac & VAX servers, integration w/applications such as MS
<b>Configuration</b>				
RAM Required on Server (bytes)	640K	Vendor did not specify	240K	1M
RAM Required on Workstation (bytes)	256K	256K	200K	100K for Mac; 512K for PC
Max. Number Nodes/Workstations	255	Vendor did not specify	150	No restriction
<b>Pricing</b>				
Package Price (\$)	Contact vendor	150	995	395 Microsoft Mail Server; 125 Mac Workstation Package; 125 PC Workstation Package
Price per User/Node (\$)	Vendor did not specify	Vendor did not specify	495 for additional 10 stations	1,495 Mac Workstation 20-Pak
GSA Contract	Vendor did not specify	Vendor did not specify	Vendor did not specify	No

explanation of keys and commands) or sophisticated (context-sensitive text explanations of program functions). The user interface also affects the package's ease of use. Menus can step the user through system configuration and spell out options such as modem types and speeds; this can be reassuring for users unfamiliar with exact types and names.

Command-driven programs save time for more experienced users. Many packages offer preset logons to online services, a text editor, and printer support, along with user-defined communications parameters that can be customized for specific configurations. Most basic communications packages support telephone directories, and many offer such common terminal emulation as TTY and Digital VT100/200. Some features such as macro support and disk access make communications easier but are unnecessary. Macro support allows the user to put a series of operations into a single key sequence—for example, the logon to CompuServe or a user's account number. Disk access makes it easier to locate files for transfer.

Applications requiring host access must use communications packages that support specific types of terminal emulation. If the application requires file transfer, the package should offer protocol support. Proprietary protocols are more commonly used with host access packages aimed at specific environments, since the user often controls

both ends of the exchange. The public domain Kermit protocol, however, is widely implemented for general host access. Host/remote access functions and unattended execution features, which allow the user to exchange data with the host during off-peak hours and from remote sites, are frequently valued by users.

These packages generally offer a more limited range of user-defined parameters and calling/answering functions that match the targeted host/terminal environment. Packages that concentrate on host access and terminal emulation may not support printer access, editing functions, or telephone number directories.

Packages that allow programmers to integrate communications into an application support sophisticated programming functions and added flexibility. Packages that offer a wide variety of user-defined parameters contain added flexibility for meeting specific requirements. Some packages support script files and offer programmable control over parameters, calls to DOS, and calls to other programs or languages.

Security is a separate issue. Some packages offer single-level password access; others offer multiple-level password access. Some packages implement security only for remote access or unattended execution. Many terminal emulation or host access packages depend on the security provided by the host rather than adding their own. Security remains a side issue in communications; most packages do not offer it. ■



# Asynchronous Communications Software: Comparison Columns

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**Synopsis**

**Editor's Note**

This report provides a detailed list of asynchronous communications products, as well as a listing of product specifications and pricing. For more information on the history and recent trends of the market, see the market overview (Report 531-101). Further information on the technology behind these products can be found in the technology overview (Report 531-201).

**Comparison Column Highlights**

The accompanying comparison columns summarize the characteristics of 82 commercially available asynchronous communications software products from 41 vendors. In most cases, the vendors supplied this information to Datapro during September 1990; their cooperation in compiling this report is acknowledged and greatly appreciated.

Datapro requested information from over 70 companies known or believed to offer asynchronous communications software products. The absence of any vendor from this report means that the company failed to respond to repeated requests for product information. Vendors that are not listed in this report are urged to contact the editorial staff of *Datapro Reports on PC & LAN Communications* to have their products included in future reports.

The products included here offer a wide variety of functions and capabilities. Datapro has tried to be as flexible as possible when including products in the comparison columns. Therefore some entries may not correspond exactly to the specification headings listed in the columns. For additional product information, or to clarify a column entry, please contact the appropriate vendor.

# Vendors

## Avenue Software, Inc.

2162 Charest Boulevard West  
Ste-Foy, QC Canada G1N 2G3 (418) 682-3088

## Bit Software, Inc.

830 Hillview Court, Suite 160  
Milpitas, CA 95035 (408) 263-2197

## Boyan Communications

P.O. Box 71  
Marriottsville, MD 21163 (201) 794-7125 (BBS support)

## Cambridge Computer Corp.

80 Mount Sanford Road  
Mt. Carmel, CT 06518 (203) 288-6004, (800)462-4481

## Cawthon Software Group

24224 Michigan Avenue  
Dearborn, MI 48124 (313) 565-4000

## Century Software

5284 South 320 West, Suite 134  
Salt Lake City, UT 84107 (801) 268-3088

## Commtech International

2580 Cumberland Parkway, Suite 150  
Atlanta, GA 30339 (404) 438-9999

## Communications Research Group

5615 Corporate Boulevard  
Baton Rouge, LA 70808 (504) 923-0888, (800)242-5278

## Computer Systems Consultants, Inc.

1454 Latta Lane  
Conyers, GA 30207 (404) 483-1717

## Crystal Point, Inc.

22122 20th Avenue SE, Suite 148  
Bothell, WA 98021 (206) 487-3656

## Datability Software Systems, Inc.

322 Eighth Avenue  
New York, NY 10001 (212) 807-7800, (800)342-5377

## Datastorm Technologies, Inc.

P.O. Box 1471  
Columbia, MO 65205 (314) 443-3282

## DCA/Crosstalk

1000 Alderman Drive  
Alpharetta, GA 30202 (404) 442-4000, (800)241-4762

## Diversified Computer Systems, Inc.

3775 Iris Avenue  
Boulder, CO 80301 (303) 447-9251

## Dynamic Microprocessor Associates

1776 E. Jericho Turnpike  
Huntington, NY 11743 (516) 462-0440

## Everex Systems, Inc.

48431 Milmont Avenue  
Fremont, CA 94538 (415) 498-1111, (800)821-0806

## The Freesoft Co.

105 McKinley Road  
Beaver Falls, PA 15010 (412) 846-2700

## Hawkeye Grafix

Box 1400  
Oldsmar, FL 34677 (813) 855-8687

## Hayes Microcomputer Products, Inc.

705 Westech Drive  
Norcross, GA 30092 (404) 449-8791

## Headlands Communications Corp.

P.O. Box 8  
Tiburon, CA 94920 (415) 435-0770

## Hilgraeve, Inc.

Genesis Centre  
111 Conant Avenue, Suite A  
Monroe, MI 95134 (313) 243-0576, (800)826-2760

## Information Analysis Systems Corp.

2 Brookside Lane  
Mansfield Center, CT 06250 (203) 429-1691

## International Business Machines, Corp. (IBM)

Old Orchard Road  
Armonk, NY 10504 Contact local IBM representative

## KEA Systems, Ltd.

3738 North Fraser Way, Unit 101  
Burnaby, BC V5J 5G1 (604) 431-0727, (800)663-8702

## Lightwave

P.O. Box 16858  
Tampa, FL 33617 (813) 988-5033

## Microcom

500 River Ridge Drive  
Norwood, MA 02060 (617) 551-1999

## MicroGate Corp.

9501 Capital of Texas Highway, #105  
Austin, TX 78759 (512) 345-7791

## MicroPlot Systems, Inc.

1897 Red Fern Drive  
Columbus, OH 43229 (614) 882-4786

## Norton-Lambert Corp.

P.O. Box 4085  
Santa Barbara, CA 93140 (805) 687-8896

## OMM Corp.

4200 Wisconsin Avenue Northwest, #106  
Washington, DC 20016 (202) 234-2117

## Persoft, Inc.

465 Science Drive  
Madison, WI 53711 (608) 273-6000, (800)368-5283

## Polygon, Inc.

1015 Corporate Square Drive, #100  
St. Louis, MO 63132 (314) 432-4142

## POS Technologies

800 N. Delsea Drive  
Plaza 47, Suite 10  
Westville, NJ 08093 (609) 848-2848, (800)426-7744

## Rupp Corp.

603 South Broadway  
Boulder, CO 80303 (303) 494-5987

## Selecterm, Inc.

153 Andover Street  
Danvers, MA 01923 (617) 246-1300

## SoftKlone Distributing Corp.

327 Office Plaza Drive, Suite 100  
Tallahassee, FL 32301 (904)878-8564, (800)634-8670

**Softronic, Inc.**  
5085 List Drive  
Colorado Springs, CO 80919 (719) 593-9540, (800)225-8590

**Software Store**  
706 Chippewa Square  
Marquette, MI 49855 (906) 228-7622

**Software Ventures**  
2907 Claremont Avenue, Suite 220  
Berkeley, CA 94705 (415) 644-3232, (800)336-6477

**Traveling Software, Inc.**  
18702 North Creek Parkway  
Bothell, WA 98011 (206) 483-8088, (800)662-2652

**Triton Technologies, Inc.**  
200 Middlesex Turnpike  
Iselin, NJ 08830 (201) 855-9440

# Asynchronous Communications Software Comparison Column Entry Descriptions

**Vendor/Product.** These identify the vendor and the name of the communications software programs to which the column entries apply.

**Communications Supported.** This section lists the function of the product. We divided asynchronous packages into PC-to-host links, PC-to-PC links, and PC-to-information service links. Some programs perform all three functions; others concentrate on one specific function.

**Remote Access Capability.** Some packages support access from remote sites and function as unattended hosts for the remote computer. This entry indicates whether such functions are supported.

**Terminals Emulated.** Emulation is the use of programming techniques and special machine features to permit a computer to execute programs written for another system. The specific terminals that a product emulates are listed in this section. The most common emulations are Digital Equipment VT52/100 and IBM 3101, but many other terminals are represented. Users

who need to emulate specific terminals, such as VT240 or Prime systems, can use this entry to locate packages which support those terminals.

**Computers Supported.** This lists the computer system(s) on which the communications software was designed to run. Most of the products run on an IBM PC/XT/AT or compatible system. Many vendors also support the IBM PS/2.

**Operating Systems.** This is the most important indicator of a software program's compatibility with a user's system. The most popular operating system supported by small computer hardware and software vendors is Microsoft's MS-DOS, also known as PC-DOS (IBM's implementation). UNIX, another popular operating system, has many derivatives—Cromix (Cromemco) and Xenix (Microsoft) are two. Apple computers run under Apple operating systems. Only operating systems on which the program will run without modification are shown.

**Users Supported.** This entry indicates whether the software supports a

single user or multiple users via a LAN-administered communications server.

**LAN Compatibility.** Some communications software programs are capable of running on local area networks (LANs). This entry refers to support of some of the most popular LANs, including Ethernet, ARCnet, Novell, 3Com, and the IBM Networks (PC Network and/or Token-Ring Network).

**Min. Memory Required (bytes).** This is the amount of internal storage a program needs to support both its own logic and the normal volume of data to which that logic will be applied; all responses will appear in either kilobytes (Kb) or megabytes (Mb).

**Memory Resident.** If the program is memory resident, it will be listed in this entry.

**Diskette Size (in inches).** This entry lists the size(s), in inches, of the diskettes on which the program is supplied and whether or not the program is compatible with hard disk systems.

**Hayes AT Command Set Compatible.** The Hayes AT command set for modems has become the de facto standard in the modem industry. This entry refers to whether or not the communications program supports this command set.

**Communications Number of Concurrent Sessions.** Many communications packages allow

a single user to conduct multiple host sessions, thus allowing more than one task to be performed simultaneously. This entry lists the number of simultaneous sessions supported by the package.

**Transmission Speed (bps).** The rate at which characters are transmitted by a communications system is listed as a range in bps. The transmission speed depends on the modem being used. For direct connections using a null modem cable, the speed depends on the system being used. For example, the serial port on an IBM PC/XT supports a maximum transmission speed of only 9600 bps.

**File Transfer Capabilities.** This entry lists the types of files transferred and the codes which the computer supports. Most computers support ASCII code, while many mainframe systems support EBCDIC. Also, seven-bit text files contain no control characters and use only ASCII values through 128; eight-bit binary files use all ASCII values up to 256. These can represent control characters, such as Control Z=026 which signals the end of a file for DOS files. These control codes can create problems when transmitted between systems and should be buffered using a protocol.

**File Transfer Protocols.** Protocols provide error-checking and correction during transmission. This allows data to be sent over phone lines without

transmission errors. The most common protocol is xmodem.

**File Transfer Info. Provided.** In this entry, the information presented on the program's status line or screen is listed. Status indicators give the user information about what the program is doing. Possible entries include number of characters sent/received, blocks sent/received, estimated transmission time, number of errors/retries, session name, and parameter settings.

**Downloading Options.** This entry indicates if the program allows the user to specify downloading options such as write to disk, write to printer, or screen snapshot.

**Capture Buffer Size (K bytes).** This entry indicates the amount of data (in K bytes) that the program can store in a buffer area.

**Communications Features.** This section indicates whether the package supports automatic dialing, automatic timed dialing, automatic redial, automatic retry on disconnect, and automatic answer mode.

**Dialing Directory.** If the package supports a telephone number directory, it will be listed here.

**Max. Phone Numbers Stored.** If the package is capable of storing phone numbers, the maximum number stored will be listed here.

**User Interface.** This entry indicates which form of user interface the program supports. Some of the choices are menu-driven, command-driven, graphic icons, and pop-up windows. Many programs offer both menus and commands to simplify use for novices, while allowing technically proficient users to bypass the menus. This entry will also indicate whether the program offers such features as an installation program, help facility, or mouse support.

**User-Defined Parameters.** These are parameters that can be established by the user so that the communications hardware/software environment can be completely customized. These include modem initialization strings, dialing commands, answerback strings, connect strings, hang-up strings, redial timeout, and sound control. For basic communi-

cations, these parameters may never need to be changed. However, being able to change such parameters gives the package increased flexibility in meeting specific user requirements.

**Hot Key to Operating System.** If the package allows the user to toggle between a communications session and the operating system, it will be indicated in this area.

**Text Editor.** If a software program possesses a built-in text editor, it will be listed in this entry.

**Programming Features.** The programming functions for each package are listed in this section. Programming features include support for macros and script files. Macros are programmable keys that allow the user to program a series of actions to a single key sequence, such as logging on to an on-line service or a host system. Script files are programs written in either a unique file structure or text file structure.

**Security.** This section lists security functions supported by the package, including file and transmission encryption, and multilevel passwords.

### **Pricing and Availability**

**Price per Unit (\$).** This figure, in dollars, is the full charge for the program.

**Date of First Delivery.** This entry lists the date of the product's initial delivery.

**Number Installed to Date.** This may help discern the magnitude of the market but does not always reveal the relative merits of a product. For example, some products may have very powerful capabilities but, because they are recently released, have a modest installed base.

**Warranty.** This entry gives the length of the warranty for each package and the vendor update policy.

**Distribution.** This entry explains the vendor distribution method.

**Vendor Phone Number.** This entry lists the number at which the vendor can be reached to obtain further details about the product.

**Comments.** This entry is used to list any information about the product or its support that cannot be accommodated in other categories.

Vendor	Avenue Software Inc.	Bit Software, Inc.	Boyan Communications	Cambridge Computer Corp.
<b>Product</b>	<b>Contact 2.00</b>	<b>BITCOM 4.08</b>	<b>BOYAN Communications 4.01</b>	<b>Mac 73/78 3.0</b>
Communications Supported	PC-to-host, Host-to-PC	PC-to-information service, PC-to-PC	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host
Remote Access Capability	Yes	Yes	Yes	Yes
Terminals Emulated	TTY, Digital VT52/100, IBM 3101, IBM 3270, Unisys	TTY, TeleVideo, Digital VT52/100, Digital VT200/VT300, IBM 3101, IBM 3270, Wyse	TTY, TeleVideo, Digital VT52/100, IBM 3101, ADM-3A	TTY, Digital VT52/100, Digital VT200/VT300, Honeywell VIP 7200/7300/7800
Computers Supported	Apple Macintosh Family	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT	Apple Macintosh Family
Operating Systems	Macintosh Finder	MS-DOS, PC-DOS, MS-Windows	MS-DOS, PC-DOS	Macintosh Finder, Multifinder
Users Supported	Single	Single	Single	Single, multiple via LAN-administered communications server
LAN Compatibility	Novell NetWare, AppleTalk	Novell NetWare	Not applicable	AppleTalk
Min. Memory Required (bytes)	300K	640K	256K	1M
Memory Resident	Yes	No	No	No
Diskette Size (in inches)	3.5	3.5, 5.25	3.5, 5.25	3.5
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
<b>Communications</b>				
Number of Concurrent Sessions	Dependent on memory	1	1	1
Transmission Speed (bps)	300 to 19.2K	300 to 19.2K	300 to 38.4K	Up to 56K
File Transfer Capabilities	ASCII, batch transfers, binary	ASCII, batch transfers, binary, graphics	ASCII, batch transfers, binary	ASCII, batch transfers, binary, Macbinary
File Transfer Protocols	Xmodem, ASCII, ICC/File Xpress Canoe	Xmodem, CRC, Kermit, MNP, ASCII, Ymodem	Xmodem, CRC, Kermit, ASCII, Ymodem, Zmodem, CompuServe B, Ymodem G	Xmodem, Kermit, ASCII
File Transfer Info. Provided	Characters sent/received, blocks sent/received	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time	Characters sent/received, blocks sent/received, session name
Downloading Options	Write to disk, screen snapshot, write to printer	Write to disk, screen snapshot	Write to disk, screen snapshot, write to printer, Save from capture buffer	Write to disk, screen snapshot, write to printer
Capture Buffer Size (K bytes)	Not applicable	Vendor did not specify	Up to 400	Unlimited
Communications Features	Auto dial, unattended execution, auto answer	Auto dial, unattended execution, auto redial, auto answer	Auto dial, unattended execution, auto redial, auto answer	Auto dial, unattended execution, auto redial, auto answer, Auto logon
Dialing Directory	No	Yes	Yes	Vendor did not specify
Max. Phone Numbers Stored	Unlimited	32,767	200 per directory	Vendor did not specify
User Interface	Status line, menu driven, nested menus, mouse support, windowing capability, Simulated LEDs	Status line, help facility, menu driven, mouse support	Installation program, status line, command driven, help facility	Installation program, status line, command driven, help facility, menu driven, graphic icons, nested menus, mouse support, pop-up windows
User-Defined Parameters	Modem initialization strings, dialing commands, log files, connect strings, answerback strings, line wrap control, sound control, monitor attributes, Character size, character sets	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, log file directories, answerback strings, line wrap control, hangup strings, sound control, redial timeout, monitor attributes	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, log file directories, line wrap control, hangup strings, sound control, redial timeout, monitor attributes	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, log file directories, answerback strings, line wrap control, hangup strings, sound control, redial timeout, monitor attributes
Hot Key to Operating System	Not applicable	No	Yes	Yes
Text Editor	Yes	No	Yes	Yes
Programming Features	Softkeys, File transfer definition	Script language, softkeys	Macros, script language, script language learn mode, predefined scripts	Macros, script language, script language learn mode, softkeys
Security	Single-level passwords	Vendor did not specify	Multilevel passwords	Host dependent
<b>Pricing and Availability</b>				
Price per Unit (\$)	395.00	79.00	65.00	295.00
Date of First Delivery	March 1987	September 1988	October 1986	November 1988
Number Installed to Date	1,000	Contact vendor	Vendor did not specify	3,000
Warranty	90 days	90 days	Vendor did not specify	1 year
Distribution	Direct, distributor/dealer/retail, mail order	Direct, OEMs, distributor/dealer/retail	Direct	Direct, distributor/dealer/retail
Vendor Phone Number	(418) 682-3088	(408) 263-2197	(201) 794-7125	(203) 288-6004
Comments	Supports international keyboards and char. sets	—	Product is shareware supported via the RelayNet international network of Bulletin Board Systems	—

Vendor	Cambridge Computer Corp.	Cawthon Software Group	Century Software	Century Software
Product	PC 73/78 1.40	ChipChat 1.1	Term 6.1	Term For X Windows
Communications Supported	PC-to-host	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host
Remote Access Capability	Yes	Vendor did not specify	Yes	Yes
Terminals Emulated	TTY, Honeywell VIP 7200/7300/7800	TTY, Digital VT52/100, Digital VT200/VT300, IBM 3101	TTY, TeleVideo, Digital VT52/100, Digital VT200/VT300, IBM 3101, Wyse, SCO Color Console	TTY, TeleVideo, Digital VT52/100, Digital VT200/VT300, IBM 3101, Wyse, SCO Color Console
Computers Supported	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), Apple Macintosh Family, IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), Apple Macintosh Family
Operating Systems	MS-DOS, PC-DOS	OS/2	MS-DOS, Macintosh Finder, PC-DOS, UNIX, OS/2, Xenix, MS-Windows, VMS, BTOS	MS-DOS, Macintosh Finder, PC-DOS, UNIX, OS/2, Xenix, MS-Windows
Users Supported	Single	Single, multiple via LAN-administered communications server	Single, multiple via LAN-administered communications server	Single
LAN Compatibility	IBM NETBIOS	IBM NETBIOS, MS OS/2 LAN Manager	IBM NETBIOS, Novell NetWare	IBM NETBIOS, Novell NetWare
Min. Memory Required (bytes)	256K	Vendor did not specify	640K	1M
Memory Resident	No	No	Yes	No
Diskette Size (in inches)	3.5	3.5, 5.25	3.5, 5.25	3.5, 5.25
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
<b>Communications</b>				
Number of Concurrent Sessions	1	Multiple	1	10
Transmission Speed (bps)	Up to 19.2K	300 to 38.4K	300 to 38.4K	300 to 38.4K
File Transfer Capabilities	ASCII, batch transfers, binary	ASCII, batch transfers, binary, graphics	ASCII, binary, graphics	ASCII, binary, graphics
File Transfer Protocols	Xmodem, Kermit, ASCII	Xmodem, CRC, Kermit, ASCII, Ymodem	Xmodem, CRC, Kermit, ASCII, Ymodem, Proprietary	Xmodem, CRC, Kermit, ASCII, Ymodem, Proprietary
File Transfer Info. Provided	Characters sent/received, blocks sent/received, session name	Characters sent/received	Number of errors/retries, blocks sent/received, session name, % of file transferred	Number of errors/retries, blocks sent/received, session name, % of file transferred
Downloading Options	Write to disk, screen snapshot, write to printer	Write to disk, screen snapshot, write to printer	Write to disk, screen snapshot, write to printer	Write to disk, write to printer
Capture Buffer Size (K bytes)	Unlimited	1024	Vendor did not specify	Vendor did not specify
Communications Features	Auto dial, unattended execution, auto redial, auto answer, Auto logon	Auto dial, auto redial, auto answer	Auto dial, unattended execution, auto redial, auto answer	Auto dial, unattended execution, auto redial, auto answer
Dialing Directory	Vendor did not specify	Yes	Yes	Yes
Max. Phone Numbers Stored	Vendor did not specify	Vendor did not specify	99	99
User Interface	Installation program, status line, command driven, help facility, menu driven, nested menus, pop-up windows	Installation program, status line, help facility, menu driven, graphic icons, nested menus, mouse support, pop-up windows, windowing capability	Installation program, status line, command driven, help facility, menu driven, windowing capability	Installation program, command driven, help facility, menu driven, windowing capability
User-Defined Parameters	Modem initialization strings, dialing commands, log files, connect strings, log file directories, answerback strings, line wrap control, hangup strings, sound control, redial timeout, monitor attributes	String equivalents/substitutions, modem initialization strings, line wrap control, monitor attributes	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, answerback strings, hangup strings, redial timeout	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, answerback strings, hangup strings, redial timeout
Hot Key to Operating System	Yes	Yes	Yes	Yes
Text Editor	No	Vendor did not specify	No	No
Programming Features	Macros, script language, softkeys	Macros, script language, softkeys	Script language, predefined scripts	Script language, predefined scripts
Security	Host dependent	File encryption	None	None
<b>Pricing and Availability</b>				
Price per Unit (\$)	295.00	299.00	195.00	599.00
Date of First Delivery	February 1985	1989	1982	1989
Number Installed to Date	8,000	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	1 year	1 year	Vendor did not specify	Vendor did not specify
Distribution	Direct, distributor/dealer/retail	Direct, mail order	Direct, OEMs, distributor/dealer/retail, mail order, VARs	Direct, OEMs, distributor/dealer/retail, mail order, VARs
Vendor Phone Number	(203) 288-6004	(313) 565-4000	(801) 268-3088	(801) 268-3088
Comments	—	ChipChat is communications software for OS/2 Presentation Manager; supports the OS/2 Clipboard, Dynamic Data Exchange	—	—

Vendor	Century Software	Commtech International	Communications Research Group	Communications Research Group
Product	TermNET Communications Software 6.1	XChange Plus 7.0	Blast MAC rev. 8.4.1	Blast PC Rev 10
Communications Supported	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-fax, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service
Remote Access Capability	Yes	Yes	No	Yes
Terminals Emulated	TTY, TeleVideo, Digital VT52/100, Digital VT200/VT300, IBM 3101, Wyse, SCO Color Console	TTY	TTY, TeleVideo, Digital VT52/100, Hewlett-Packard, Digital VT200/VT300, Lear Siegler, Wyse, Data General	TTY, TeleVideo, Digital VT52/100, Hewlett-Packard, Digital VT200/VT300, Lear Siegler, IBM 3101
Computers Supported	IBM PC/AT/XT, IBM PS/2 (MCA), Apple Macintosh Family, UNIX, ZENIX, VMS	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	Apple Macintosh Family	IBM PC/AT/XT, Apple Macintosh Family, IBM PS/2 (non-MCA), 30 others
Operating Systems	MS-DOS, PC-DOS, UNIX, OS/2, Xenix, MS-Windows	MS-DOS, PC-DOS, UNIX	Macintosh Finder	MS-DOS, Macintosh Finder, PC-DOS, UNIX, Xenix, VM/CMS, VAX/VMS, others
Users Supported	Single, multiple via LAN-administered communications server	Single	Single	Single, multiple via LAN-administered communications server
LAN Compatibility	IBM NETBIOS, Novell NetWare	Not applicable	AppleTalk	IBM NETBIOS, Novell NetWare, ACS, LAT
Min. Memory Required (bytes)	640K	280K	512K	90K
Memory Resident	No	No	Yes	Yes
Diskette Size (in inches)	3.5, 5.25	3.5, 5.25	3.5, 5.25	3.5, 5.25
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
<b>Communications</b>				
Number of Concurrent Sessions	10	1	1	Variable
Transmission Speed (bps)	300 to 38.4K	300 to 57.6	300 to 57.6K	300 to 115K
File Transfer Capabilities	ASCII, binary, graphics	ASCII, batch transfers, binary, graphics	ASCII, batch transfers, binary, graphics, Mac Binary	ASCII, batch transfers, binary, graphics
File Transfer Protocols	Xmodem, CRC, Kermit, ASCII, Ymodem, Proprietary	Xmodem, CRC, Kermit, ASCII, Ymodem, Proprietary	Xmodem, ASCII, BLAST	Xmodem, CRC, Kermit, ASCII, Ymodem, BLAST
File Transfer Info. Provided	Number of errors/retries, blocks sent/received, session name, % of file transferred	Characters sent/received, number of errors/retries, blocks sent/received, session name	Characters sent/received, number of errors/retries, blocks sent/received, session name	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time
Downloading Options	Write to disk, write to printer	Write to disk, write to printer, Delayed DOS commands	Write to disk, write to printer	Write to disk, write to printer
Capture Buffer Size (K bytes)	Vendor did not specify	6K	32, not applicable	Unlimited
Communications Features	Auto dial, unattended execution, auto redial, auto answer	Auto dial, unattended execution, auto redial, auto answer	Auto dial, unattended execution, auto redial, auto answer	Auto dial, unattended execution, auto redial, auto answer, polling
Dialing Directory	Yes	Yes	Vendor did not specify	Yes
Max. Phone Numbers Stored	99	Vendor did not specify	Unlimited	Unlimited
User Interface	Installation program, status line, command driven, help facility, menu driven, windowing capability	Installation program, status line, command driven, help facility, menu driven, nested menus, pop-up windows, Graphic log display, modem window	Installation program, status line, command driven, graphic icons, nested menus, mouse support, pop-up windows	Installation program, status line, command driven, help facility, menu driven, nested menus, pop-up windows, windowing capability
User-Defined Parameters	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, answerback strings, hangup strings, redial timeout	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, log file directories, answerback strings, hangup strings, redial timeout, monitor attributes	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, answerback strings, hangup strings, redial timeout	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, log file directories, answerback strings, line wrap control, hangup strings, sound control, redial timeout, monitor attributes
Hot Key to Operating System	Yes	Yes	Vendor did not specify	Yes
Text Editor	No	Yes	Yes	Yes
Programming Features	Script language, predefined scripts	Script language, predefined scripts	Script language, softkeys, predefined scripts	Macros, script language, script language learn mode, softkeys, predefined scripts
Security	None	Multilevel passwords, transmission encryption	Single-level passwords, multilevel passwords, lock & key codes	Single-level passwords, multilevel passwords, lock & key codes
<b>Pricing and Availability</b>				
Price per Unit (\$)	249.00	245.00	195.00	250.00
Date of First Delivery	1988	August 1987	Vendor did not specify	1981
Number Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	70,000
Warranty	Vendor did not specify	90 days	90 days	90 days
Distribution	Direct, OEMs, distributor/dealer/retail, mail order, VARs	Direct, OEMs, distributor/dealer/retail	OEMs, distributor/dealer/retail, VARs	Distributor/dealer/retail, VARs
Vendor Phone Number	(801) 268-3088	(404) 438-9999	(504) 923-0888	(504) 923-0888
Comments	—	Remote control feature is memory resident	—	Connects to any mini or mainframe with BLAST; uses high-speed data compression and full-duplex protocol

Vendor	Communications Research Group	Communications Research Group	Communications Research Group	Computer Systems Consultants, Inc.
Product	Blast Unix rev. 8.4	Blast Xenix rev. 8.4	PC Blast Plus rev 10.0	CMODEM 9.1
Communications Supported	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service
Remote Access Capability	No	No	Yes	No
Terminals Emulated	TTY	TTY, TeleVideo, Digital VT52/100, Hewlett-Packard, Digital VT200/VT300, Lear Siegler, IBM 3101, Wyse	TTY, TeleVideo, Digital VT52/100, Hewlett-Packard, Digital VT200/VT300, IBM 3101, IBM 3270, Wyse	TTY, TeleVideo, Digital VT200/VT300
Computers Supported	IBM PC/AT/XT	Xenix-based computers	IBM PC/AT/XT, Apple Macintosh Family, 30 others	IBM PC/AT/XT, UNIX, XENIX
Operating Systems	UNIX	Xenix	MS-DOS, Macintosh Finder, PC-DOS, UNIX, Xenix, VM/CMS, VAX/VMS, others	MS-DOS, PC-DOS, UNIX, Xenix
Users Supported	Single	Single, multiple via LAN-administered communications server	Single, multiple via LAN-administered communications server	Single
LAN Compatibility	Not applicable	Not applicable	IBM NETBIOS, Novell NetWare, ACS, LAT	Vendor did not specify
Min. Memory Required (bytes)	Vendor did not specify	Vendor did not specify	256K	128K
Memory Resident	Yes	Yes	Yes	No
Diskette Size (in inches)	3.5, 5.25	3.5, 5.25	3.5, 5.25	5.25
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
<b>Communications</b>				
Number of Concurrent Sessions	1, variable	Variable	2	1
Transmission Speed (bps)	300 to 57.6K	300 to 57.6K	300 to 115K	300 to 19.2K
File Transfer Capabilities	ASCII, batch transfers, binary, graphics	ASCII, batch transfers, binary, graphics	ASCII, batch transfers, binary, graphics	ASCII, batch transfers, binary
File Transfer Protocols	BLAST	Xmodem, CRC, ASCII, BLAST	Xmodem, CRC, Kermit, ASCII, Ymodem, BLAST	Xmodem, ASCII
File Transfer Info. Provided	Characters sent/received, number of errors/retries, blocks sent/received, session name	Characters sent/received, blocks sent/received, session name	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time	Number of errors/retries, blocks sent/received
Downloading Options	Write to disk, write to printer	Write to disk, write to printer	Write to disk, write to printer	Write to disk, write to printer
Capture Buffer Size (K bytes)	Not applicable	Vendor did not specify	Vendor did not specify	At least 64K
Communications Features	Auto dial, unattended execution, auto redial, auto answer	Auto dial, unattended execution	Auto dial, unattended execution, auto redial, auto answer, polling	Auto dial, auto answer
Dialing Directory	Yes	Yes	Yes	No
Max. Phone Numbers Stored	Not applicable	Unlimited	Unlimited	Vendor did not specify
User Interface	Installation program, status line, command driven, help facility, menu driven, nested menus	Installation program, status line, command driven, help facility, menu driven, nested menus	Installation program, status line, command driven, help facility, menu driven, nested menus, pop-up windows, windowing capability	Menu driven
User-Defined Parameters	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, log file directories, answerback strings, line wrap control, hangup strings, redial timeout, monitor attributes	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, log file directories, answerback strings, line wrap control, hangup strings, redial timeout, monitor attributes	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, log file directories, answerback strings, line wrap control, hangup strings, redial timeout, monitor attributes	Modem initialization strings, dialing commands
Hot Key to Operating System	Vendor did not specify	Vendor did not specify	Yes	Yes
Text Editor	Yes	Yes	Yes	No
Programming Features	Script language, softkeys, predefined scripts	Script language, predefined scripts	Script language, script language learn mode, softkeys, predefined scripts	Vendor did not specify
Security	Single-level passwords, multilevel passwords, lock & key codes	Single-level passwords, multilevel passwords, lock & key codes	Single-level passwords, multilevel passwords, lock & key codes	Vendor did not specify
<b>Pricing and Availability</b>				
Price per Unit (\$)	495.00	395.00	295.00	100.00
Date of First Delivery	1980	1988	September 1, 1990	1984
Number Installed to Date	Vendor did not specify	Vendor did not specify	1,000	200
Warranty	90 days	90 days	90 days	Permanent
Distribution	OEMs, distributor/dealer/retail, VARs	OEMs, distributor/dealer/retail, VARs	Distributor/dealer/retail, VARs	Direct, distributor/dealer/retail, mail order
Vendor Phone Number	(504) 923-0888	(504) 923-0888	(504) 923-0888	(404) 483-1717
Comments	Unix BLAST connects to PC, MAC, Xenix or any other computers with BLAST	Connects to any other computer with BLAST; provides high-speed, noise-resistant data transfers	Offers PC-to-PC remote control features; connects to any other computer with BLAST	—

Vendor	Crystal Point, Inc.	Datability Software Systems, Inc.	Datastorm Technologies, Inc.	Datastorm Technologies, Inc.
Product	PC-TERM 3.2	RAF Remote Access Facility 2.1	ProComm PLUS 1.1B	ProComm PLUS Network Version 1.0
Communications Supported	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service
Remote Access Capability	Yes	Yes	Yes	Yes
Terminals Emulated	TTY, TeleVideo, Digital VT52/100, Hewlett-Packard, Digital VT200/VT300, IBM 3270	Digital VT52/100, Digital VT200/VT300	TTY, TeleVideo, Digital VT52/100, Lear Siegler, IBM 3101, IBM 3270, Wyse, Heath Zenith 19, ANSI	TTY, TeleVideo, Digital VT52/100, Lear Siegler, IBM 3101, IBM 3270, Wyse, Heath Zenith 19, ANSI
Computers Supported	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)
Operating Systems	MS-DOS, PC-DOS, OS/2	MS-DOS, PC-DOS	MS-DOS, PC-DOS, OS/2	MS-DOS, PC-DOS
Users Supported	Single, multiple via LAN-administered communications server	Single	Single	Multiple via LAN-administered communications server
LAN Compatibility	IBM NETBIOS, Novell NetWare, AT&T Starlan, 3Com	IBM NETBIOS, Novell NetWare	Novell NetWare	Novell NetWare
Min. Memory Required (bytes)	256K	640K	192K	192K
Memory Resident	Yes	Vendor did not specify	No	No
Diskette Size (in inches)	3.5, 5.25	3.5, 5.25	3.5, 5.25	3.5, 5.25
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
<b>Communications</b>				
Number of Concurrent Sessions	Dependent on memory	1, 6	1	Up to 9
Transmission Speed (bps)	300 to 19.2K	300 to 38.4K	300 to 115.2K	300 to 19.2K
File Transfer Capabilities	ASCII, batch transfers, binary	ASCII, batch transfers, binary, graphics	ASCII, batch transfers, binary, graphics	ASCII, batch transfers, binary, graphics
File Transfer Protocols	Xmodem, Kermit, ASCII	Vendor did not specify	Xmodem, Kermit, ASCII, Ymodem, Sealink, Telink, Modem 7	Xmodem, Kermit, ASCII, Ymodem, Sealink, Imodem, Telink
File Transfer Info. Provided	Characters sent/received, number of errors/retries, blocks sent/received, session name	Characters sent/received, number of errors/retries, blocks sent/received, Transfer status	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time
Downloading Options	Write to disk, screen snapshot, write to printer	Write to disk, screen snapshot, write to printer	Write to disk, screen snapshot, write to printer	Write to disk, screen snapshot, write to printer
Capture Buffer Size (K bytes)	Vendor did not specify	Not applicable	4K	4
Communications Features	Unattended execution	Auto dial, unattended execution, auto redial	Auto dial, unattended execution, auto redial, auto answer	Auto dial, unattended execution, auto redial, auto answer
Dialing Directory	Vendor did not specify	No	Yes	Yes
Max. Phone Numbers Stored	Vendor did not specify	Not applicable	200 per dialing dir.	200 per dialing dir.
User Interface	Menu driven, nested menus	Installation program, status line, help facility, menu driven	Installation program, status line, command driven, help facility, menu driven, pop-up windows	Installation program, status line, command driven, help facility, menu driven, pop-up windows
User-Defined Parameters	String equivalents/substitutions, answerback strings, line wrap control, hangup strings	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, line wrap control, hangup strings, redial timeout, monitor attributes, Keyboard remapping	Modem initialization strings, dialing commands, log files, connect strings, log file directories, answerback strings, line wrap control, hangup strings, sound control, redial timeout, monitor attributes, Keyboard remapping	Modem initialization strings, dialing commands, log files, connect strings, log file directories, answerback strings, line wrap control, hangup strings, sound control, redial timeout, monitor attributes, Keyboard remapping
Hot Key to Operating System	Yes	Yes	Yes	Yes
Text Editor	No	No	Yes	Yes
Programming Features	Macros	Script language, softkeys, predefined scripts, Remote procedure calls	Macros, script language, script language learn mode	Macros, script language, script language learn mode
Security	Vendor did not specify	Keyboard idle timeout	Single-level passwords	Single-level passwords
<b>Pricing and Availability</b>				
Price per Unit (\$)	249.00	395.00	119.00	595.00
Date of First Delivery	1983	1986	February 7, 1988	August 1989
Number Installed to Date	Vendor did not specify	30,000	Vendor did not specify	Vendor did not specify
Warranty	90 days	90 days	60 days	60 days
Distribution	Direct, OEMs, distributor/dealer/retail, VARs	Direct, VARs	Direct, OEMs, distributor/dealer/retail, VARs	Direct, OEMs, distributor/dealer/retail, VARs
Vendor Phone Number	(206) 487-3656	(212) 807-7800	(314) 443-3282	(314) 443-3282
<b>Comments</b>	—	Price dependent on quantity purchased; Ethernet version also available	Program offers Host mode, allowing a PC to act as a small BBS	Cost is for a LAN 5-Pak, additional ports can be added for \$119 each, offers Host mode, allowing a PC to act as a small BBS

Vendor	DCA/Crosstalk	DCA/Crosstalk	DCA/Crosstalk	DCA/Crosstalk
Product	Crosstalk for Windows 1.1	Crosstalk MK.4 2.0	Crosstalk XVI 3.71	R2LAN 2.0
Communications Supported	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service	PC-to-PC
Remote Access Capability	No	No	No	Yes
Terminals Emulated	TTY, Digital VT52/100, IBM 3101, VIDTEX	TTY, TeleVideo, Digital VT52/100, Digital VT200/VT300, Lear Siegler, IBM 3101, IBM 3270	TTY, TeleVideo, Digital VT52/100, IBM 3101, TI 940 Adds viewpoint	TTY
Computers Supported	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)
Operating Systems	MS-DOS, PC-DOS	MS-DOS, PC-DOS	MS-DOS, PC-DOS	MS-DOS, PC-DOS
Users Supported	Single	Single, multiple via LAN-administered communications server	Single	Multiple via LAN-administered communications server
LAN Compatibility	Vendor did not specify	IBM NETBIOS, Novell NetWare	Vendor did not specify	IBM NETBIOS, Novell NetWare
Min. Memory Required (bytes)	150K	320K	128K	104K Host, 128K Call
Memory Resident	Yes	Yes	Yes	Yes
Diskette Size (in inches)	3.5, 5.25	3.5, 5.25	3.5, 5.25	3.5, 5.25
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
<b>Communications</b>				
Number of Concurrent Sessions	1	15	1	1
Transmission Speed (bps)	300 to 19.2K	300 to 115.2K	300 to 115.2K	Dependent on network speed
File Transfer Capabilities	ASCII, binary, graphics	ASCII, batch transfers, binary, graphics	ASCII, binary, graphics	Binary, graphics
File Transfer Protocols	Xmodem, Kermit, ASCII, Ymodem, Zmodem, Dart, CompuServe B	Xmodem, CRC, Kermit, ASCII, X.PC, Ymodem, Zmodem, Dart, CompuServe B	Xmodem, Kermit, ASCII, X.PC, Ymodem, Zmodem, Dart, Crosstalk	Xmodem, Ymodem, Crosstalk
File Transfer Info. Provided	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time	Characters sent/received, number of errors/retries, blocks sent/received, session name	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time
Downloading Options	Write to disk, screen snapshot, write to printer	Write to disk, screen snapshot, write to printer	Write to disk, screen snapshot, write to printer	Write to disk, screen snapshot, write to printer
Capture Buffer Size (K bytes)	64K	64K	64K	Not applicable
Communications Features	Auto dial, auto redial, auto answer	Auto dial, unattended execution, auto redial, auto answer	Auto dial, auto redial, auto answer	Auto dial, unattended execution, auto redial, auto answer
Dialing Directory	Yes	Yes	No	Yes
Max. Phone Numbers Stored	Dependent on memory	Dependent on memory	Dependent on memory	2,000
User Interface	Installation program, help facility, menu driven, graphic icons, nested menus, mouse support, pop-up windows	Installation program, help facility, menu driven, nested menus, windowing capability	Status line, command driven, help facility	Installation program, help facility, menu driven, nested menus, pop-up windows
User-Defined Parameters	String equivalents/substitutions, modem initialization strings, dialing commands, connect strings, answerback strings, line wrap control, hangup strings, redial timeout	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, answerback strings, line wrap control, hangup strings, redial timeout	Modem initialization strings, dialing commands, log files, connect strings, answerback strings, line wrap control, hangup strings	Modem initialization strings, dialing commands, log files, connect strings, log file directories, answerback strings, hangup strings, redial timeout, monitor attributes
Hot Key to Operating System	No	Yes	Yes	Yes
Text Editor	No	Yes	No	No
Programming Features	Script language, script language learn mode, predefined scripts	Macros, script language, script language learn mode, predefined scripts	Script language, predefined scripts	None
Security	Single-level passwords	Single-level passwords	Single-level passwords	Multilevel passwords, Guard Host Security System
<b>Pricing and Availability</b>				
Price per Unit (\$)	195.00	245.00	195.00	795.00
Date of First Delivery	July 1989	March 1987	1983	1988
Number Installed to Date	Vendor did not specify	Vendor did not specify	900,000	Vendor did not specify
Warranty	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Distribution	OEMs, distributor/dealer/retail, VARs	OEMs, distributor/dealer/retail, mail order, VARs	OEMs, distributor/dealer/retail, VARs	Distributor/dealer/retail, VARs
Vendor Phone Number	(404) 442-4000	(404) 442-4000	(404) 442-4000	(404) 442-4000
Comments	—	—	—	—

Vendor	DCA/Crosstalk	Diversified Computer Systems, Inc.	Diversified Computer Systems, Inc.	Diversified Computer Systems, Inc.
Product	Remote2 2.0	EM320 5.10	EM4010 5.10 3.02	EM4105 5.10 2.24
Communications Supported	PC-to-PC	PC-to-host, PC-to-information service	PC-to-host, PC-to-information service	PC-to-host, PC-to-information service
Remote Access Capability	Yes	Yes	Yes	Yes
Terminals Emulated	TTY	Digital VT52/100, Digital VT200/VT300, Wyse	Digital VT52/100, Digital VT200/VT300, Wyse, Tek 4010/4014, VT640	Digital VT52/100, Digital VT200/VT300, Wyse, Tek 4105, 4010/4014, 4107
Computers Supported	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)
Operating Systems	MS-DOS, PC-DOS	MS-DOS, PC-DOS, MS- Windows	MS-DOS, PC-DOS, MS- Windows	MS-DOS, PC-DOS, MS- Windows
Users Supported	Single	Single	Single	Single
LAN Compatibility	Vendor did not specify	IBM NETBIOS, Novell NetWare, DEC NET, 3COM, Ungermann-Bass	IBM NETBIOS, Novell NetWare, DEC NET, 3COM, Ungermann-Bass	IBM NETBIOS, Novell NetWare, DEC NET, 3COM, Ungermann-Bass
Min. Memory Required (bytes)	64K on Host, 128K Call	170K	330K	300K
Memory Resident	Yes	Yes	Yes	Yes
Diskette Size (in inches)	3.5, 5.25	3.5, 5.25	3.5, 5.25	3.5, 5.25
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
<b>Communications</b>				
Number of Concurrent Sessions	1	8	8	8
Transmission Speed (bps)	300 to 115.2K	1200 to 38.4K	1200 to 38.4K	1200 to 38.4K
File Transfer Capabilities	Binary, graphics	ASCII, batch transfers, binary	ASCII, batch transfers, binary, graphics	ASCII, batch transfers, binary, graphics
File Transfer Protocols	Xmodem, Ymodem, Crosstalk	Xmodem, Kermit, ASCII	Xmodem, Kermit, ASCII	Xmodem, Kermit, ASCII
File Transfer Info. Provided	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time	Characters sent/received, number of errors/retries, blocks sent/received, session name, %complete	Characters sent/received, number of errors/retries, blocks sent/received, session name, %complete	Characters sent/received, number of errors/retries, blocks sent/received, session name, %complete
Downloading Options	Write to disk, screen snapshot, write to printer	Write to disk, screen snapshot, write to printer	Write to disk, screen snapshot, write to printer	Write to disk, screen snapshot, write to printer
Capture Buffer Size (K bytes)	Not applicable	10 to 100	10 to 100	10 to 100
Communications Features	Auto dial, unattended execution, auto redial, auto answer	Auto dial, unattended execution, auto answer	Auto dial, unattended execution, auto answer	Auto dial, unattended execution, auto answer
Dialing Directory	Yes	Yes	Yes	Yes
Max. Phone Numbers Stored	2,000	15	15	15
User Interface	Installation program, help facility, menu driven, nested menus, pop-up windows	Installation program, status line, command driven, help facility, menu driven, windowing capability	Installation program, status line, command driven, help facility, menu driven, mouse support, windowing capability	Installation program, status line, command driven, help facility, menu driven, mouse support, windowing capability
User-Defined Parameters	Modem initialization strings, dialing commands, log files, connect strings, log file directories, answerback strings, hangup strings, redial timeout, monitor attributes	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, line wrap control, hangup strings, redial timeout	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, line wrap control, hangup strings, redial timeout	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, log file directories, line wrap control, hangup strings, redial timeout
Hot Key to Operating System	Yes	Yes	Yes	Yes
Text Editor	No	No	No	No
Programming Features	None	Macros, script language, softkeys, predefined scripts	Macros, script language, softkeys, predefined scripts	Macros, script language, softkeys, predefined scripts
Security	Multilevel passwords, Guard host security system	None	None	None
<b>Pricing and Availability</b>				
Price per Unit (\$)	195.00	189.00	249.00	359.00
Date of First Delivery	1988	1985	1984	1987
Number Installed to Date	Vendor did not specify	11,000	10,000	6,000
Warranty	Vendor did not specify	90 days	90 days	90 days
Distribution	OEMs, distributor/dealer/retail, VARs	Direct, OEMs, distributor/dealer/retail, VARs	Direct, OEMs, distributor/dealer/retail, VARs	Direct, OEMs, distributor/dealer/retail, VARs
Vendor Phone Number	(404) 442-4000	(303) 447-9251	(303) 447-9251	(303) 447-9251
Comments	—	Includes 132 Column Mode, remappable keyboard, scroll memory, and extensive network support; 15% federal government discount	Includes high resolution graphics support, hard copy, and graphics print queuing; 15% federal government discount	Includes 16 color 800 x 600 support, PostScript support, HP Laserjet III, and HP GC support; 15% federal government discount

Vendor	Dynamic Microprocessor Associates	Dynamic Microprocessor Associates	Dynamic Microprocessor Associates	Dynamic Microprocessor Associates
Product	ASCOM IV 1.42	PC Macterm II 3.11C	pcANYWHERE IV 4.0	pcANYWHERE IV/LAN 4.0
Communications Supported	PC-to-information service, PC-to-PC	Mac-to-PC	PC-to-information service, PC-to-PC	PC-to-information service, PC-to-PC
Remote Access Capability	No	Yes	Yes	Yes
Terminals Emulated	TTY, TeleVideo, Digital VT52/100, VT200/VT300, Hewlett-Packard, Wyse, IBM 3101, IBM 3270	Not applicable	Digital VT52/100, Digital VT200/VT300	Digital VT52/100, Digital VT200/VT300
Computers Supported	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), Apple Macintosh Family, IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)
Operating Systems	MS-DOS, PC-DOS	MS-DOS, Macintosh Finder, PC-DOS, PC MOS	MS-DOS, PC-DOS, PC MOS	MS-DOS, PC-DOS
Users Supported	Single, multiple via LAN-administered communications server	Single	Single	Multiple via LAN-administered communications server
LAN Compatibility	Vendor did not specify	AppleTalk	IBM NETBIOS, Novell NetWare	IBM NETBIOS, Novell NetWare
Min. Memory Required (bytes)	256K	256K	256K	320K
Memory Resident	Yes	Yes	Yes	Yes
Diskette Size (in inches)	5.25	3.5, 5.25	3.5, 5.25	3.5, 5.25
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
<b>Communications</b>				
Number of Concurrent Sessions	1	1	Up to 3	Dependent on license
Transmission Speed (bps)	300 to 19.2K	300 to 57.6K	300 to 115.2K	300 to 115.2K
File Transfer Capabilities	ASCII, batch transfers, binary, graphics	ASCII, batch transfers, binary, graphics	ASCII, batch transfers, binary, graphics	ASCII, batch transfers, binary, graphics
File Transfer Protocols	Xmodem, CRC, Kermit, MNP, ASCII, X.PC, Ymodem, proprietary	Proprietary	Xmodem, Proprietary	Xmodem, Proprietary
File Transfer Info. Provided	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time
Downloading Options	Write to disk, screen snapshot, write to printer	Write to disk, write to printer	Write to disk, screen snapshot, write to printer	Write to disk, screen snapshot, write to printer
Capture Buffer Size (K bytes)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Communications Features	Auto dial, unattended execution, auto redial, auto answer	Auto dial, auto redial, auto answer	Auto dial, unattended execution, auto redial	Auto dial, unattended execution, auto redial, auto answer
Dialing Directory	Yes	Yes	Yes	Yes
Max. Phone Numbers Stored	Unlimited	Unlimited	Unlimited	Unlimited
User Interface	Status line, command driven, help facility, menu driven	Help facility, menu driven, graphic icons, mouse support, pop-up windows	Installation program, status line, command driven, help facility, menu driven, nested menus, pop-up windows	Installation program, status line, command driven, help facility, menu driven, nested menus, pop-up windows
User-Defined Parameters	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, log file directories, answerback strings, hangup strings, redial timeout	Modem initialization strings, dialing commands, log files, connect strings, log file directories, answerback strings, hangup strings, redial timeout	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, log file directories, answerback strings, hangup strings, redial timeout, monitor attributes	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, log file directories, answerback strings, hangup strings, redial timeout, monitor attributes
Hot Key to Operating System	No	Yes	Yes	Yes
Text Editor	Yes	No	Yes	No
Programming Features	Macros, script language	None	Script language	Script language
Security	Multilevel passwords	Multilevel passwords	File encryption, multilevel passwords	File encryption, multilevel passwords
<b>Pricing and Availability</b>				
Price per Unit (\$)	195.00	195.00	179.00	495.00
Date of First Delivery	1979	1988	1976	August 1, 1990
Number Installed to Date	100,000	10,000	400,000	Vendor did not specify
Warranty	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Distribution	Distributor/dealer/retail, VARs	OEMs, distributor/dealer/retail, mail order, VARs	OEMs, distributor/dealer/retail, mail order, VARs	OEMs, distributor/dealer/retail, mail order, VARs
Vendor Phone Number	(516) 462-0440	(516) 462-0440	(516) 462-0440	(516) 462-0440
Comments	—	Purchase price includes remote Mac and Host PC software; network version \$395	Purchase price includes both host and remote software	Purchase price includes license for two nodes; additional nodes \$25 each

Vendor	Everex Systems, Inc.	Everex Systems, Inc.	The Freesoft Co.	The Freesoft Co.
<b>Product</b>	<b>CommUnity DOS 3.2</b>	<b>CommUnity MAC 1.3.1</b>	<b>OKyto 1.02</b>	<b>Second Sight 2.1</b>
Communications Supported	PC-to-host, PC-to-PC	PC-to-host, PC-to-PC	PC-to-PC	PC-to-PC
Remote Access Capability	Yes	Yes	Yes	Yes
Terminals Emulated	Digital VT52/100, Digital VT200/VT300	Digital VT52/100, Digital VT200/VT300	TTY	TTY, Digital VT52/100
Computers Supported	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	Apple II Family, Apple Macintosh Family	Apple Macintosh Family	Apple Macintosh Family
Operating Systems	MS-DOS, PC-DOS	Macintosh Finder	Macintosh Finder	Macintosh Finder
Users Supported	Single, multiple via LAN-administered communications server	Single, multiple via LAN-administered communications server	Single	Single
LAN Compatibility	IBM NETBIOS	AppleTalk	AppleTalk	AppleTalk
Min. Memory Required (bytes)	256K	80K	1M	1M
Memory Resident	No	No	Yes	Yes
Diskette Size (in inches)	5.25	3.5	3.5	3.5
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
<b>Communications</b>				
Number of Concurrent Sessions	1	1	1	1
Transmission Speed (bps)	19.2K, 10M Ethernet	19.2K, 10M Ethernet	300 to 19.2K	300 to 57.6K
File Transfer Capabilities	ASCII, batch transfers, binary	ASCII, batch transfers, binary	ASCII, batch transfers, binary, graphics	ASCII, batch transfers, binary, graphics
File Transfer Protocols	ASCII	ASCII	Proprietary	Xmodem, ASCII, Zmodem
File Transfer Info. Provided	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time	Characters sent/received, number of errors/retries, blocks sent/received
Downloading Options	Write to disk, write to printer	Write to disk, write to printer	Write to disk	Write to disk
Capture Buffer Size (K bytes)	Vendor did not specify	Not applicable	Not applicable	Not applicable
Communications Features	Vendor did not specify	Vendor did not specify	Auto dial, unattended execution, auto redial, auto answer	Unattended execution
Dialing Directory	Vendor did not specify	Vendor did not specify	Yes	Vendor did not specify
Max. Phone Numbers Stored	Vendor did not specify	Vendor did not specify	Unlimited	Not applicable
User Interface	Installation program, menu driven, mouse support	Installation program, menu driven, mouse support	Nested menus, pop-up windows	Menu driven, nested menus
User-Defined Parameters	Vendor did not specify	Vendor did not specify	String equivalents/substitutions, modem initialization strings, dialing commands, log files, hangup strings, redial timeout	Modem initialization strings, log files, connect strings, log file directories, line wrap control, hangup strings, monitor attributes
Hot Key to Operating System	No	No	No	No
Text Editor	Yes	Yes	No	No
Programming Features	Macros, script language, softkeys	Macros, script language, softkeys	Script language, predefined scripts	Survey language
Security	File encryption, multilevel passwords, transmission encryption	File encryption, multilevel passwords, transmission encryption	Multilevel passwords	Single-level passwords
<b>Pricing and Availability</b>				
Price per Unit (\$)	475.00	445.00	39.95	135.00
Date of First Delivery	1986	1988	November 1, 1989	January 23, 1989
Number Installed to Date	3,000	2,000	Vendor did not specify	Vendor did not specify
Warranty	1 year	1 year	60 days	60 days
Distribution	Direct, OEMs, distributor/dealer/retail, VARs	Direct, OEMs, distributor/dealer/retail, VARs	Direct, OEMs, distributor/dealer/retail, mail order, VARs	Direct, distributor/dealer/retail, mail order
Vendor Phone Number	(415) 498-1111	(415) 498-1111	(412) 846-2700	(412) 846-2700
<b>Comments</b>	Additional licenses \$315	Additional licenses \$315	—	—

Vendor	The Freesoft Co.	Hawkeye Grafix	Hayes Microcomputer Products, Inc.	Hayes Microcomputer Products, Inc.
Product	White Knight V.11	COMM X A.05	Smartcom Exec	Smartcom EZ 2.0
Communications Supported	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service
Remote Access Capability	Yes	Yes	Yes	Yes
Terminals Emulated	TTY, Digital VT52/100	TTY, TeleVideo, Digital VT52/100, Hewlett-Packard, Lear Siegler, IBM 3101, Wyse	TTY, Digital VT52/100, ANSI	TTY, Digital VT52/100
Computers Supported	Apple Macintosh Family	IBM PC/AT/XT, Apple II Family, IBM PS/2 (non-MCA), CP/M80	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)
Operating Systems	Macintosh Finder	MS-DOS, PC-DOS, MS-Windows, CP/M80	MS-DOS, PC-DOS	MS-DOS, PC-DOS
Users Supported	Single	Single, multiple via LAN-administered communications server	Single	Single
LAN Compatibility	AppleTalk	IBM NETBIOS	Not applicable	Not applicable
Min. Memory Required (bytes)	1M	64K	400K	256K
Memory Resident	Yes	Yes	Yes	Yes
Diskette Size (in inches)	3.5	3.5, 5.25	3.5, 5.25	3.5, 5.25
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
<b>Communications</b>				
Number of Concurrent Sessions	1	2	Vendor did not specify	1
Transmission Speed (bps)	300 to 57.6K	300 to 19.2K	300 to 115.2K	300 to 19.2K
File Transfer Capabilities	ASCII, batch transfers, binary, graphics	ASCII, batch transfers, binary, graphics	ASCII, batch transfers, binary, graphics	ASCII, binary, graphics
File Transfer Protocols	Xmodem, CRC, Kermit, ASCII, Ymodem, Zmodem	Xmodem, CRC, Kermit, ASCII	Xmodem, CRC, Kermit, ASCII, Ymodem, Zmodem	Xmodem
File Transfer Info. Provided	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time	Characters sent/received, blocks sent/received, session name, estimated transmit time
Downloading Options	Write to disk, screen snapshot, write to printer	Write to disk, screen snapshot, write to printer	Write to disk, screen snapshot, write to printer	Write to disk, screen snapshot, write to printer
Capture Buffer Size (K bytes)	Unlimited	Vendor did not specify	200	Not applicable
Communications Features	Auto dial, unattended execution, auto redial, auto answer	Auto dial, unattended execution, auto redial, auto answer	Auto dial, auto redial, auto answer	Auto dial, auto redial, auto answer
Dialing Directory	Yes	Yes	Yes	Yes
Max. Phone Numbers Stored	Unlimited	500	Dep. on disk space	Vendor did not specify
User Interface	Status line, menu driven, graphic icons, nested menus, mouse support, pop-up windows, windowing capability, User Definable dialogs, shell compiler	Installation program, status line, help facility, menu driven, pop-up windows, windowing capability	Installation program, status line, command driven, help facility, menu driven, nested menus, mouse support, pop-up windows	Status line, command driven, help facility, menu driven, nested menus, pop-up windows
User-Defined Parameters	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, log file directories, answerback strings, line wrap control, hangup strings, sound control, redial timeout	String equivalents/substitutions, dialing commands, log files, connect strings, monitor attributes	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, answerback strings, line wrap control, hangup strings, redial timeout, monitor attributes	Modem initialization strings, answerback strings, redial timeout
Hot Key to Operating System	No	Yes	Yes	Yes
Text Editor	No	No	Yes	No
Programming Features	Macros, script language, script language learn mode	Macros, script language, predefined scripts	Macros, script language, script language learn mode, softkeys, predefined scripts	Macros, softkeys
Security	Single-level passwords, multilevel passwords	Single-level passwords, file encryption, transmission encryption	Single-level passwords	Single-level passwords
<b>Pricing and Availability</b>				
Price per Unit (\$)	139.00	99.00	129.00	49.00
Date of First Delivery	November 1, 1989	1978	1990	1988
Number Installed to Date	Vendor did not specify	50,000	Vendor did not specify	Vendor did not specify
Warranty	60 days	30 day trial	90 days	90 days
Distribution	Direct, OEMs, distributor/dealer/retail, mail order, VARs	Direct, distributor/dealer/retail	OEMs, distributor/dealer/retail, VARs	OEMs, distributor/dealer/retail, VARs
Vendor Phone Number	(412) 846-2700	(813) 855-8687	(404) 449-8791	(404) 449-8791
Comments	—	—	Includes color utility, custom & international keyboard and printer support	—

Vendor	Hayes Microcomputer Products, Inc.	Hayes Microcomputer Products, Inc.	Headlands Communications Corp.	Hilgraeve, Inc.
Product	Smartcom for the Macintosh	Smartcom II for the Macintosh 3.2	PC-TALK4	HyperACCESS/5 1.1
Communications Supported	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service
Remote Access Capability	No	Yes	Yes	Yes
Terminals Emulated	TTY, Digital VT52/100	TTY, Digital VT52/100, Show controls	TTY, Digital VT52/100	TTY, TeleVideo, Digital VT52/100, VT200/VT300, IBM 3101, IBM 3278, Wang, ANSI, VideoText IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)
Computers Supported	Apple Macintosh Family	Apple Macintosh Family	IBM PC/AT/XT	
Operating Systems	Macintosh Finder, Macintosh Multifinder	Macintosh Finder, Macintosh Multifinder	MS-DOS, PC-DOS	MS-DOS, PC-DOS, UNIX, OS/2, Xenix, MS-Windows
Users Supported	Single	Single, multiple via LAN-administered communications server	Single	Single
LAN Compatibility	AppleTalk	AppleTalk	Vendor did not specify	MS OS/2 LAN Manager, Lan Server
Min. Memory Required (bytes)	256K	350K	Vendor did not specify	350K
Memory Resident	Yes	Yes	Yes	No
Diskette Size (in inches)	3.5	3.5, 5.25	3.5, 5.25	3.5, 5.25
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
<b>Communications</b>				
Number of Concurrent Sessions	1	1	1	Unlimited under OS/2
Transmission Speed (bps)	300 to 38.4K	300 to 57.6K	300 to 9600	300 to 115.6K
File Transfer Capabilities	ASCII, batch transfers, binary, graphics	ASCII, batch transfers, binary, graphics	ASCII, binary	ASCII, batch transfers, binary, graphics
File Transfer Protocols	Xmodem, ASCII	Xmodem, CRC, ASCII, Ymodem, Zmodem	Xmodem, CRC	Xmodem, CRC, Kermit, ASCII, Ymodem, Zmodem, Hyper Protocol
File Transfer Info. Provided	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time	Characters sent/received, number of errors/retries, session name, estimated transmit time	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time
Downloading Options	Write to disk, write to printer	Write to disk, write to printer	Write to disk, screen snapshot, write to printer	Write to disk, screen snapshot, write to printer
Capture Buffer Size (K bytes)	Vendor did not specify	Dependent on memory	Vendor did not specify	250K
Communications Features	Auto dial, auto redial, auto answer	Auto dial, unattended execution, auto redial, auto answer	Auto dial, auto redial, auto answer	Auto dial, unattended execution, auto redial, auto answer
Dialing Directory	Yes	Yes	Yes	Yes
Max. Phone Numbers Stored	Dep. on disk space	Dep. on disk space	900	250
User Interface	Status line, help facility, menu driven, graphic icons, mouse support, pop-up windows	Status line, help facility, menu driven, graphic icons, mouse support, pop-up windows	Status line, command driven, help facility	Installation program, status line, command driven, help facility, menu driven, nested menus, pop-up windows, Point-and-shoot
User-Defined Parameters	String equivalents/substitutions, answerback strings, line wrap control, redial timeout	String equivalents/substitutions, modem initialization strings, dialing commands, connect strings, answerback strings, line wrap control, hangup strings, redial timeout	String equivalents/substitutions, modem initialization strings, dialing commands, hangup strings, sound control, redial timeout	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, log file directories, answerback strings, line wrap control, hangup strings, sound control, redial timeout, monitor attributes, Screen colors
Hot Key to Operating System	Yes	Yes	Yes	Yes
Text Editor	No	No	Yes	Yes
Programming Features	Macros, softkeys	Macros, script language, script language learn mode, softkeys, predefined scripts	Macros	Macros, script language, script language learn mode, softkeys, predefined scripts
Security	Vendor did not specify	Protected strings	None	Single-level passwords, multilevel passwords, Password encryption
<b>Pricing and Availability</b>				
Price per Unit (\$)	49.00	149.00	99.00	199.00
Date of First Delivery	1990	1985	Vendor did not specify	10,000
Number Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	90 days	90 days	Vendor did not specify	1 year
Distribution	OEMs, distributor/dealer/retail, VARs	OEMs, distributor/dealer/retail, VARs	Direct, distributor/dealer/retail, mail order	Direct, OEMs, distributor/dealer/retail, mail order, VARs
Vendor Phone Number	(404) 449-8791	(404) 449-8791	(415) 435-0770	(313) 243-0576
Comments	—	—	—	—

Vendor	Information Analysis Systems Corp.	Information Analysis Systems Corp.	International Business Machines Corp. (IBM.)	KEA Systems, Ltd.
Product	Genterm 2.04	Genterm	FTTERM 2.1	ZSTEM 100 2.7.2
Communications Supported	PC-to-host, PC-to-PC	Vendor did not specify	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service
Remote Access Capability	No	Vendor did not specify	Vendor did not specify	Yes
Terminals Emulated	TTY, TeleVideo, Digital VT52/100, Lear Siegler, IBM 3101	TTY, TeleVideo, Digital VT52/100, Lear Siegler, IBM 3101	TTY, Digital VT52/100, Digital VT200/VT300, IBM 3101, IBM 3270	Digital VT52/100
Computers Supported	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)
Operating Systems	MS-DOS, PC-DOS	MS-DOS, PC-DOS	MS-DOS, PC-DOS	MS-DOS, PC-DOS, UNIX, Xenix, MS-Windows
Users Supported	Single	Single	Single	Single
LAN Compatibility	Not applicable	Not applicable	IBM Token-Ring	IBM NETBIOS, Novell NetWare
Min. Memory Required (bytes)	256K	256K	256K	Vendor did not specify
Memory Resident	No	No	Yes	No
Diskette Size (in inches)	3.5, 5.25	3.5, 5.25	3.5, 5.25	3.5, 5.25
Hayes AT Command Set Compatible	Yes	Yes	Vendor did not specify	Yes
<b>Communications</b>				
Number of Concurrent Sessions	1	1	1 Host, 1 DOS	1
Transmission Speed (bps)	300 to 9600	300 to 9600	300 to 19.2K	Dependent on connection
File Transfer Capabilities	ASCII, binary	ASCII, binary, graphics	ASCII, batch transfers, binary	ASCII, binary
File Transfer Protocols	Xmodem, Kermit	Xmodem, Kermit, ASCII	Xmodem, CRC, ASCII, Ymodem	Xmodem, Kermit, ASCII
File Transfer Info. Provided	Number of errors/retries, blocks sent/received	Number of errors/retries, blocks sent/received	Vendor did not specify	Characters sent/received, number of errors/retries, blocks sent/received
Downloading Options	Write to disk, write to printer	Write to disk, write to printer	Write to disk, write to printer	Write to disk, screen snapshot, write to printer
Capture Buffer Size (K bytes)	Not applicable	Not applicable	Vendor did not specify	Vendor did not specify
Communications Features	Auto dial, auto redial	Auto dial	Auto dial, unattended execution, auto redial, auto answer	Auto dial, unattended execution, auto answer
Dialing Directory	Yes	Yes	Yes	Yes
Max. Phone Numbers Stored	100	20	Vendor did not specify	Vendor did not specify
User Interface	Installation program, status line, help facility, menu driven, nested menus	Installation program, status line, help facility, menu driven, nested menus	Help facility, menu driven, pop-up windows	Status line, menu driven, nested menus
User-Defined Parameters	Modem initialization strings, dialing commands, connect strings, answerback strings, line wrap control	Modem initialization strings, dialing commands, connect strings, answerback strings	Vendor did not specify	Log files, connect strings, answerback strings, line wrap control, redial timeout, monitor attributes
Hot Key to Operating System	Yes	Yes	Yes	Yes
Text Editor	No	No	Vendor did not specify	No
Programming Features	Macros, script language	Macros, script language	Macros, predefined scripts, FTHLLAPI program interface	Macros, script language, softkeys, predefined scripts
Security	Vendor did not specify	None	Dependent on Host	Vendor did not specify
<b>Pricing and Availability</b>				
Price per Unit (\$)	79.95	79.95	145.00	99.00
Date of First Delivery	1985	1985	July 1988	Vendor did not specify
Number Installed to Date	40,000	20,000	Vendor did not specify	Vendor did not specify
Warranty	1 year	1 year	90 days	Vendor did not specify
Distribution	Direct, VARs	Direct	Direct, distributor/dealer/retail, VARs	Direct, OEMs, distributor/dealer/retail
Vendor Phone Number	(203) 429-1691	(203) 429-1691	(914) 765-1900	(604) 431-0727
Comments	—	—	108 addl. licenses; product #75X3-286 supports all IBM 3270 protocol converters	30 day money back guarantee

Vendor	KEA Systems, Ltd.	KEA Systems, Ltd.	KEA Systems, Ltd.	Lightwave
Product	ZSTEM 220 3.3.3	ZSTEM 240 2.2.1	ZSTEM 4014 2.1.5A	Lightwave Communications 1.1
Communications Supported	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service
Remote Access Capability	Yes	Yes	No	Vendor did not specify
Terminals Emulated	Digital VT52/100, Digital VT200/VT300	Digital VT52/100, Digital VT200/VT300, Tektronix 4010/4014	Tektronix 4010/4014	TTY, IBM 3101
Computers Supported	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA)
Operating Systems	MS-DOS, PC-DOS, UNIX, Xenix, MS-Windows	MS-DOS, PC-DOS, UNIX, Xenix, MS-Windows	MS-DOS, PC-DOS, UNIX, OS/2, Xenix, MS-Windows	MS-DOS, PC-DOS
Users Supported	Single, multiple via LAN-administered communications server	Single, multiple via LAN-administered communications server	Single	Multiple via LAN-administered communications server
LAN Compatibility	IBM NETBIOS, Novell NetWare, TCP/IP	IBM NETBIOS, Novell NetWare, TCP/IP	Vendor did not specify	Vendor did not specify
Min. Memory Required (bytes)	220K	220K	Vendor did not specify	128K
Memory Resident	No	No	Yes	No
Diskette Size (in inches)	3.5, 5.25	3.5, 5.25	3.5, 5.25	3.5, 5.25
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
<b>Communications</b>				
Number of Concurrent Sessions	1	2	1	1
Transmission Speed (bps)	Dependent on connection	Dependent on connection	Dependent on connection	1200 to 19.2K
File Transfer Capabilities	ASCII, binary	ASCII, binary	ASCII, binary	ASCII, binary, graphics
File Transfer Protocols	Xmodem, Kermit, ASCII	Xmodem, Kermit, ASCII	Xmodem, Kermit, ASCII	Xmodem, ASCII
File Transfer Info. Provided	Characters sent/received, number of errors/retries, blocks sent/received	Characters sent/received, number of errors/retries, blocks sent/received	Vendor did not specify	Characters sent/received, number of errors/retries
Downloading Options	Write to disk, screen snapshot, write to printer	Write to disk, screen snapshot, write to printer	Vendor did not specify	Write to disk
Capture Buffer Size (K bytes)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Not applicable
Communications Features	Auto dial, unattended execution, auto answer	Auto dial, unattended execution, auto answer	Vendor did not specify	Auto dial, auto redial, auto answer
Dialing Directory	Yes	Yes	Yes	Yes
Max. Phone Numbers Stored	Vendor did not specify	Vendor did not specify	24K	10
User Interface	Status line, menu driven, nested menus	Installation program, menu driven, nested menus, mouse support	Menu driven, nested menus	Installation program, help facility, menu driven, pop-up windows
User-Defined Parameters	Log files, connect strings, answerback strings, line wrap control, redial timeout, monitor attributes	Log files, connect strings, answerback strings, line wrap control, redial timeout, monitor attributes	Vendor did not specify	Monitor attributes
Hot Key to Operating System	Yes	Yes	No	Yes
Text Editor	No	No	No	No
Programming Features	Macros, script language, softkeys, predefined scripts	Macros, script language, softkeys, predefined scripts	Macros, script language, predefined scripts	Vendor did not specify
Security	Vendor did not specify	Vendor did not specify	Vendor did not specify	None
<b>Pricing and Availability</b>				
Price per Unit (\$)	150.00	295.00	99.00	45.00
Date of First Delivery	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Number Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	Direct, OEMs, distributor/dealer/retail	Direct, OEMs, distributor/dealer/retail	Direct, OEMs, distributor/dealer/retail	Direct, OEMs, distributor/dealer/retail, mail order, VARs
Distribution				(813) 988-5033
Vendor Phone Number	(604) 431-0727	(604) 431-0727	(604) 431-0727	
Comments	30 day money back guarantee, Full ANSI support with true double-high/double-wide characters, smooth scrolling, and 132 column mode	30 day satisfaction or money back guarantee, 1 year technical support; ZSTEM 240 features true 132 column support, and extensive network support	30 day money back guarantee	—

Vendor	Microcom	Microcom	Microcom	MicroGate Corp.
<b>Product</b>	<b>Carbon Copy Plus &amp; Host 5.2.2</b>	<b>Relay Gold 5.0</b>	<b>Relay Gold for Windows 5.0</b>	<b>MicroGate 6540 4.13</b>
Communications Supported	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host
Remote Access Capability	Yes	Yes	Yes	Yes
Terminals Emulated	Digital VT52/100, IBM 3278/79	TTY, TeleVideo, Digital VT52/100, Lear Siegler, IBM 3101, IBM 3278/79, ANSI, Tymnet-78	TTY, TeleVideo, Digital VT52/100, Lear Siegler, IBM 3278/79, ADDS 25	TTY, Tandem 65XX
Computers Supported	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)
Operating Systems	MS-DOS	MS-DOS, PC-DOS	MS-Windows	MS-DOS, PC-DOS, MS-Windows
Users Supported	Single	Single, multiple via LAN-administered communications server	Single, multiple via LAN-administered communications server	Single
LAN Compatibility	Novell NetWare, Banyan, 3Com	IBM NETBIOS, Novell NetWare, Banyan, 3Com, Ungermann Bass	IBM NETBIOS, Novell NetWare, Banyan, 3Com, Ungermann Bass	Not applicable
Min. Memory Required (bytes)	60K - host; 256K - remote	129K (w/expanded memory)	129K (w/expanded memory)	256K
Memory Resident	Yes	Yes	Yes	Yes
Diskette Size (in inches)	3.5, 5.25	3.5, 5.25	3.5, 5.25	3.5, 5.25
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
<b>Communications</b>				
Number of Concurrent Sessions	1	15	15	1
Transmission Speed (bps)	300 to 38.4K	300 to 57.6K	300 to 57.6K	1200 to 19.2K
File Transfer Capabilities	ASCII, batch transfers, binary, graphics	ASCII, batch transfers, binary, graphics	ASCII, batch transfers, binary, graphics	ASCII, binary, graphics
File Transfer Protocols	Xmodem, Kermit, ASCII, Ymodem, proprietary	Xmodem, CRC, Kermit, ASCII, Ymodem, IBM IND\$FILE, relay	Xmodem, CRC, Kermit, ASCII, Ymodem, IBM IND\$FILE, relay	FLASH
File Transfer Info. Provided	Session name, estimated transmit time	Characters sent/received, number of errors/retries, blocks sent/received, session name	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time	Number of errors/retries, blocks sent/received
Downloading Options	Write to disk, screen snapshot, write to printer	Write to disk, screen snapshot, write to printer	Write to disk, screen snapshot, write to printer	Write to disk, screen snapshot, write to printer
Capture Buffer Size (K bytes)	Limited to available memory	32 screens	32 screens	Not applicable
Communications Features	Auto dial, unattended execution, auto redial, auto answer	Auto dial, unattended execution, auto redial, auto answer	Auto dial, unattended execution, auto redial, auto answer	Auto dial, unattended execution, auto redial, auto answer
Dialing Directory	Yes	Yes	Yes	No
Max. Phone Numbers Stored	200	Dependent on memory	Dependent on memory	Not applicable
User Interface	Installation program, status line, help facility, menu driven, nested menus	Installation program, status line, command driven, help facility, menu driven, pop-up windows, windowing capability	Installation program, status line, command driven, help facility, menu driven, pop-up windows, windowing capability	Status line
User-Defined Parameters	String equivalents/substitutions, modem initialization strings, dialing commands, connect strings, log file directories, answerback strings, line wrap control, hangup strings, redial timeout, monitor attributes	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, answerback strings, line wrap control, hangup strings, sound control, redial timeout, monitor attributes	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, answerback strings, line wrap control, hangup strings, sound control, redial timeout, monitor attributes	Vendor did not specify
Hot Key to Operating System	Yes	Yes	Yes	Yes
Text Editor	No	Yes	Yes	No
Programming Features	Script language	Macros, script language, script language learn mode, softkeys	Macros, script language, script language learn mode, softkeys	Script language learn mode
Security	Single-level passwords, transmission encryption, Auto call-back	Single-level passwords, multilevel passwords, transmission encryption	Single-level passwords, multilevel passwords, transmission encryption	Vendor did not specify
<b>Pricing and Availability</b>				
Price per Unit (\$)	342.00	299.00	299.00	195.00
Date of First Delivery	April 1990	1983	December 1990	1984
Number Installed to Date	Vendor did not specify	250,000	Vendor did not specify	Vendor did not specify
Warranty	90 days	90 days	90 days	Vendor did not specify
Distribution	Direct, OEMs, distributor/dealer/retail, mail order, VARs	Direct, OEMs, distributor/dealer/retail, VARs	Direct, distributor/dealer/retail, VARs	Direct
<b>Vendor Phone Number</b>	(617) 551-1999	(617) 551-1999	(617) 551-1999	(512) 345-7791
<b>Comments</b>	Package includes a host (cc) program in addition to the full Carbon Copy Plus product	—	Also supports 3270 coax, async token-ring SDLC and X.25 gateways	Features 16-page display memory, configurable display colors, recording and playback of sessions

Vendor	MicroPlot Systems, Inc.	Norton-Lambert Corp.	OMM Corp.	Persoft, Inc.
Product	PC-Plot-V 5.11	Close-Up 3.0A	MIST+ 1.4	SmarTerm 240 3.1
Communications Supported	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service
Remote Access Capability	Yes	Yes	Yes	Yes
Terminals Emulated	TTY, Digital VT52/100, Digital VT200/VT300, Tektronix 410S/07	TTY	TTY	TTY, Digital VT52/100, Digital VT200/VT300
Computers Supported	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT
Operating Systems	MS-DOS, PC-DOS	MS-DOS, PC-DOS	MS-DOS, PC-DOS	PC-DOS
Users Supported	Single	Single, multiple via LAN-administered communications server	Single, multiple via LAN-administered communications server	Single, multiple via LAN-administered communications server
LAN Compatibility	IBM NETBIOS, Novell NetWare, TCP/IP, DecNet	IBM NETBIOS, MS OS/2 LAN Manager, Novell NetWare	IBM NETBIOS, Novell NetWare	Novell NetWare, 3Com, Banyan, Ungermann-Bass
Min. Memory Required (bytes)	512K	67K customer/term	256K	512K
Memory Resident	No	Yes	No	No
Diskette Size (in inches)	3.5, 5.25	3.5, 5.25	5.25	3.5, 5.25
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
<b>Communications</b>				
Number of Concurrent Sessions	1	1	1	Vendor did not specify
Transmission Speed (bps)	300 to 19.2K	300 to 38.4K	300 to 9600	75 to 19.2K
File Transfer Capabilities	ASCII, batch transfers, binary, graphics	ASCII, batch transfers, binary, graphics	ASCII, batch transfers, binary, graphics	ASCII, binary
File Transfer Protocols	Xmodem, Kermit, ASCII	Xmodem	Xmodem, ASCII	Xmodem, CRC, Kermit, Ymodem, PDIP
File Transfer Info. Provided	Characters sent/received, number of errors/retries, blocks sent/received, session name	Characters sent/received, 100% error corrected	Vendor did not specify	Characters sent/received, number of errors/retries, blocks sent/received
Downloading Options	Write to disk, screen snapshot, write to printer	Write to disk, screen snapshot, write to printer	Write to disk, write to printer	Write to disk, write to printer
Capture Buffer Size (K bytes)	64K	Vendor did not specify	Not applicable	Vendor did not specify
Communications Features	Auto dial, auto redial, auto answer	Auto dial, unattended execution, auto redial, auto answer	Auto dial, unattended execution, auto redial, auto answer	Auto dial, auto redial
Dialing Directory	Yes	Yes	Yes	No
Max. Phone Numbers Stored	Unlimited	Unlimited	Unlimited	Not applicable
User Interface	Installation program, status line, help facility, menu driven, nested menus, mouse support, pop-up windows	Command driven, menu driven	Command driven, help facility	Installation program, status line, help facility, menu driven, mouse support, pop-up windows, windowing capability
User-Defined Parameters	String equivalents/substitutions, modem initialization strings, dialing commands, connect strings, answerback strings, line wrap control, hangup strings, redial timeout, monitor attributes	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, log file directories, answerback strings, line wrap control, hangup strings, redial timeout, monitor attributes	String equivalents/substitutions, modem initialization strings, dialing commands, connect strings, answerback strings, hangup strings, redial timeout	Answerback strings, line wrap control, redial timeout
Hot Key to Operating System	Yes	Yes	No	Yes
Text Editor	Yes	No	Yes	No
Programming Features	Macros, script language, softkeys	Script language, softkeys	Macros, script language, predefined scripts	Macros, softkeys
Security	None	Multilevel passwords	Multilevel passwords	Vendor did not specify
<b>Pricing and Availability</b>				
Price per Unit (\$)	225.00	195.00	149.00	345.00
Date of First Delivery	January 1990	March 1985	May 1983	January 1986
Number Installed to Date	4,600	Vendor did not specify	3,000	87,286
Warranty	1 year	90 days	None	30 day guarantee
Distribution	Direct, OEMs, distributor/dealer/retail, mail order	Direct, distributor/dealer/retail	Direct, mail order	Direct, distributor/dealer/retail, VARs
Vendor Phone Number	(614) 882-4786	(805) 687-8896	(202) 234-2117	(608) 273-6000
Comments	—	195 customer/terminal, \$245 support/ACS	—	Multi-user version available for \$1,495

Vendor	Persoft, Inc.	Persoft, Inc.	Polygon Inc.	Polygon Inc.
Product	SmarTerm 320 1.1	SmarTerm 340 1.0	Poly-STAR/G 2.3	Poly-STAR/T 2.3
Communications Supported	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host	PC-to-host
Remote Access Capability	Vendor did not specify	Yes	Yes	Yes
Terminals Emulated	TTY, Digital VT52/100, Digital VT200/VT300	TTY, Digital VT52/100	Digital VT52/100, Digital VT200/VT300	Digital VT52/100, Digital VT200/VT300
Computers Supported	IBM PC/AT/XT	IBM PC/AT/XT	IBM PC/AT/XT, IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (non-MCA)
Operating Systems	PC-DOS	MS-DOS, PC-DOS	MS-DOS, PC-DOS, MS- Windows	MS-DOS, PC-DOS, MS- Windows
Users Supported	Single, multiple via LAN-administered communications server	Single, multiple via LAN-administered communications server	Single, multiple via LAN-administered communications server	Single, multiple via LAN-administered communications server
LAN Compatibility	Novell NetWare, 3Com, Banyan, Ungermann-Bass	Novell NetWare, 3Com, Banyan, Ungermann-Bass	MS OS/2 LAN Manager, Novell NetWare, Banyan, 3Com	MS OS/2 LAN Manager, Novell NetWare, Banyan, 3Com
Min. Memory Required (bytes)	320K	310K	512K	512K
Memory Resident	Vendor did not specify	Yes	Yes	Yes
Diskette Size (in inches)	3.5, 5.25	3.5, 5.25	3.5, 5.25	3.5, 5.25
Hayes AT Command Set Compatible	Vendor did not specify	Yes	Yes	Yes
<b>Communications</b>				
Number of Concurrent Sessions	Vendor did not specify	4 via LAN	Up to 20 sessions	Up to 20 sessions
Transmission Speed (bps)	75 to 19.2K	75 to 19.2K	300 to 9600	300 to 9600
File Transfer Capabilities	ASCII, batch transfers, binary	ASCII, binary	ASCII, binary	ASCII, binary
File Transfer Protocols	Xmodem, CRC, Kermit, Ymodem, PDIP	Xmodem, CRC, Kermit, Ymodem, PDIP	Kermit, ASCII, XFR plus	Kermit, ASCII, XFR plus
File Transfer Info. Provided	Characters sent/received, number of errors/retries, blocks sent/received	Characters sent/received, number of errors/retries, blocks sent/received	Number of errors/retries, blocks sent/received	Number of errors/retries, blocks sent/received
Downloading Options	Write to printer	Write to disk, write to printer	Write to disk	Write to disk
Capture Buffer Size (K bytes)	Not applicable	Not applicable	Vendor did not specify	Vendor did not specify
Communications Features	Auto dial, auto answer	Auto dial, auto redial, auto answer	Auto dial, unattended execution, auto answer	Auto dial, unattended execution, auto answer
Dialing Directory	No	No	Yes	Yes
Max. Phone Numbers Stored	Vendor did not specify	Not applicable	50	50
User Interface	Installation program, status line, help facility, menu driven, pop-up windows, windowing capability	Installation program, status line, help facility, menu driven, mouse support, pop-up windows, windowing capability	Installation program, status line, command driven, help facility, menu driven, nested menus, mouse support, pop-up windows	Installation program, status line, command driven, help facility, menu driven, nested menus, mouse support, pop-up windows
User-Defined Parameters	Answerback strings, line wrap control, redial timeout	Log files, log file directories, answerback strings, line wrap control, monitor attributes	String equivalents/substitutions, modem initialization strings, dialing commands, log files, answerback strings, line wrap control, sound control	String equivalents/substitutions, modem initialization strings, dialing commands, log files, answerback strings, line wrap control, sound control
Hot Key to Operating System	Yes	Yes	Yes	Yes
Text Editor	Vendor did not specify	No	No	No
Programming Features	Macros, softkeys	Macros, softkeys	Macros, script language, softkeys, predefined scripts	Macros, script language, softkeys, predefined scripts
Security	Vendor did not specify	Vendor did not specify	None	None
<b>Pricing and Availability</b>				
Price per Unit (\$)	195.00	349.00	329.00	229.00
Date of First Delivery	September 1989	June 1990	November 1986	November 1986
Number Installed to Date	273	903	100,000	100,000
Warranty	30 day guarantee	30 day guarantee	90 days	90 days
Distribution	Direct, distributor/dealer/retail, VARs	Direct, distributor/dealer/retail, VARs	Direct, distributor/dealer/retail, VARs	Direct, distributor/dealer/retail, VARs
Vendor Phone Number	(608) 273-6000	(608) 273-6000	(314) 432-4142	(314) 432-4142
Comments	Multi-user version available for \$825	Multi-user version available for \$1,495	—	—

Vendor	POS Technologies	Rupp Corp.	Selecterm, Inc.	SoftKlone Distributing Corp.
Product	The Video Store 4.5	FASTLYNX 1.1	Microscript 1.11	Mirror III 2.0
Communications Supported	PC-to-host, PC-to-PC	PC-to-PC	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service
Remote Access Capability	Yes	Yes	Yes	No
Terminals Emulated	Wyse	Not applicable	TTY, Digital VT52/100, IBM 3101, IBM 3270	TTY, TeleVideo, Digital VT52/100, VT200/VT300, Lear Siegler, IBM 3101, Wyse, ANSI, IBM 3278
Computers Supported	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)
Operating Systems	MS-DOS, PC-DOS, PC-MOS	MS-DOS, PC-DOS	MS-DOS	MS-DOS, PC-DOS
Users Supported	Single, multiple via LAN-administered communications server	Single	Single	Single
LAN Compatibility	Novell NetWare, 3-Com	IBM NETBIOS, Novell NetWare, Any DOS environment LAN	Novell NetWare	Not applicable
Min. Memory Required (bytes)	2,048K/LAN, 640K/DOS	190K	640K	185 to 470K
Memory Resident	Yes	No	Yes	Yes
Diskette Size (in inches)	3.5, 5.25	3.5, 5.25	3.5, 5.25	3.5, 5.25
Hayes AT Command Set Compatible	Yes	Vendor did not specify	Vendor did not specify	Yes
<b>Communications</b>				
Number of Concurrent Sessions	1, 2	1	1	1
Transmission Speed (bps)	300 to 9600	Dependent on CPU	300 to 9600	300 to 115.2K
File Transfer Capabilities	Vendor did not specify	ASCII, batch transfers, binary, graphics	ASCII, batch transfers	ASCII, batch transfers, binary, graphics
File Transfer Protocols	Xmodem, MNP, Ymodem	CRC	ASCII	Xmodem, CRC, Kermit, MNP, ASCII, Ymodem, Zmodem, Crosstalk, Hayes
File Transfer Info. Provided	Vendor did not specify	Number of errors/retries, Percentage sent/received	Not applicable	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time
Downloading Options	Write to disk, write to printer	Vendor did not specify	Write to disk, write to printer, Data element capture	Write to disk, screen snapshot, write to printer
Capture Buffer Size (K bytes)	Not applicable	Not applicable	Variable	50K (variable)
Communications Features	Auto dial, auto redial, auto answer	Not applicable	Unattended execution	Auto dial, unattended execution, auto redial, auto answer
Dialing Directory	Yes	No	No	Yes
Max. Phone Numbers Stored	Not applicable	Not applicable	Not applicable	Unlimited
User Interface	Installation program, command driven, help facility, menu driven	Command driven, menu driven, pop-up windows	Installation program, status line, help facility, nested menus, pop-up windows	Installation program, status line, command driven, help facility, menu driven, nested menus, mouse support, pop-up windows
User-Defined Parameters	Log files, log file directories	Monitor attributes, Port selection, error checking method	Vendor did not specify	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, answerback strings, line wrap control, sound control, redial timeout, monitor attributes
Hot Key to Operating System	No	No	No	Yes
Text Editor	No	No	Yes	Yes
Programming Features	None	Macros, DOS command mode	Script language, script language learn mode	Macros, script language, script language learn mode, predefined scripts, Script debugger
Security	Multilevel passwords	None	Single-level passwords, multilevel passwords	Single-level passwords, multilevel passwords, Directory limits
<b>Pricing and Availability</b>				
Price per Unit (\$)	Contact vendor	149.95	1,995.00	149.00
Date of First Delivery	Vendor did not specify	November 1, 1987	August 3, 1989	December 1988
Number Installed to Date	550	100,000	300	300,000
Warranty	90 days	30 day	90 days	60-day moneyback guarantee
Distribution	Direct	Direct, OEMs, distributor/dealer/retail, mail order, VARs	Direct, OEMs, distributor/dealer/retail, VARs	Direct, distributor/dealer/retail, VARs
Vendor Phone Number	(609) 848-2848	(303) 494-5987	(617) 246-1300	(904) 878-8564
Comments	—	149.94 retail, both serial and parallel cables are included	—	—

Vendor	SoftKlone Distributing Corp.	SoftKlone Distributing Corp.	Softronic, Inc.	Softronic, Inc.
Product	Mirror III LAN 2.0	Takeover 1.0	Softerm Modular Work Group 1	Softerm PC 3.10
Communications Supported	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-information service	PC-to-host, PC-to-information service
Remote Access Capability	No	Yes	Yes	Yes
Terminals Emulated	TTY, TeleVideo, Digital VT52/100, VT200/VT300, Lear Siegler, IBM 3101, Wyse, ANSI, IBM 3278	TTY, TeleVideo, Digital VT52/100, VT200/VT300, Lear Siegler, IBM 3101, Wyse, ANSI, IBM 3278	TTY, TeleVideo, Digital VT52/100, VT200/VT300, Hewlett-Packard, Wyse, IBM 3101, ANSI, Prime	TTY, TeleVideo, Digital VT52/100, VT200/VT300, Lear Siegler, ANSI, ADDS, IBM 3101, Wyse, Honeywell
Computers Supported	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)
Operating Systems	MS-DOS, PC-DOS	MS-DOS, PC-DOS	MS-DOS, PC-DOS, UNIX, OS/2, MS-Windows	MS-DOS, PC-DOS, MS-Windows
Users Supported	Single, multiple via LAN-administered communications server	Single	Single, multiple via LAN-administered communications server	Single, multiple via LAN-administered communications server
LAN Compatibility	IBM NETBIOS, Novell NetWare, 3Com, Ungermann Bass	Vendor did not specify	IBM NETBIOS, MS OS/2 LAN Manager, Novell NetWare	IBM NETBIOS, MS OS/2 LAN Manager, Novell NetWare
Min. Memory Required (bytes)	Vendor did not specify	Guest 480K, Host PC 55K	400	230
Memory Resident	Yes	Yes	No	Yes, no
Diskette Size (in inches)	3.5, 5.25	3.5, 5.25	3.5, 5.25	3.5, 5.25
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
<b>Communications</b>				
Number of Concurrent Sessions	1	1	Limited by hardware	1
Transmission Speed (bps)	300 to 115.2K	300 to 57.6K	300 to 19.2K	300 to 19.2K
File Transfer Capabilities	ASCII, batch transfers, binary, graphics	ASCII, batch transfers, binary, graphics	ASCII, batch transfers, binary	ASCII, batch transfers, binary
File Transfer Protocols	Xmodem, CRC, Kermit, MNP, ASCII, Ymodem, Zmodem, Crosstalk, Hayes	Xmodem, CRC, Kermit, MNP, ASCII, Ymodem, Zmodem, Crosstalk, Hayes	Xmodem, CRC, Kermit, ASCII, Ymodem, Crosstalk, Hayes	Xmodem, CRC, Kermit, ASCII, Ymodem, Crosstalk, Hayes
File Transfer Info. Provided	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time	Characters sent/received, number of errors/retries, blocks sent/received	Characters sent/received, number of errors/retries
Downloading Options	Write to disk, screen snapshot, write to printer	Write to disk, screen snapshot, write to printer	Write to disk, screen snapshot, write to printer	Write to disk, screen snapshot, write to printer
Capture Buffer Size (K bytes)	50K (variable)	50K (variable)	User-defined	User-defined
Communications Features	Auto dial, unattended execution, auto redial, auto answer	Auto dial, unattended execution, auto redial, auto answer	Auto dial, unattended execution, auto answer	Auto dial, unattended execution, auto answer
Dialing Directory	Yes	Yes	Yes	Yes
Max. Phone Numbers Stored	Unlimited	Unlimited	Unlimited	Unlimited
User Interface	Installation program, status line, command driven, help facility, menu driven, nested menus, mouse support, pop-up windows	Installation program, status line, command driven, help facility, menu driven, nested menus, mouse support, pop-up windows	Installation program, status line, help facility, menu driven, nested menus, mouse support, pop-up windows, windowing capability	Installation program, status line, help facility, menu driven, nested menus, pop-up windows, windowing capability
User-Defined Parameters	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, answerback strings, line wrap control, sound control, redial timeout, monitor attributes	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, answerback strings, line wrap control, sound control, redial timeout, monitor attributes	String equivalents/substitutions, dialing commands, log files, connect strings, log file directories, answerback strings, line wrap control, sound control, redial timeout, monitor attributes	String equivalents/substitutions, dialing commands, log files, connect strings, answerback strings, line wrap control, redial timeout, monitor attributes, Colors
Hot Key to Operating System	Yes	Yes	Yes	Yes
Text Editor	Yes	Yes	No	Yes
Programming Features	Macros, script language, script language learn mode, predefined scripts, Script debugger	Macros, script language, script language learn mode, predefined scripts, Script debugger	Vendor did not specify	Macros, script language, softkeys
Security	Single-level passwords, multilevel passwords, Directory limits	Single-level passwords, Directory limits	None	Vendor did not specify
<b>Pricing and Availability</b>				
Price per Unit (\$)	595.00	295.00	Contact vendor	195.00
Date of First Delivery	Vendor did not specify	March 1990	1990	1988
Number Installed to Date	Vendor did not specify	Vendor did not specify	500	80,000
Warranty	60-day moneyback guarantee	60-day moneyback guarantee	90 days	90 days
Distribution	Direct, distributor/dealer/retail, VARs	Direct, distributor/dealer/retail, VARs	Direct, OEMs, distributor/dealer/retail, VARs	Vendor did not specify
Vendor Phone Number	(904) 878-8564	(904) 878-8564	(719) 593-9540	(719) 593-9540
Comments	Price is for 5 workstations	—	—	—

Vendor	Software Store	Software Ventures	Software Ventures	Software Ventures
<b>Product</b>	<b>MasterCom</b>	<b>Microphone 1.5</b>	<b>MicroPhone II 3.0</b>	<b>MicroPhone II for windows 1.0</b>
Communications Supported	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service
Remote Access Capability	Yes	Yes	Yes	Yes
Terminals Emulated	TTY, Lear Siegler	TTY, Digital VT52/100	TTY, Digital VT52/100	TTY, Digital VT52/100
Computers Supported	IBM PC/AT/XT, Apple II Family, CP/M	Apple Macintosh Family	Apple Macintosh Family	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)
Operating Systems	MS-DOS, PC-DOS, CP/M	Macintosh Finder	Macintosh Finder	MS-Windows
Users Supported	Single	Single	Single	Single
LAN Compatibility	IBM NETBIOS, Novell NetWare	Vendor did not specify	Vendor did not specify	Vendor did not specify
Min. Memory Required (bytes)	256K	512K	Vendor did not specify	Vendor did not specify
Memory Resident	No	Vendor did not specify	Vendor did not specify	Vendor did not specify
Diskette Size (in inches)	3.5, 5.25	3.5	3.5	3.5, 5.25
Hayes AT Command Set Compatible	Yes	Yes	Yes	Yes
<b>Communications</b>				
Number of Concurrent Sessions	1	1	1	1
Transmission Speed (bps)	300 to 19.2K	300 to 57.6K	300 to 57.6K	300 to 19.2K
File Transfer Capabilities	ASCII, batch transfers, binary, graphics	ASCII, binary, graphics	ASCII, batch transfers, binary, graphics	ASCII, batch transfers, binary, graphics
File Transfer Protocols	Xmodem, CRC, ASCII, X-PC	Xmodem, CRC, ASCII	Xmodem, CRC, Kermit, ASCII, Ymodem, Zmodem	Xmodem, CRC, ASCII, Ymodem
File Transfer Info. Provided	Number of errors/retries, blocks sent/received	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time	Characters sent/received, number of errors/retries, blocks sent/received, estimated transmit time
Downloading Options	Write to disk, screen snapshot, write to printer	Write to disk, write to printer	Write to disk, write to printer	Write to disk, write to printer
Capture Buffer Size (K bytes)	Vendor did not specify	Dependent on memory	Vendor did not specify	Dependent on memory
Communications Features	Auto dial, unattended execution, auto redial, auto answer	Auto dial, unattended execution, auto redial, auto answer	Auto dial, auto redial, auto answer	Auto dial, auto redial, auto answer
Dialing Directory	Yes	Yes	Yes	Yes
Max. Phone Numbers Stored	Not applicable	16	16	75
User Interface	Status line, command driven, menu driven, nested menus	Menu driven, graphic icons, mouse support	Menu driven	Installation program, menu driven, graphic icons, mouse support
User-Defined Parameters	String equivalents/substitutions, dialing commands, log files, connect strings, line wrap control	Answerback strings, line wrap control	Modem initialization strings, dialing commands, connect strings, answerback strings, line wrap control, hangup strings, sound control, redial timeout	Modem initialization strings, dialing commands, connect strings, answerback strings, line wrap control, hangup strings, redial timeout
Hot Key to Operating System	Yes	Vendor did not specify	Vendor did not specify	Vendor did not specify
Text Editor	No	Yes	Yes	Yes
Programming Features	Macros, softkeys	Script language, script language learn mode, predefined scripts	Script language, script language learn mode, predefined scripts	Script language, script language learn mode, predefined scripts
Security	Single-level passwords	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Pricing and Availability</b>				
Price per Unit (\$)	49.00	99.00	295.00	295.00
Date of First Delivery	June 1982	February 1985	Vendor did not specify	Vendor did not specify
Number Installed to Date	1,000	Vendor did not specify	Vendor did not specify	Vendor did not specify
Warranty	1 year	30 day money back guarantee	30 day money back guarantee	30 day money back guarantee
Distribution	Direct, distributor/dealer/retail	Direct	Direct	Direct
<b>Vendor Phone Number</b>	(906) 228-7622	(415) 644-3232	(415) 644-3232	(415) 644-3232
<b>Comments</b>	—	—	—	—

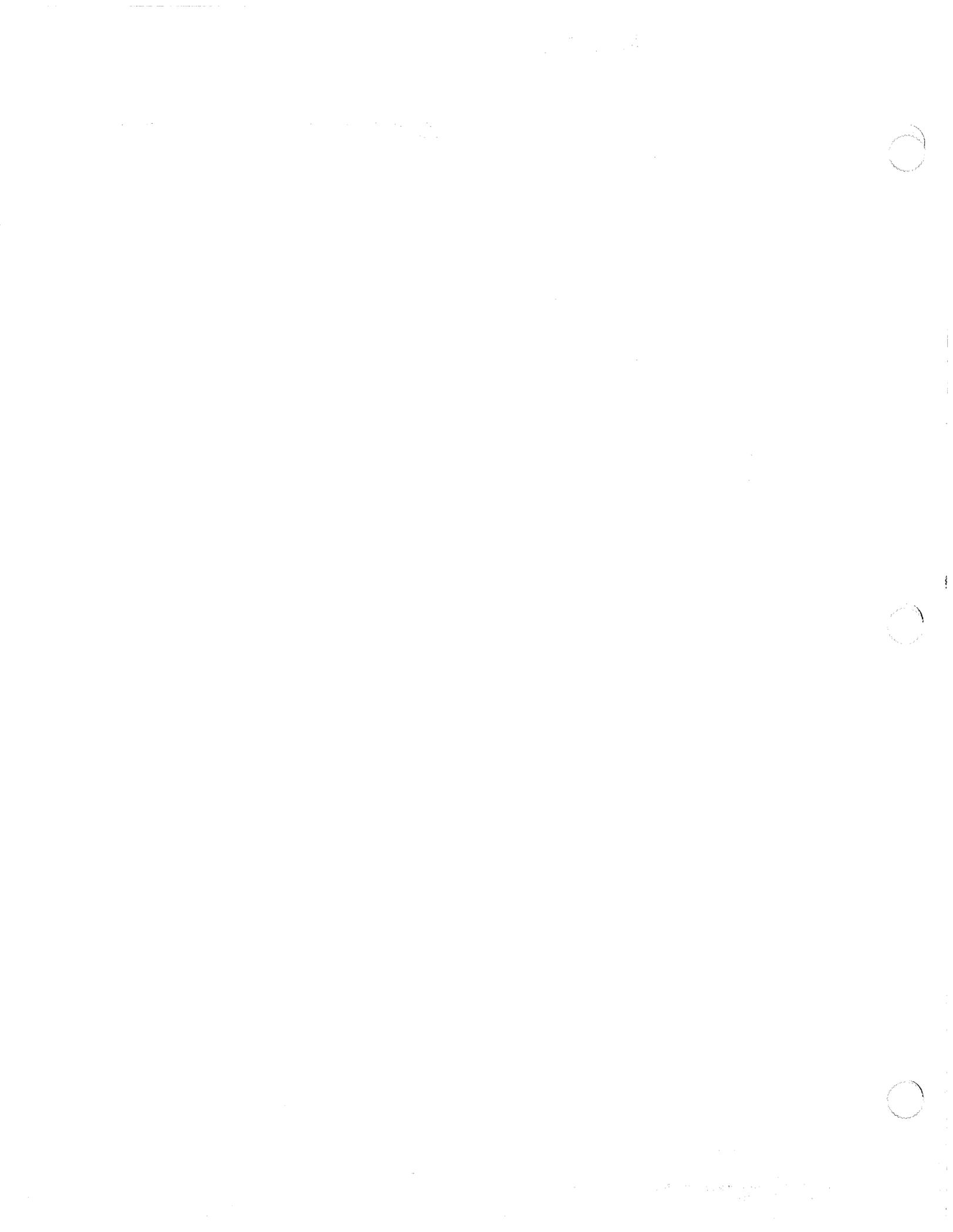
Vendor	Traveling Software, Inc.	Traveling Software, Inc.	Traveling Software, Inc.	Triton Technologies, Inc.
<b>Product</b>	<b>DeskLink</b>	<b>LapLink III</b>	<b>LapLink Mac Connectivity Pac 3.00a</b>	<b>Co/Session 4.0</b>
Communications Supported	PC-to-PC	PC-to-PC	Mac-to-Mac, Mac-to-PC	PC-to-host, PC-to-PC, PC-to-information service
Remote Access Capability	No	No	Yes	Yes
Terminals Emulated	Not applicable	Not applicable	Not applicable	TTY, Via Emulation Package
Computers Supported	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), Apple Macintosh Family, IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)
Operating Systems	MS-DOS, PC-DOS	MS-DOS, PC-DOS	MS-DOS, Macintosh Finder, PC-DOS	MS-DOS, PC-DOS
Users Supported	Multiple via LAN-administered communications server	Single	Single	Single
LAN Compatibility	Novell NetWare, 3Com	Novell NetWare, 3Com	Novell NetWare, AppleTalk, Tops, 3Com	IBM NETBIOS, Novell NetWare
Min. Memory Required (bytes)	140K	256	PC 330K, Mac 300K	51 to 125K
Memory Resident	Yes	No	No	Yes
Diskette Size (in inches)	3.5, 5.25	3.5	3.5, 5.25	3.5, 5.25
Hayes AT Command Set Compatible	No	No	Yes	Yes
<b>Communications</b>				
Number of Concurrent Sessions	Vendor did not specify	Vendor did not specify	1	1
Transmission Speed (bps)	300 to 115.2K	Vendor did not specify	300 to 750K	300 to 57.6K
File Transfer Capabilities	ASCII, binary, graphics	ASCII, batch transfers, binary, graphics	ASCII, binary, graphics	ASCII, batch transfers, binary, graphics
File Transfer Protocols	Proprietary	Proprietary	Proprietary	Xmodem, Proprietary
File Transfer Info. Provided	Blocks sent/received	Blocks sent/received	Blocks sent/received	Characters sent/received, number of errors/retries, blocks sent/received, session name
Downloading Options	Write to disk, write to printer	Write to disk, not applicable	Write to disk	Write to disk, screen snapshot, write to printer
Capture Buffer Size (K bytes)	Not applicable	Not applicable	Not applicable	Not applicable
Communications Features	Vendor did not specify	Vendor did not specify	Auto dial, unattended execution, auto answer	Auto dial, unattended execution, auto answer
Dialing Directory	No	No	Yes	Yes
Max. Phone Numbers Stored	Not applicable	Not applicable	Unlimited	256
User Interface	Installation program, help facility, pop-up windows	Help facility, menu driven	Help facility, menu driven, mouse support	Status line, command driven, menu driven, pop-up windows, windowing capability
User-Defined Parameters	Vendor did not specify	Vendor did not specify	Modem initialization strings, dialing commands, monitor attributes, Various copy options	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, answerback strings, hangup strings, sound control
Hot Key to Operating System	No	No	No	Yes
Text Editor	No	No	No	No
Programming Features	None	None	None	Vendor did not specify
Security	None	None	Multilevel passwords	Single-level passwords, file encryption, multilevel passwords, transmission encryption, <sup>1</sup>
<b>Pricing and Availability</b>				
Price per Unit (\$)	169.95	140.00	189.95	249.00
Date of First Delivery	November 1987	April 1989	January 1990	August 1988
Number Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	138,000
Warranty	45 days	45 days	45 days	90 days
Distribution	OEMs, distributor/dealer/retail, VARs	OEMs, distributor/dealer/retail, VARs	Distributor/dealer/retail	Direct, OEMs, distributor/dealer/retail, mail order, VARs
Vendor Phone Number	(206) 483-8088	(206) 483-8088	(206) 483-8088	(201) 855-9440
<b>Comments</b>	—	—	—	<sup>1</sup> Dialback, screen blanking & keyboard disabling; 30-day money back guarantee

Vendor	Triton Technologies, Inc.	Triton Technologies, Inc.
<b>Product</b>	<b>Co/Session LAN 4.0</b>	<b>Session/XL 2.0</b>
Communications Supported	PC-to-host, PC-to-PC, PC-to-information service	PC-to-host, PC-to-PC, PC-to-information service
Remote Access Capability	Yes	Yes
Terminals Emulated	TTY, Via Emulation Package	TTY, Via Emulation Package
Computers Supported	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)	IBM PC/AT/XT, IBM PS/2 (MCA), IBM PS/2 (non-MCA)
Operating Systems	MS-DOS, PC-DOS	MS-DOS, PC-DOS
Users Supported	Single, multiple via LAN-administered communications server	Single
LAN Compatibility	IBM NETBIOS, Novell NetWare, 3Com, Banyan	IBM NETBIOS, Novell NetWare
Min. Memory Required (bytes)	51 to 125K	Vendor did not specify
Memory Resident	Yes	No
Diskette Size (in inches)	3.5, 5.25	3.5, 5.25
Hayes AT Command Set Compatible	Yes	Yes
<b>Communications</b>		
Number of Concurrent Sessions	4	1
Transmission Speed (bps)	300 to 57.6K	300 to 57.6K
File Transfer Capabilities	ASCII, batch transfers, binary, graphics	ASCII, batch transfers, binary, graphics
File Transfer Protocols	Xmodem, Proprietary	Xmodem, Proprietary
File Transfer Info. Provided	Characters sent/received, number of errors/retries, blocks sent/received, session name	Characters sent/received, blocks sent/received, session name
Downloading Options	Write to disk, screen snapshot, write to printer	Write to disk, screen snapshot, write to printer
Capture Buffer Size (K bytes)	Vendor did not specify	Vendor did not specify
Communications Features	Auto dial, unattended execution, auto redial, auto answer	Auto dial, unattended execution, auto redial, auto answer
Dialing Directory	Yes	Yes
Max. Phone Numbers Stored	256	Unlimited
User Interface	Installation program, status line, command driven, menu driven, pop-up windows, windowing capability	Command driven, menu driven
User-Defined Parameters	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, answerback strings, hangup strings, sound control, redial timeout	String equivalents/substitutions, modem initialization strings, dialing commands, log files, connect strings, answerback strings, hangup strings, sound control, redial timeout
Hot Key to Operating System	Yes	No
Text Editor	No	No
Programming Features	Macros, script language, predefined scripts	Macros, script language, predefined scripts
Security	Single-level passwords, file encryption, multilevel passwords, transmission encryption, <sup>1</sup>	Single-level passwords, file encryption, multilevel passwords, transmission encryption
<b>Pricing and Availability</b>		
Price per Unit (\$)	495.00	95.00
Date of First Delivery	March 1990	March 1988
Number Installed to Date	1,000	Vendor did not specify
Warranty	90 days	90 days
Distribution	Direct, OEMs, distributor/dealer/retail, mail order, VARs	Direct, OEMs, distributor/dealer/retail, mail order, VARs
Vendor Phone Number	(201) 855-9440	(201) 855-9440
Comments	<sup>1</sup> Dialback, screen blanking & keyboard disabling; 30-day money back guarantee	30-day money back guarantee

Vendor	NBI, Inc.	Retix Corp.	Telenet Communications Corp.	3COM Corp.
Product	Office Works 2.0	RetixMail	Telemail	3+ Mail 1.3.2
Operating Environments	MS-/PC-DOS, Macintosh OS, Microsoft Windows, NBI Office Works Network	MS-/PC-DOS, Mac OS, TOPS, 10-Net, NetWare, MS Windows, MultiFinder, IBM PC LAN, OS/2 LAN Mgr., UNIX/Xenix, Vines,	MS-/PC-DOS	MS-/PC-DOS, Macintosh OS, MultiFinder, OS/2 LAN Manager
Type	LAN-based messaging package, bridge between LAN & mini/mainframe	LAN-based messaging package, bridge between LAN & remote computing service, bridge between LAN & mini/mainframe, X.400-based messaging system	Vendor did not specify	LAN mail software with extensions
Messaging Help Facility	Standard	Standard	Standard	Standard
Withdraw	None	Standard	Standard	None
Message Length Restriction	2 pages, 10 10 doc/files attach	None	2,000,000	20,000
Distribution	To individual, groups, self, global	To individual, groups, self, global, persons not logged on to system, Fax, Telex, Teletext outputs	To individual, groups, self, bulletin board, persons not logged on to system	To individual, groups, self, global, persons not logged on to system
Scan Mailbox for Incoming Message	Standard	Standard	Standard	Standard
Scan Mailbox for Status of Previously Sent Messages	None	Standard	Vendor did not specify	None
Registered Messages	None	Standard	Standard	Standard
Acknowledges Message Receipt	Standard	Standard	Standard	None
Message Status	Originator, date/time, file type for attachments	Originator; date/time; urgency; msg. header, scan summary; length; privacy level; confidential; response requested, required, recpt. requested, msg. read notification	Originator, date/time, urgency, message header, scan summary, length, privacy level, confidential, response requested, response required, receipt requested	Originator
Filing Directory	Optional	Standard	Standard	Standard
Message Storage	Optional periodic purging	Optional periodic purging	Indefinite, optional periodic purging	Indefinite
Purging	Vendor did not specify	Per-message automatic expiration	Automatic periodic purging, user/supervisor defined	Supervisor manual purge
Text Retrieval	Subject, date, date ranges, originator, keyword	Date, date ranges, originator, keyword, destination, filename or number, priority of message	Subject, date, date ranges, originator, keyword, filename or number	Subject, date, date ranges, originator, keyword, notes field, entire text search
Tickler File	None	Standard	Standard	None
Electronic Wastebasket	Standard	Standard	Vendor did not specify	Standard
Features Security	Access codes, database controlled	Password, encryption, access codes, answerback verification, ISO encrypted data types	Password, privacy password	Password, encryption
Management Tracking	Standard	Standard	Standard	Standard
Access to Outside Services	Optional	Standard	Standard	Optional
Outside Services Accessed	DDD, Internet	TELEX, MCI Mail, DDD, Internet, DISOSS/PROFS, ALL-IN-1, FAX, X.400 networks	TELEX, MCI Mail, DDD, DISOSS/PROFS, ALL-IN-1, FAX, X.400 networks, Wang, ATT Mail, H-P, VM	TELEX, MCI Mail, DDD, CompuServe, Internet, DISOSS/PROFS, ALL-IN-1, FAX, X.400 networks
Protocols Observed	RFC 821, 822, transport	Vendor did not specify	X.400	X.400, SNADS, through optional gateway
Customization	Intrusive notification mail arrival	All functions configurable on a per-user basis; private - labelling available to OEMs	Available	API available
Other Features	Vendor did not specify	Native-mode X.400 implementation on PC-LANs; meets all CCITT and ISO profiles worldwide, plus U.S. GOSIP and U.K. GOSIP; supports APIs for access by other programs	Scripts (user defined or library) send and receive controls by user, hierarchical organization	Transparently send mail between Macintosh and PCs; send up to 25 binary or text file attachments with each message; access mailbox remotely/off-net via modem dialup
Configuration RAM Required on Server (bytes)	4M	640K	Vendor did not specify	130K
RAM Required on Workstation (bytes)	2M	640K; 32,000 (virt. ntwk.)	Vendor did not specify	270K
Max. Number Nodes/Workstations	Unlimited	7,000 - 100-user syst. approx.	Vendor did not specify	Unlimited
Pricing Package Price (\$)	2,000 - 5,000 for Office Works	50 - 70 based on network size	Contact vendor	595 - 1-5 user license (per server); buy 2 packages for unlimited user license (per server)
Price per User/Node (\$)	Vendor did not specify	Via third party leasor	Vendor did not specify	Vendor did not specify
GSA Contract	Yes	Vendor did not specify	Vendor did not specify	No

Vendor	3COM Corp.	3COM Corp.	Tops	Verimation, Inc.
<b>Product</b>	3+ Mail for Macintosh 1.5	3+ Open Mail 1.0	InBox 3.0	Memo/PC 1.3
<b>Operating Environments</b>	MS-/PC-DOS, Macintosh OS, MultiFinder, OS/2 LAN Manager	MS-/PC-DOS, Macintosh OS, MultiFinder, OS/2 LAN Manager	MS-/PC-DOS, Mac. OS, TOPS, NetWare, MultiFinder, IBM PC LAN, UNIX/Xenix, Windows & OS/2 spprt	MS-/PC-DOS
<b>Type</b>	LAN mail software with extensions	Vendor did not specify	LAN-based messaging package, LAN mail software with extensions	Bridge between LAN & mini/mainframe
<b>Messaging Help Facility</b>	Standard	Standard	Standard	Standard
<b>Withdraw</b>	None	None	Standard	Standard
<b>Message Length Restriction</b>	20,000	20,000	None	None
<b>Distribution</b>	To individual, groups, self, global, persons not logged on to system	To individual, groups, self, global, persons not logged on to system	To individual, groups, self, bulletin board, global	To individual, groups, self
<b>Scan Mailbox for Incoming Message</b>	Standard	Standard	Standard	Standard
<b>Scan Mailbox for Status of Previously Sent Messages</b>	None	None	Standard	Standard
<b>Registered Messages</b>	Standard	Standard	Standard	Standard
<b>Acknowledges Message Receipt</b>	None	None	Standard	Standard
<b>Message Status</b>	Originator	Originator	Originator, date/time, urgency, message header, length, receipt requested	Originator, date/time, message header, confidential, response required
<b>Filing Directory</b>	Standard	Standard	Standard	Standard
<b>Message Storage</b>	Indefinite	Indefinite	Vendor did not specify	Indefinite
<b>Purging</b>	Supervisor manual purge	Supervisor manual purge	Option to store locally user defined	Vendor did not specify
<b>Text Retrieval</b>	Subject, date, date ranges, originator, keyword, notes field, entire text search	Subject, date, date ranges, originator, keyword, notes field, entire text search	Subject, date, originator, keyword	Subject, date, originator, keyword, destination
<b>Tickler File</b>	None	None	Standard	None
<b>Electronic Wastebasket</b>	Standard	Standard	Standard	None
<b>Features Security</b>	Password, encryption	Password, encryption	Password, encryption	Through mainframe interface
<b>Management Tracking</b>	Standard	Standard	Standard	None
<b>Access to Outside Services</b>	Optional	Optional	Standard	None
<b>Outside Services Accessed</b>	TELEX, MCI Mail, DDD, CompuServe, Internet, DISOSS/PROFS, ALL-IN-1, FAX, X.400 networks	TELEX, MCI Mail, DDD, CompuServe, Internet, DISOSS/PROFS, ALL-IN-1, FAX, X.400 networks	PROFS and SMTP	Not applicable
<b>Protocols Observed</b>	X.400, SNADS	X.400, SNADS, through optional gateway	Vendor did not specify	SNADS, SAA CUA, not applicable
<b>Customization</b>	API available	API available	Vendor did not specify	Vendor did not specify
<b>Other Features</b>	Transparently send mail between Macintosh and PCs; send up to 25 binary or text file attachments with each message; access mailbox remotely/off-net via modem dialup	Transparently send mail between Macintosh and PCs; send up to 25 binary or text file attachments with each message; access mailbox remotely/off-net via modem dialup	PEsonal address books and localized storage files; no restricted to an applicable network system; runs over all network platforms	Allows uploading and downloading of mail from mainframe MSMO system
<b>Configuration RAM Required on Server (bytes)</b>	130K	130K	137K	Vendor did not specify
<b>RAM Required on Workstation (bytes)</b>	270K	270K	220	Vendor did not specify
<b>Max. Number Nodes/Workstations</b>	Unlimited	Unlimited	100 per message center	Vendor did not specify
<b>Pricing Package Price (\$)</b>	1,190 per server, unlimited users	595 - for Macintosh Ver. 1.5 for 1-5 user license (per server); buy 2 packages for unlimited user	Contact vendor	15,000 site license
<b>Price per User/Node (\$)</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>GSA Contract</b>	No	No	Vendor did not specify	No

<b>Vendor</b>	Waterloo Microsystems Inc.	Waterloo Microsystems Inc.
<b>Product</b>	Port Internet Mail	Port Lite Mail
<b>Operating Environments</b>	MS-/PC-DOS, Port Network	MS-/PC-DOS, Port Lite Network
<b>Type</b>	LAN-based messaging package, bridge between LAN & remote computing service	LAN-based messaging package
<b>Messaging</b>		
Help Facility	Vendor did not specify	Vendor did not specify
Withdraw	None	Vendor did not specify
Message Length Restriction	None	None
Distribution	To individual, groups, self	To individual, groups, self
Scan Mailbox for Incoming Message	Standard	Standard
Scan Mailbox for Status of Previously Sent Messages	Standard	Standard
Registered Messages	Standard	Standard
Acknowledges Message Receipt	Standard	Standard
Message Status	Originator, date/time, message header, length, privacy level	Originator, date/time, message header, length, privacy level
<b>Filing</b>		
Directory	Standard	Standard
Message Storage	Indefinite	Indefinite
Purging	User/supervisor defined	User/supervisor defined
Text Retrieval	Filename or number	Filename or number
Tickler File	None	None
Electronic Wastebasket	None	None
<b>Features</b>		
Security	Password	Password
Management Tracking	None	None
Access to Outside Services	None	None
Outside Services Accessed	Not applicable	Not applicable
Protocols Observed	Not applicable, not applicable	Not applicable, not applicable
Customization	Vendor did not specify	Vendor did not specify
Other Features	Message filing; relays mail among LANs; defines nicknames for user destinations; msg. attachments of up to 4GB; access restrictions; carbon copies, blind carbon copies, registered mail	Message filing and organization; copies and registered mail; message attachments; automatic correspondence history; use of nicknames; on-line directory of mail users
<b>Configuration</b>		
RAM Required on Server (bytes)	512K	512K
RAM Required on Workstation (bytes)	64K	640K
Max. Number Nodes/Workstations	255	10
<b>Pricing</b>		
Package Price (\$)	495	295
Price per User/Node (\$)	Vendor did not specify	Vendor did not specify
GSA Contract	No	No



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# Microcomputers: Market Overview

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**In this report:**

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**Synopsis****Editor's Note**

This Market Overview examines important market trends and describes the marketing strategies of major vendors. The accompanying Technology Overview (Report 550-201) describes components common to all microcomputers. The Comparison Columns (Report 550-301) include a list of vendors with their addresses and phone numbers, a description of the entries, and columns with detailed specifications and pricing for microcomputer systems offered by the responding vendors.

Our survey was sent to nearly 400 microcomputer vendors. The response from 96 vendors details 534 products.

**Market Highlights**

When IBM introduced the IBM PC in 1981, 1.24 million personal computers were in use in the workplace. More than 10 times that number will be sold in the United States this year alone. The industry, despite its rapid growth, retains much of the innovative and entrepreneurial characteristics that distinguished its early history.

Several significant issues have been debated by industry leaders and have been placed before the voters—corporate buyers. The competing MCA and EISA input/output buses, as well as the 80286 and 80386 processor architectures, have distracted some buyers from usually dominant issues: reliability, expansion options, performance, and price.

# Analysis

## Market Leaders

### Apple Computer Corporation

Both the Macintosh product line and Apple's sales continue to grow. The Macintosh IIx provides 32-bit processing power, 16MHz speed, and six NuBus expansion slots. The Mac IIcx is comparable but provides only three slots—and a less expensive entry point into the Mac II line. Both models also use a 1.44M-byte diskette drive that can read and write PC-/MS-DOS and OS/2 diskettes. Responding to corporate needs has been a successful tactic for Apple since 1987, when the NuBus expansion slots and high-resolution color options were added to the line. As a result, Apple's sales are now nearly \$5 billion.

### Compaq Corporation

In September 1988, Compaq led an industry consortium (nicknamed the "Gang of Nine") to fend off the challenge of IBM's 32-bit Micro Channel Architecture. By introducing an alternate 32-bit bus architecture with downward compatibility, the EISA consortium touched off a battle royal with proponents of the incompatible MCA. Compaq also introduced the multiprocessor Systempro—more a minicomputer than a micro—and increased top system speed to 33MHz. To compete with the graphics capability of workstations, Compaq introduced a graphics board and a 16-inch color monitor, providing 1,024-by-768 pixel graphics resolution. In addition, Compaq severed ties with Businessland, ending a seven-year dispute over dealer margins.

### Dell Computer Corporation

Once known as PC's Limited, this direct-response (mail order) company is known as much for its service and support as for its quality and low prices. In April 1988, Dell announced it would offer

MCA-compatible clones. With MCA demand lacking, Dell reconsidered its decision and did not introduce the new models. Although the company has announced support for the EISA initiative, it was not one of the founding members. Dell has filled two gaps in its product line with the System 316SX, an 80386SX-based desktop model, and with the 316LT laptop.

### IBM

Once the clear industry leader with over 60 percent of the market, IBM now shares the limelight (and the profits) with successful clone vendors such as Compaq, Dell, Tandy, and Zenith and newcomers such as AST, Everex, and NEC. IBM currently holds less than a 30 percent share in the microcomputer market, although acceptance MCA has gradually increased. The latest enhancements to its PS/2 product line are the i486 Power Platform upgrade to the Model 70-A21 and an i486-based version of the Model 70.

### Tandy Corporation

In April 1988, Tandy became the only major vendor to announce an MCA-compatible machine. The 20MHz 5000 MC, which competes against the PS/2 Model 70-A21, began shipping in December 1988. Tandy is also an EISA proponent. Tandy subsidiary GRiD Systems, a high-end laptop vendor, operates 61 GRiD Systems Centers (former Radio Shack Computer Center locations). More importantly, however, GRiD's success in the government market and its corporate direct sales channel enable Tandy to profit from these lucrative markets. Tandy also manufactures microcomputers for Digital Equipment Corporation and for Matsushita Electric, the latter to be sold under the Panasonic label.

### Zenith Electronics Corporation

In an effort to focus its resources on the consumer electronics market, Zenith Electronics sold its Zenith Data Systems (ZDS) division to Groupe Bull. The French computer vendor, a leader in Europe, lacks market share in the United States. ZDS, on the other hand, is among the largest microcomputer suppliers to the U.S. government. At least initially, ZDS continues to operate under the Zenith name with its own product line. Products from Bull probably will be sold in the U.S. under the Zenith name, and vice versa.



*The Apple Macintosh IIcx is a high-performance version of Apple's Macintosh IIcx system using a 25MHz 68030 microprocessor.*

### Survey Results

Among vendors that responded to our survey, 11 provide MCA-compatible products; only 9 offer EISA products. One vendor, Leading Edge, includes both MCA and EISA products in its line. Since EISA-based products were first introduced in the fall of 1989, the number of EISA products should increase over the next year.

The number of products using IBM and compatible bus architectures reveals the range of choices offered by each bus.

### I/O Bus Architectures

Architecture	Percent
AT	73
AT based (1)	9
XT	12
MCA	4
EISA	2

(1) Includes split bus, passive backplane, and separate memory bus designs.

This table does not necessarily reflect the relative sales of each bus in the market. It is, however, a good indicator of market interest, as perceived by these vendors. The AT bus remains the dominant microcomputer architecture.

### Processors

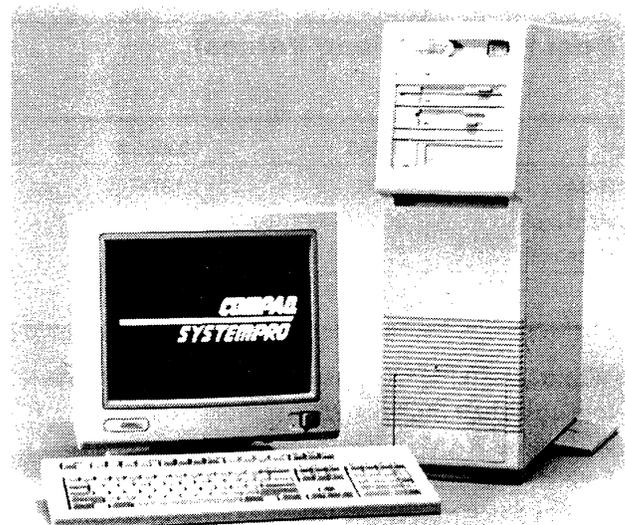
The overwhelming majority of systems included in these columns use a microprocessor manufactured by or under license from Intel. Half the remainder use Intel-compatible processors manufactured by NEC.

Our survey reveals that more products are based on the Intel 80386 microprocessor than on the 80286. Of the floorstanding systems, 83 percent use the 80386. As previously noted, the variety of products does not indicate relative market share.

### Intel Processor Usage (percent of all models)

CPU	Desktop	Floor
i486	2	7
80386	37	83
80386SX	14	2
80286 (1)	33	9
8086/88 (2)	7	0

(1) Includes CMOS version (80C286) and products of licensees.  
(2) Includes CMOS versions.



*November 6, 1989— The COMPAQ SYSTEMPRO 25MHZ i486 EISA-based system, is designed for network server and multi-user host environments.*



*The HP Vectra 486 PC is the first of Hewlett-Packard Company's new generation of PCs based on the Intel i486 microprocessor and the extended industry standard architecture (EISA).*

### 80386SX vs. 80286

According to the data compiled by Datapro Research, 80386SX-based systems are *not* priced as low as 80286 systems. A more detailed analysis, however, shows that several factors contribute to the disparity. The two most significant factors of a system's cost (other than the processor itself) are RAM and hard disk capacity. A comparison of the mean values for these factors explains part of the price differential.

### Cost Factors (Mean Values)

	80286	80386SX
RAM	839K	1,197K
Hard Disk	20.2M	39.5M
Price	\$2,139	\$2,952

While the 80386SX is associated with higher system cost than 80286 systems, it is also associated with more RAM *and* greater mass storage. The high standard deviations associated with these mean values reflect the diverse range of available products.

## Trends and Issues

### Architecture Wars: AT vs. EISA vs. MCA

IBM's 1981 entry into the market impelled a thriving industry, but subsequent tremendous market growth was at IBM's expense. Until the advent of the 80386 microprocessor, the AT bus was more than adequate for the 16-bit demands of the 32-bit 80286. Intel's introduction of the 80386 presented a problem for vendors—if the full potential of the 80386 was to be achieved, a new bus was needed.

In April 1987, responding to this need to advance technology and a desire to regain market share, IBM introduced the Micro Channel Architecture (MCA) in its Personal System/2 (PS/2) systems. MCA provides more advanced internal expansion capabilities, leaving the limitations of the AT bus—and compatibility with it—behind. IBM also indicated it would enforce legal protections for its new technology. Vendors that had liberally copied IBM's microcomputers in the past would now have to pay royalties to do so.

Initially, most vendors were unconcerned, particularly Compaq Computer, which introduced increasingly fast 80386-based systems (now up to 33MHz) based on the AT bus. Late in 1988, an industry-led consortium proposed an alternate bus called Extended Industry Standard Architecture (EISA). EISA is an extension of the current AT bus that maintains compatibility with the 8MHz AT standard. Both the EISA bus and the MCA bus are 32 bit; therefore, both will outperform the current 16-bit AT bus.

MCA represents IBM's vision of the future. Sales have been disappointing during its first three years, however, and much of MCA's potential remains untapped. On the other hand, EISA-based systems are just now reaching market. Although MCA is generally regarded as technologically superior, EISA provides an alternative to proprietary technology. The success of both MCA and EISA depends more on marketing prowess than on technological superiority.

### Microprocessor Choices

Intel microprocessors continue to dominate the microcomputer industry. Systems based on the i486, Intel's latest processor, are currently available. The i486 has the equivalent of over 1 million

transistors and includes floating-point, cache memory, and paging support. This processor will be important for servers and multiuser systems.

Since the i486 is compatible with the 80386 processor architecture, the market has temporarily shed some of its uncertainty. The 80386 provides 32-bit processing and, in addition to the 80286's protected mode, includes a virtual mode that can simulate multiple 8086 machines. With these advanced capabilities and with higher clock speeds, the 80386 costs significantly more than an 80286 processor. The lack of true 32-bit software applications further inhibits sales of systems using these processors.

The original Intel 80286 was rated at a maximum speed of 12MHz. Advanced Micro Devices and the Harris Semiconductor Corporation, licensed by Intel to manufacture the 80286, now produce 16MHz and 20MHz versions of the 80286.

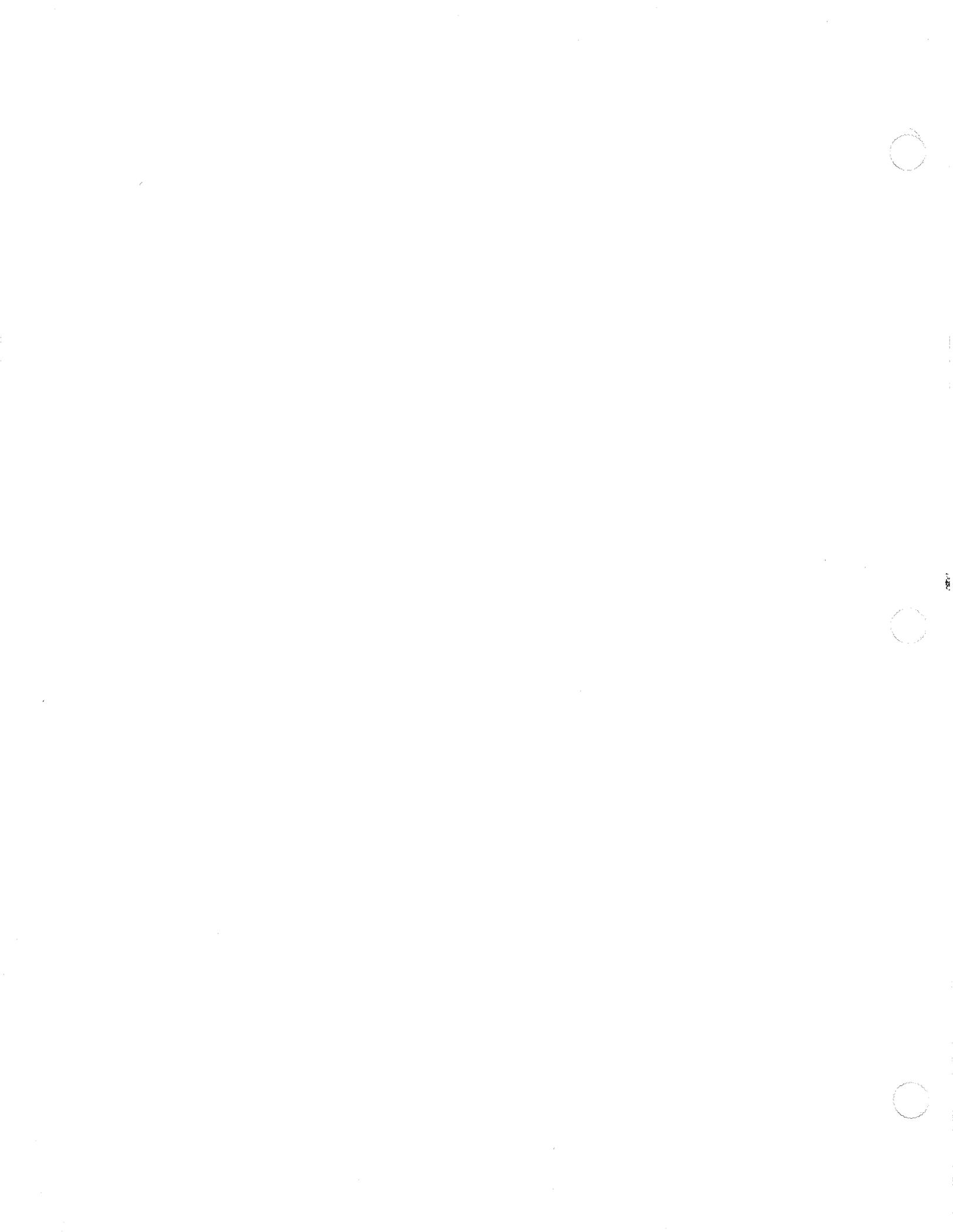
The 80386SX, like the 80386, can process 32 bits of data internally. The 80386SX supports 80286 protected mode and 8086 virtual mode but has a 16-bit data path. At approximately 50 percent less than a comparable 16MHz 80386 microprocessor, the 386SX offers a cost-effective entry into 32-bit computing.

Intel positions the 80386SX against the 80286 in an attempt to recapture sales lost to second-source manufacturers. The lack of a 20MHz 80386SX will be addressed soon, but the first casualty of this move could be the 20MHz version of the 80386.

With the advent of 32-bit microprocessors at 25MHz and 33MHz, microcomputers can compete successfully with low-end technical workstations. While microcomputers are usually used as stand-alone machines for moderate work loads, workstations are designed for multitasking on a multilayered network with more demanding applications, such as CAD/CAE. The growth rate and profit potential are much higher in this market sector.

### **Graphical User Interface**

Apple's successful Macintosh line provides an alternative to the conservative world of IBM and compatible microcomputers. Attesting to the acceptance of the Macintosh approach to computing in the business market are vendor attempts to imitate and adopt the "look and feel" of the Mac graphical user interface. Although the approach was once spurned by the industry, many operating systems are now providing windows, icons, pull-down menus, and mouse-driven control on a graphical display. ■



# Microcomputers: Technology Overview

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**Synopsis****Editor's Note**

This Technology Overview describes components common to all microcomputers. For an examination of the important market trends and a description of the marketing strategies of major vendors, see the Market Overview (Report 550-101). The accompanying Comparison Columns (Report 550-301) include a list of vendors with their addresses and telephone numbers, a description of the entries, and columns with detailed specifications and pricing for microcomputer systems offered by the responding vendors.

**Technology Highlights**

A microcomputer is a reprogrammable electronic device used for processing information. The information is encoded as a digital signal and is manipulated over circuits etched on wafers of silicon. Microcomputer sophistication has progressed from the simplicity of hardwired devices with a few circuits on a single silicon wafer to the complexity of Very Large Scale Integration (VLSI) that places over 100,000 circuits on a chip.

# Analysis

## Technology Basics

Current microcomputer technology combines a microprocessor with interrelated subsystems and VLSI support circuitry. A basic microcomputing system comprises the following main components and subsystems: a single *microprocessor* or *CPU* for controlling the system; *memory*, which temporarily stores programs and data; a *mass storage* subsystem for permanent storage of programs and files; a digital or analog *display* for viewing system output; and a *keyboard* for inputting data and responding to the system.

## Microprocessors

The microprocessor, also known as the central processing unit (CPU), is the single most important component in a microcomputer. The CPU executes program instructions, reads information from and writes to memory, and accesses peripheral devices. The microprocessor is an integrated digital circuit that processes information sequentially via a series of on/off electronic states.

All IBM microcomputers and compatibles use the Intel 80X86 series microprocessors—the 8088/8086, 80286, 80386SX, 80386, and i486. Other choices include the Motorola 680X0 series—68000, 68020, 68030, and 68040—typically found in Apple Macintosh computers and high-end workstations.

Microprocessor performance is a function of several factors:

- clock speed;
- processor instruction set;
- address and data bus widths; and
- word size.

Clock speed refers to the frequency of CPU timing cycles, determined by the number of pulses generated by a quartz crystal oscillator. During each pulse, the CPU performs one small operation.

## CPU Architectures

Processor Type	Word Size (bits)	Data Bus (bits)	Address Bus (bits)
<b>Intel</b>			
8088	16	8	20
8086	16	16	20
80286	16	16	24
80386SX	32	16	24
80386DX	32	32	32
i486	32	32	32
<b>Motorola</b>			
68000	32	16	24
68020	32	32	32
68030	32	32	32

These cycles are measured in megahertz (MHz), or millions of cycles per second. The higher the clock speed, the faster the microprocessor executes instructions. The CPU manufacturer determines the finished chip's highest acceptable clock speed through empirical testing.

The processor's instruction set determines what processes can be carried out directly. Simple instructions can be carried out in a few processor cycles, while more complex instructions generally require more cycles. Reduced instruction set computer (RISC) architectures provide fewer hard-coded instructions, since complex instructions can be built from many simple instructions; as a result, the circuitry is less complex and higher clock speeds are possible. For most general-purpose applications on microcomputers, however, a rich instruction set is favored.

The address bus determines the total physical amount of memory that can be addressed directly by the CPU. Every memory location must have a unique binary address. The 20-bit address bus of the 8088/8086 microprocessors allows 1 megabyte of memory ( $2^{20} = 1,048,576$ ). A 24-bit address bus (80286) supports 16 megabytes, while a 32-bit address bus (80386 and i486) allows up to four gigabytes. With more memory a processor can handle more data without slow input/output (I/O) access and can also run more complex programs.

Word size refers to the size of the operand registers internal to the CPU. A larger word size

means that larger pieces of data can be manipulated internally, increasing processing speed. The width of the data bus (also known as the I/O bus) determines the amount of data that can be transferred into and out of the CPU on a single pass. A wider data bus means faster performance. For example, the 16MHz 80386SX (with its 16-bit data bus) is slower than the 16MHz 80386, which has a 32-bit bus—even though the processors are identical internally.

With Intel's 80286, a protected mode was added to the real mode of the 8088/8086 microprocessors. Applications developed for the 8088/8086 will run on the newer processors in real mode, benefiting from increased processor speed.

Protected mode allows the 80286 to address 16M bytes of memory and also uses four privilege levels to manage system memory and I/O devices. The 80386's protected mode expands those functions and also supports a virtual-8086 mode that simulates an 8086 machine. Through the 80386's paging functions and virtual-8086 mode, multiple 8088/8086 machines can be simulated (allowing concurrent processing of 8088/8086 applications) under an 80386 protected-mode operating system. The 80386 can run a single copy of an 80286 protected-mode operating system, but it cannot run multiple copies. Therefore, 80386 multitasking can be accomplished more easily with 8088/8086 applications and applications written specifically for the 80386.

### **Memory**

For the CPU to receive its start-up information and access the operating systems, programs, and software applications, a microcomputer needs a memory subsystem. Microcomputer memories are classified into two major categories: read-only memory (ROM) and random-access memory (RAM).

All ROM is nonvolatile memory—data is not lost when power is turned off. The program code needed for system start-up, including the Basic Input/Output System (BIOS), is stored in ROM. The BIOS is the direct interface between the processor and subsystems such as mass storage, video, and keyboard. In addition, application programs can access the hardware through the ROM BIOS. Some microcomputer ROMs also contain the operating system or application programs.

Most microcomputer ROMs are nonprogrammable; their contents cannot be changed. Some kinds of ROM can be erased and reprogrammed. For example, Erasable Programmable ROMs (EPROMs) can be erased by exposure to ultraviolet light and reprogrammed.

RAM is volatile: it will hold its contents only while power is on. The CPU can read from and write to RAM, which is usually used to store code and data during operation. Two kinds of RAM are used in microcomputers: the more common, lower cost Dynamic RAM (DRAM) and expensive Static RAM (SRAM).

DRAM consists of a series of capacitors that store bits as charges. The presence of a charge represents a "one" bit (on); the absence of a charge represents a "zero" bit (off). Unfortunately, this kind of electronic memory arrangement by itself will completely discharge before the CPU has time to decode it. To be useful in a microcomputing system, therefore, DRAM must be refreshed frequently to maintain the proper charge. This refresh cycle consumes approximately 7 percent of the CPU's time.

SRAM stores bits in a series of flip-flops or registers that can be switched to either a zero or a one state. SRAM maintains its contents without the need for a refresh cycle, providing a faster access time than DRAM. Once a bit has been stored in SRAM, it retains that state until explicitly changed. The more complex circuitry makes SRAM much more expensive.

In addition to its capacity, a memory chip is rated for its access time in nanoseconds (billionths of a second). As microprocessor clock speeds have increased, however, RAM access times have not decreased in proportion. If the clock speed outpaces the RAM access time, data in RAM cannot be accessed as quickly as the CPU requires. In such cases, the processor inserts one or more wait states to synchronize with slower memory, decreasing CPU performance.

Among the methods used to improve CPU performance is direct memory access (DMA). DMA circuitry allows a subsystem to bypass the CPU and directly read from and write to RAM. Shadow RAM is a technique that loads system BIOS or video BIOS directly into fast RAM on start-up. The BIOS or video instructions can then be accessed much faster.

Static-column RAM is a technique using DRAM that operates like DRAM for initial random access and like SRAM for subsequent sequential accesses. The first row address and the second column address work just like static RAM if the row address stays the same and only the column address changes. The Compaq Deskpro 386 was designed with a static-column memory subsystem.

Cache memory was first used in mainframes and minicomputers. Data that is frequently accessed by the CPU is stored in a small amount (typically 32K or 64K bytes) of very fast SRAM (35 ns. or less). If data needed by the CPU happens to be in the cache, it is accessed without wait states. The resulting improvement in CPU performance depends on the cache size and on the algorithm used to determine what data remains in the cache.

To get around the 1M-byte limit of Intel 8088/8086 CPUs, vendors introduced several schemes that took advantage of bank switching. With specialized hardware and software, bank switching uses part of the CPU's address space as a window into extra pages of RAM, and memory is thus "expanded." Emerging from the confusion, Expanded Memory Specification (EMS) Version 4.0 has become a standard. Expanded memory is often confused with extended memory (the amount of memory above the 8086/8088 1M-byte limit) and conventional memory (the traditional 640K-byte limit of MS-DOS).

### Mass Storage

The earliest microcomputers to advance beyond cassette tape for mass storage used eight-inch diskette drives. The 5.25-inch size became popular with the CP/M operating system and a standard with MS-DOS. In 1984 the Macintosh was among the first to use 3.5-inch diskette drives; laptop computers and IBM's PS/2 line have provided further impetus. Zenith recently introduced the two-inch diskette drive, which may approach a practical size limit.

Diskettes vary in their density, or capacity, for data storage. This capacity is partly determined by the microcomputer manufacturer's formatting design (preparing areas of the magnetic surface for data storage). Capacity also depends on whether the medium is single or double sided.

Inexpensive and reliable, 5.25-inch diskettes are circular Mylar disks coated with magnetic particles. The disks are enclosed in a protective PVC jacket that has openings for the drive spindle, the read/write head, the timing hole, and a write-protect notch. The 3.5-inch diskettes are comparable but have a hard plastic case with a sliding metal door to protect the medium.

Hard disk drives are designed for larger storage requirements. A hard disk consists of several circular aluminum platters coated with a film of iron oxide or other magnetized metal and spinning at 3,600 revolutions per minute. The read/write heads hover above each surface on a cushion of air. To read or write data on the hard disk, a stepper motor or voice coil moves the heads above the appropriate track and sector of the disk where the data resides. Hard disks are usually enclosed in a sealed box to protect the drive heads and the medium from environmental contaminants such as dust.

Hard disk speed, or access time, is measured in milliseconds. The access time is the interval required for a hard disk to retrieve or deliver data from the disk after the CPU signals a request. Another factor affecting speed is the disk interleave, the number of physical sectors between consecutively numbered logical sectors. For example, an interleave of three means that the drive reads every third sector as contiguous. The interleave should allow the operating system enough time to process data before the disk's read/write head reaches the next logical sector.

Disk speeds can be improved with a disk cache. Similar to a memory cache, a disk cache is a software implementation that stores copies of recently used disk sectors in a reserved area of RAM. When the system accesses sectors that are in a cache, no disk access is required and the response time is much faster. If the sector is not found, the caching algorithm places the sector in the cache for the next access. A disk cache can improve disk access time by as much as 50 percent.

The hard disk controller is the on-board circuitry that controls hard disk operations, determining data transfer rates and the data encoding scheme. Popular data encoding schemes include the common Modified Frequency Modulation (MFM) and Run Length Limited (RLL), the latter providing higher densities and faster transfer rates.

The hard disk interface determines data transfer rates. Seagate's serial ST506/412 interface, used in the IBM PC XT and PC AT, has a 5M bit-per-second data transfer rate. For high-performance hard disks, both the Enhanced Small Disk Interface (ESDI) and the Small Computer Systems Interface (SCSI) are popular. Established by a consortium of 22 disk drive manufacturers, ESDI has a 10M bit-per-second serial data transfer rate. SCSI is a parallel interface with a 32M bit-per-second transfer rate. SCSI requires a dedicated microprocessor-based controller and allows up to seven daisy-chained devices.

### **Displays**

In April 1987, the Video Graphics Array (VGA) adapter debuted with the IBM PS/2 Models 50, 60, and 80 as the new display standard. The VGA 640-by-480 resolution is an incremental step forward from IBM's previous EGA standard, with 640-by-350 resolution. The VGA is unique; it uses analog signals rather than the digital inputs of all the previous color adapters. Analog signals allow the video controller to vary voltage output on-screen, which results in more gradations of colors. For example, the VGA offers 256 simultaneous on-screen colors from a palette of 256,000.

A video adapter consists of three elementary components: the video controller, the video BIOS, and the video RAM (VRAM). The video controller generates the appropriate CRT scan signals for the graphics or characters that appear on-screen. The video BIOS provides a smooth interface to perform various video and screen tasks—e.g., mode selection, cursor positioning, and character writing. The video RAM (VRAM) is dedicated video memory that contains information defining the CRT image.

### **Keyboards**

The Qwerty key arrangement was designed in the 19th Century to inhibit fast typists, who frequently jammed the type bars. Alternatives, such as the Dvorak keyboard, have been advocated to improve typing efficiency, but the old design remains entrenched from typewriters to microcomputers.

In 1986, IBM introduced the 101-key Enhanced Keyboard. Twelve function keys are included in a single row across the top. The numeric keypad was relieved of double duty as separate

cursor-control keys were added. Control and Alternate keys were placed on each side of the spacebar. In 1987 IBM adopted the Enhanced Keyboard across the entire PS/2 line. Although the 101-key arrangement is not the most ergonomically designed or satisfying, it has become common on most desktop and floorstanding microcomputers. IBM's keyboards have responsive audible and tactile feedback.

Apple's original Macintosh keyboard was compact, with little more than the alphanumeric and punctuation keys. This was not much of a limitation, however, since the graphical user interface used a mouse and was common to all Mac applications. With the open architecture of the newer Macintosh models, however, Apple introduced an extended keyboard with 15 function keys to accommodate alternate operating systems and terminal emulation.

### **Operating Systems**

The operating system is a set of software programs that acts as the middle layer between applications software and hardware resources. The functions of an operating system include tracking memory, managing disk information flow, recognizing keyboard interrupts, displaying messages, formatting media, and performing input and output. There are four main operating systems in today's market: MS-DOS, OS/2, UNIX, and Macintosh.

Since 1981 Microsoft's MS-DOS (and IBM's version, PC-DOS) has remained the dominant single-user, single-tasking operating system for microcomputers, with an existing base of tens of thousands of available applications. The reason for this large base of third-party software is the binary standard that links the Intel 8086, 8088, 80286, 80386, and i486 microprocessors at the object code level. Third-party software vendors provide utilities for MS-DOS that further enhance its capabilities. More advanced systems, however, require a more advanced operating system.

OS/2, developed jointly by IBM and Microsoft, is a single-user, multitasking operating system. Released in December 1987, OS/2 offers a larger addressable memory than MS-DOS (16M bytes versus 640K bytes) and the ability to run more than one program at the same time. OS/2 takes advantage of the protected mode of the Intel 80286 microprocessor. While OS/2 can run on the

80386 microprocessor, it does not take advantage of that CPU's inherent capabilities.

UNIX is a multiuser, multitasking operating system first developed at AT&T Bell Laboratories. Written in C, UNIX is available in two versions: the original AT&T version, now labeled System V, and the BSD (Berkeley Software Development) Version 4.2 created at the University of California at Berkeley. Microsoft's Xenix/386 (a version of UNIX) was developed around the 80386 chip. Unlike OS/2, UNIX can take advantage of the 80386's capabilities. Thus, UNIX is an attractive alternative for high-end workstations based on the 32-bit chip.

The Macintosh operating system, known as MultiFinder/System, has a consistent user interface across applications. Based on concepts originally developed at Xerox PARC, the graphical interface uses windows, icons, and a mouse. The Macintosh operating system is especially well suited to working with high-quality graphic images, making it an appropriate tool for desktop publishing. The Macintosh interface's success has spawned imitators. Two such products, Microsoft Windows and the OS/2 Presentation Manager, provide similar Mac-like interfaces for IBM-compatible microcomputers.

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## **Selection Guidelines**

The decision to purchase microcomputer systems and to implement a microcomputer strategy has never been easy and will not likely be any simpler in the future. Strategic planning is best thought of in terms of time and technology. What hardware/software is needed for present and future needs? Will the financial investment be worth the cost of implementation and administration?

Do the circumstances warrant the immediate purchase of equipment, or will it depend on market conditions? Will individual and organizational productivity be increased? The rapid changes in microcomputing technology make these decisions critical to the success of the project.

Once the necessary applications are determined, other hardware parameters are more easily determined. Implementing an effective LAN will require 80386- or i486-based servers with a true 32-bit operating system. Sophisticated graphics applications such as CAD/CAM or scientific workstations will typically require a high-performance 80386 with UNIX. Where cost is a concern, DOS and OS/2 applications running on 80386SX systems will be sufficient. In some cases, for word processing, modest spreadsheet accounting, and medium-sized databases, an upgrade to present equipment proves sufficient. ■

# Microcomputers: Comparison Columns



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**Synopsis**

**Editor's Note**

This comparison columns report includes a list of vendors with their addresses and telephone numbers, a description of the column entries, and columns with detailed specifications and pricing for microcomputer systems offered by the responding vendors. For a description of the components common to all microcomputers, see the Technology Overview (Report 550-201). For an examination of the important market trends and a description of the marketing strategies of major vendors, see the Market Overview (Report 550-101).

**The Columns**

During November and December 1989, Datapro Research surveyed nearly 400 vendors that manufacture microcomputers. The response from 103 manufacturers detailed 561 desktop and floorstanding microcomputers. The comparison columns highlight the systems' characteristics.

*The absence of a company or a particular system from the columns indicates that the company failed to respond to our repeated requests for information or the product is no longer actively marketed. In those instances where we were unable to obtain a response from a manufacturer that impacts the marketplace, we obtained the information from in-house sources.*

Below are descriptions of the formal column entries and explanations of computer specifications. These definitions should help potential microcomputer users recognize state-of-the-art features and functions of current microcomputers.



# Vendors

**Acer America Corp.**

401 Charcot Avenue  
San Jose, CA 95131 (408) 922-0333

**Acma Computers, Inc.**

117 Fourier Avenue  
Fremont, CA 94539 (415) 623-1212

**Advanced Digital Corp.**

5432 Production Drive  
Huntington Beach, CA 92649 (714) 891-4004

**Advanced Logic Research, Inc.**

9401 Jeronimo  
Irvine, CA 92718 (714) 581-6770

**Amdek Corp.**

3471 N. First Street  
San Jose, CA 95134 (408) 922-5700

**American Mitac Corp.**

410 E. Plumeria Drive  
San Jose, CA 95134 (408) 432-1160

**Amstrad, Inc.**

1915 Westridge Drive  
Irving, TX 70538 (214) 518-0668

**Apple Computer, Inc.**

20525 Mariani Avenue  
Cupertino, CA 95014 (408) 996-1010

**Arche Technologies, Inc.**

48881 Kato Road  
Fremont, CA 94539 (415) 623-8100

**Area Electronics Systems, Inc.**

330 E. Orangethorpe Avenue, Suite F  
Placentia, CA 92670 (714) 993-0300

**Ark Science Corp.**

500 Laurelwood Drive #5, Suite 5  
Santa Clara, CA 95054 (408) 988-6421

**AT&T**

Technologies Information Systems  
1 Speedwell Avenue  
Morristown, NJ 07962-1954 (201) 898-2000

**Atari Corp.**

1196 Borregas Avenue, P.O. Box 3427  
Sunnyvale, CA 94086 (408) 745-2000

**Atronics International, Inc.**

1830 McCandless Drive  
Milpitas, CA 95035 (408) 942-3344

**Austin Computer Systems**

10300 Metric Boulevard  
Austin, TX 78758 (512) 338-7932

**Blackship Computer Systems, Inc.**

4031 Clipper Court  
Fremont, CA 94538 (415) 770-9300

**Broadax Systems, Inc.**

9440 Telstar Avenue  
El Monte, CA 91731 (818) 442-0200

**Canon U.S.A., Inc.**

One Canon Plaza  
Lake Success, NY 11042 (516) 488-6700

**Cardinal Technologies, Inc.**

New Products Div.  
1827 Freedom Road  
Lancaster, PA 17601 (717) 293-3000

**Chartered Electronics Inc.**

21 Airport Boulevard, Suites G & H  
San Francisco, CA 94080 (415) 875-3636

**Citizen America Corp.**

2401 Colorado Avenue, Suite 190  
Santa Monica, CA 90404 (213) 453-0614

**Club American Technology, Inc.**

3401 W. Warren Avenue  
Fremont, CA 94539 (415) 683-6600

**Comark Corp.**

93 West Street  
Medfield, MA 02052 (508) 359-8161

**Commodore International Ltd.**

1200 Wilson Drive  
West Chester, PA 19380 (215) 431-9100

**Compaq Computer Corp.**

P.O. Box 692000  
Houston, TX 77269 (713) 370-0670

**Compuadd Corp.**

12303 Technology Boulevard  
Austin, TX 78727 (512) 250-1489

**Cordata, Inc.**

1055 W. Victoria Street  
Compton, CA 90220 (213) 603-2901

**CSR**

370 North Street  
Teterboro, NJ 07608 (201) 288-6655

**CCS Custom Computer Systems, Inc.**

191 Woodport Road  
Sparta, NJ 07871 (201) 729-6762

**Data Bank Computer**

48363 Warm Springs Boulevard  
Fremont, CA 94539 (415) 490-5002

**Data General Corp.**

4400 Computer Drive  
Westboro, MA 01580 (508) 366-8911

**Data Storage Marketing, Inc.**

5541 Central Avenue  
Boulder, CO 80301 (303) 442-4747

**Dataworld**

3733 San Gabriel River Parkway  
Pico Rivera, CA 90660 (213) 695-3777

**Daytronic Corp.**

2589 Corporate Place  
Miamisburg, OH 45342 (513) 866-3300

**Dell Computer Corp.**

9505 Arboretum Boulevard  
Austin, TX 78759 (512) 338-4400

**Delta Data Systems Corp.**

7175 Columbia Gateway Drive  
Columbia, MD 21046 (301) 290-6400

**Digitech Research Inc.**  
800 Monterey Pass Road  
Monterey, CA 91754 (213) 267-1638

**DSC Communications**  
P.O. Box 110940  
Campbell, CA 95011 (408) 954-5729

**Electrified Discounters Inc.**  
1066 Sherman Avenue  
Hamden, CT 06514 (203) 287-1976

**Emerald Computers, Inc.**  
7324 SW Durham Road  
Portland, OR 97224 (503) 620-6094

**Emerson Computer Corp.**  
5500 E. Slauson  
Commerce, CA 90040 (213) 722-9800

**Epson America, Inc.**  
Computer Products Div.  
23530 Hawthorne Blvd., P.O. Box 2842  
Torrance, CA 90505 (213) 539-9140

**Everex Systems, Inc.**  
48431 Milmont Drive  
Fremont, CA 94538 (415) 498-1111

**First Class Systems Inc.**  
2875 Northwestern Parkway  
Santa Clara, CA 95051 (408) 496-0237

**Fortis Information Systems, Inc.**  
6070 Rickenbacker Road  
Commerce, CA 90040 (213) 727-1227

**Fortron Corp.**  
2380 Kume Drive, Suite F  
San Jose, CA 95131 (408) 432-1191

**Fountain Technologies, Inc.**  
12K Worlds Fair Drive  
Somerset, NJ 08873 (201) 563-4800

**GCH Systems, Inc.**  
777 E. Middlefield Road  
Mountain View, CA 94043 (415) 968-3400

**GMX, Inc.**  
1337 W. 37th Place  
Chicago, IL 60609 (312) 927-5510

**Herko Electronics, Inc.**  
4655 Ridge Road W.  
Spencerport, NY 14559 (716) 352-1102

**Hetra Computer & Communications Industries, Inc.**  
P.O. Box 9000  
Sebastian, FL 32958 (407) 589-7331

**Hewlett-Packard Co.**  
Business Computing Systems  
19091 Pruneridge Avenue  
Cupertino, CA 95014 (800) 752-0900

**IBC/Integrated Business Computers**  
21621 Nordhoff Street  
Chatsworth, CA 91311 (818) 882-9007

**ICL Datachecker**  
800 Central Expressway, P.O. Box 58112  
Santa Clara, CA 95052 (408) 748-0194

**International Business Machines Corp. (IBM)**  
Old Orchard Road  
Armonk, NY 10504  
Contact your local IBM representative.

**Isotropic Computer Inc.**  
E. 5920 Seltice Way  
Post Falls, ID 83854 (208) 667-1447

**Kaypro, Inc.**  
533 Stevens Avenue  
Solana Beach, CA 92075 (619) 259-4713

**Leading Edge Products, Inc.**  
225 Turnpike Street  
Canton, MA 02021 (617) 828-8150

**Lee Data Corp.**  
7075 Flying Cloud Drive  
Eden Prairie, MN 55344 (612) 828-0300

**Logix Microcomputers**  
375 Morgan Lane, 12 Oak Business Park  
West Haven, CT 06516 (203) 932-4881

**Mark Computer Products Corp.**  
Birchwood Business Park, 25 Birch Street  
Milford, MA 01757 (508) 634-3455

**Maxar P.C.**  
710 Lakeway, Suite 285  
Sunnyvale, CA 94086 (408) 733-0810

**Memorex Telex**  
6422 E. 41st Street  
Tulsa, OK 74135 (918) 627-1111

**Micro Express**  
1801 Carnegie Avenue  
Santa Ana, CA 92705 (714) 852-1400

**Mission Cyrus Corp.**  
18303 8th Avenue S.  
Seattle, WA 98148 (604) 432-7727

**Mitsuba Corp.**  
650 Terrace Drive  
San Dimas, CA 91773 (714) 592-2866

**Mitsubishi Electronics America, Inc.**  
991 Knox Street  
Torrance, CA 90502 (213) 515-3993

**NCR Corp.**  
1700 S. Patterson Boulevard, USG-3  
Dayton, OH 45479 (513) 445-5000

**NEC Information Systems, Inc.**  
1414 Massachusetts Avenue  
Boxborough, MA 01719 (508) 264-8000

**Octave Systems, Inc.**  
1715 Dell Avenue  
Campbell, CA 95008 (408) 866-8424

**Otec Technologies, Inc.**  
1031 E. Duane Avenue, Suite A  
Sunnyvale, CA 94086 (408) 736-3356

**Packard Bell**  
9425 Canoga Avenue  
Chatsworth, CA 91311 (818) 773-4400

**Panasonic Industrial Co.**  
Office Automation Group  
Panazip 76-1  
Secaucus, NJ 07094 (201) 392-4688

**PC Pros**  
8205 S. Cass Avenue  
Darien, IL 60559 (312) 810-1010

**Philips Information Systems**  
15301 Dallas Parkway, Suite 300 LB 35  
Dallas, TX 75248 (214) 980-2000

**Polywell Computers Inc.**

61-C Airport Boulevard  
South San Francisco, CA 94080 (415) 583-7222

**Precision Systems Group**

7660-20 Phillips Highway  
Jacksonville, FL 32256 (904) 730-3867

**QIC Research**

1961 Concourse Drive, Suite C  
North San Jose, CA 95131 (408) 432-8880

**Rexon Business Machines Corp.**

An Alpha Microsystems Co.  
3501 W. Sunflower Avenue  
Santa Ana, CA 92704 (714) 641-6500

**Sanyo Business Systems Corp.**

51 Joseph Street  
Moonachie, NJ 07074 (201) 440-9300

**S.F. Micro, Inc.**

1143 Post Street  
San Francisco, CA 94109 (415) 929-1505

**Silver Dollars International, Inc.**

2550 W. Main Street No. 202  
Alhambra, CA 91803 (818) 281-6878

**Sirex USA, Inc.**

132-14 11th Avenue  
College Point, NY 11356 (718) 746-7500

**Sun Moon Star**

1941 Ringwood Avenue  
San Jose, CA 95131 (408) 452-1119

**Suntronics Co., Inc.**

12603 Crenshaw Boulevard  
Hawthorne, CA 90250 (213) 644-1140

**Swan Technologies**

3075 Research Drive  
State College, PA 16801 (814) 238-1820

**Systems Integration Associates**

222 E. Pearson, Suite 502  
Chicago, IL 60611 (312) 440-1275

**System & Associates**

3033 Kellway Drive, Suite 120  
Carrollton, TX 75066 (214) 418-6699

**Tandon Computer Corp.**

609 Science Drive  
Moorpark, CA 93021 (805) 378-3010

**Tandy Corp./Radio Shack**

1800 One Tandy Center  
Fort Worth, TX 76102 (817) 390-3011

**Tatung Company of America, Inc.**

2850 El Presidio Street  
Long Beach, CA 90810 (213) 979-7055

**Teconomics, Inc.**

755 5th Avenue SW  
Calgary, AB, Canada T2P 0N2 Canada (403) 265-0707

**TeleVideo Systems, Inc.**

550 E. Brokaw Road, P.O. Box 49048  
San Jose, CA 95161 (408) 954-8333

**Texas Instruments**

P.O. Box 181153  
Austin, TX 78718 (800) 527-3500

**Third Coast Technologies, Inc.**

219 N. Milwaukee  
Milwaukee, WI 53202 (414) 272-4220

**Toshiba America, Inc.**

Information Systems Div.  
9740 Irvine Boulevard  
Irvine, CA 92718 (714) 583-3000

**Tri-Star Computers**

1520 W. Mineral Road  
Tempe, AZ 85283 (602) 838-1222

**Twinhead Corp.**

1537 Centre Pointe Drive  
Milpitas, CA 95035 (408) 945-0808

**Unisys**

Township Line & Jolly Roads, P.O. Box 500  
Blue Bell, PA 19424 (215) 542-3501

**Versyss, Inc.**

One Dedham Place  
Dedham, MA 02026 (617) 461-6400

**VNS America Corp.**

910 Boston Post Road, #270  
Marlboro, MA 01752 (508) 481-7192

**Zendex Corporation**

6700 Sierra Lane  
Dublin, CA 94568 (415) 828-3000

**Zenith Data Systems Corp.**

1000 Milwaukee Avenue  
Glenview, IL 60025 (312) 699-4800.

## Microcomputer Comparison Column Entry Descriptions

### Vendor and Product Name

**Vendor and Product.** The *vendor* and *product* listings show all desktop and floorstanding microcomputers that we were able to identify for this report. We define a microcomputer as any general-purpose programmable device intended for placement on a desk or a floor stand or in any general work area.

### Processor/Memory

**CPU/Clock Speed.** *CPU* indicates the name of the microprocessor, the most common being the 80X86 family (Intel), 680X0 (Motorola), and V-series (NEC). Harris Semiconductor and American Micro Devices also manufacture the 80286 chip under license from Intel. *Clock speed* is a measure of the speed, in MHz, with which the microprocessor executes its instructions. Comparing microcomputer systems on clock speeds alone can be deceptive, since several other factors also affect microcomputer performance.

### Co-Processor Options.

*Co-processors* are microprocessors dedicated to number crunching; they process floating-point instructions to reduce the main processor load. This entry indicates the co-processors supported by

the system and notes any that are included.

### Standard RAM/Speed.

This entry shows the minimum amount of *random-access memory* (RAM), in bytes, included in the base configuration. Like all memory, it is measured in thousands (K) or millions (M) of bytes. *Speed* refers to the memory access time, measured in nanoseconds (billionths of a second).

### RAM Expansion Capacity.

This entry shows the maximum amount of memory, in bytes, that can be installed on the system board before an expansion slot must be used.

### Maximum System RAM.

This entry indicates the total memory supported, in bytes, by each system.

### RAM Cache, Size/Speed.

Several vendors, especially of 80386-based systems, provide a high-speed *RAM cache* to reduce or eliminate wait states. We asked vendors to provide the cache controller type, size (in bytes), and speed (in ns.).

### Input/Output

**Bus Architecture.** This entry describes the system bus type. The emergence of new bus architectures has made this an important buying

consideration, since it determines what type of expansion boards can be used.

**Bus Speed.** Some timing-dependent expansion boards function only in systems with a particular bus speed, here given in MHz. (The processor clock speed is usually the same as or an integral fraction of the bus speed.)

### Total Expansion Slots.

This entry indicates how many 8-, 16-, and 32-bit expansion slots are built into the system.

### Available Expansion

**Slots.** Some expansion slots may be taken by video adapters, drive controllers, and I/O boards included in the system. This entry indicates how many slots are left.

**Serial Ports.** This entry provides the number of serial ports on the system board, as well as any that are on adapters included with the base system. A serial port may be needed to attach an external peripheral, such as a mouse or a modem.

**Parallel Ports.** This entry provides the number of parallel ports on the system board, as well as any that are on adapters included with the base system. Parallel ports are mainly used to attach printers.

### Other I/O Devices In-

**cluded.** Noted here is whether or not a mouse, modem, or other peripheral device is included with the system.

**Other I/O Interfaces.** Any other interfaces included with the system are noted here.

### Mass Storage

**Internal Drive Bays Available.** This entry indicates the maximum number of full-height, half-height, and/or third-height devices that can be installed internally. Note that a full-height bay will accommodate two half-height devices and that a third-height device can be installed in a half-height bay with an appropriate mounting kit.

### Diskette Drives Included.

Most systems include one or more diskette drives. The number of drives and their capacity in bytes are shown here. In nearly all cases, the capacity also indicates the diskette size: 360K- and 1.2M-byte drives use older, more common 5¼-inch media; 720K-, 800K-, and 1.44M-byte drives use the increasingly popular 3½-inch media.

### Diskette Drive Options.

Optional diskette drives offered by the vendor are listed here, in bytes. If a particular drive format is not offered by the vendor, third-party products may be available to fill the gap.

**Hard Disk Interface.** The type of hard disk interface determines which hard disk drives are supported. Also part of this entry is the implementation: integrated on the system board, or on an adapter included with the system.

**Hard Disk Size/AAT.** This entry provides the hard disk capacity, in bytes,

included with the system. Also shown is the average access time (AAT), in ms., a measure of the drive's speed; lower numbers imply higher performance.

#### **Optional Mass Storage.**

Optional hard disks offered by the vendor are listed here, along with tape drives and optical mass storage media.

#### **Keyboard**

**Availability.** This entry indicates whether a keyboard is included with the system and whether it is detachable or in a fixed position.

#### **Number of Keys/Function Keys.**

In addition to the requisite alphanumeric keys, most computer keyboards include cursor control keys and function keys. Typically, a keyboard with 83 or more keys has 10 function keys and a separate keypad that provides cursor-control and numeric modes. The popular 101-key keyboard includes 12 function keys and dedicated cursor-control keys.

#### **Video/Display**

##### **Video Controller/**

**Resolution.** This entry indicates whether the controller is integrated on the system board, provided on an adapter, or optional. Unless the controller is optional, also given is its maximum resolution in pixels, or picture elements.

**Display.** If the system includes a display, this entry indicates its diagonal screen size and the type of display.

#### **Local Area Network Support**

**Vendor LAN Options.** A local area network (LAN) allows sharing of resources, such as databases and printers. This entry indicates whether a vendor sells and supports hardware to connect to a LAN. If the vendor offers no LAN options for a system, third-party vendors often do.

#### **Product Design**

**Type of Unit.** This entry indicates whether the system is a desktop or a floorstanding microcomputer.

#### **Tempest Version.**

Tempest-protected devices meet National Security Agency standards for reduction of radio frequency emissions. Such emissions could be monitored electronically, resulting in interception of sensitive information. This entry indicates whether a Tempest version of the system is available from the manufacturer or from a third party.

**Dimensions.** The dimensions of the system unit (height, width, and depth) are given in inches.

**Weight.** The weight of the system unit is indicated in pounds.

**AC Power Supply.** This entry indicates the amount of power, in watts, the system is capable of delivering.

#### **Software**

##### **Operating System(s)**

**Bundled.** This entry indicates the operating systems included with the system.

##### **Operating System(s)**

**Supported.** Any additional operating systems supported by the microcomputer are listed here.

##### **Additional Software Included.**

Vendors may include programs ranging from diagnostics, communications, and desk accessory software (such as schedulers and phone lists), to word processing, spreadsheets, or other major applications. Multi-tasking shells—such as Windows and DesqView—are sometimes bundled with high-end systems.

##### **Service/Support**

##### **Distribution Channels.**

Microcomputers may be sold by computer retailers, general retail stores, value-added resellers (VARs), or directly by the manufacturer.

**Parts Warranty.** This entry indicates the length of the vendor's warranty on parts.

**Labor Warranty.** This entry indicates the length of the vendor's warranty on labor.

**Service Supplied by.** This entry indicates the source of support and maintenance for a microcomputer system.

**Service Features.** Noted here is whether the vendor provides toll-free user support, a 30-day money-back guarantee, and/or an on-site service contract.

#### **Base Price**

We asked each vendor to provide information on the base configuration of each model. Therefore, the base price, given in dollars, reflects the manufacturer's list price for the system as described in the column. The availability of General Services Administration (GSA) pricing for government buyers is also indicated. If no price is indicated, contact the vendor for further information.

#### **Other Terms Used within the Columns**

*Vendor did not specify* indicates the vendor did not supply us with all of the information. *Not applicable* means the question was not pertinent to a particular system. A dash appears in a combination entry where only one of the features is provided or does not apply.

Vendor	Acer America Corp.	Acma Computers, Inc.	Acma Computers, Inc.	Acma Computers, Inc.
Product	Acer 1200	Acma 286-16	Acma 286/12 Desktop System	Acma 386-25 Business System
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	1486/25	80286/16	80286/12	80386/25
Co-Processor Options	Weitek 4167	80287	80287	80387
Standard RAM (bytes)/Speed (ns)	4.0M/80	1.0M/80	1.0M/100	4.0M/5
RAM Expansion Capacity (bytes)	64M	8.0M	8.0M	16.0M
Maximum System RAM (bytes)	64M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Proprietary, 128K/35	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	EISA	AT	AT	AT/separate memory bus
Bus Speed (MHz)	Vendor did not specify	8	8	12.5, 8.33; 8
Total Expansion Slots	6 32-bit	3 8-bit, 5 16-bit	3 8-bit, 5 16-bit	2 8-bit, 5 16-bit, 2 32-bit
Available Expansion Slots	4 32-bit	2 8-bit, 3 16-bit	2 8-bit, 3 16-bit	1 8-bit, 3 16-bit, 1 32-bit
Serial Ports	2 on adapter	2 on adapter	2 on adapter	2 on adapter
Parallel Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
Other I/O Devices Included	Mouse	Vendor did not specify	None	None
Other I/O Interfaces	Vendor did not specify	101-key keyboard port	101-key keyboard port	101-key keyboard port
<b>Mass Storage</b>				
Internal Drive Bays Available	5 half-height	3 half-height, 1 third-height	3 half-height, 1 third-height	5 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	Vendor did not specify	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M
Hard Disk Interface	ESDI	ST506/412	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	None	40M/28	20M/40	60M/28
Optional Mass Storage	170M, 380M, tape drive	20M, 30M, 40M, 50M, 60M, 70M, 80M, 90M, 120M, 150M, 300M, tape drive	20M, 30M, 40M, 50M, 60M, 70M, 70M, 80M, 90M, 120M, 150M, 300M, tape drive	20M, 30M, 40M, 50M, 60M, 70M, 80M, 90M, 120M, 150M, 300M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	On included adapter/640 x 480	On included adapter/640 x 480	On included adapter/640 x 480
Display	Optional	Included, 14-inch, analog color	Included, 14-inch, analog color	Included, 14-inch, analog color
<b>Local Area Network Support</b>				
Vendor LAN Options	None	None	None	None
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Dimensions (H x W x D, inches)	6.3 x 20.9 x 16.5	6.0 x 17.0 x 16.0	6 x 17 x 16	6 x 20 x 16
Weight (pounds)	22.00	45.00	45.00	47.00
AC Power Supply (watts)	230	200	200	Vendor did not specify
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	None	None	None
Operating System(s) Supported	MS-DOS	IBM PC-DOS, IBM OS/2 Standard, enhanced MS-DOS, MS-DOS, Vendor MS-OS/2	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, Vendor MS-OS/2, UNIX, UNIX deriv.	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, Vendor MS-OS/2, UNIX, UNIX deriv.
Additional Software Included	BIOS, setup, windows, util./diagn., Basic	BIOS, setup, util./diagn.	BIOS, setup, util./diagn.	BIOS, setup, util./diagn.
<b>Service/Support</b>				
Distribution Channels	Direct from vendor	Direct from vendor	Direct from vendor	Direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	2 years	2 years	2 years
Service Supported by	Vendor	Vendor	Vendor	Vendor
Service Features	On site	Toll free, 30-day money back	Toll free, 30-day money back	Toll free
<b>Base Price (\$)</b>	10,995	1,785	1,610	2,785

Vendor	Acma Computers, Inc.	Acma Computers, Inc.	Acma Computers, Inc.	Acma Computers, Inc.
<b>Product</b>	<b>Acma 386/20 Professional System</b>	<b>Acma 386/25 Cache</b>	<b>Acma 386/33</b>	<b>Acma 386SX</b>
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/20	80386/25	80386/33	80386sx/16
Co-Processor Options	80387, 80287	80387	80387	80387SX
Standard RAM (bytes)/Speed (ns)	1.0M/100	1.0M/80	1.0M/60	1.0M/80
RAM Expansion Capacity (bytes)	16.0M	16.0M	16.0M	8.0M
Maximum System RAM (bytes)	16.0M	16.0M	Vendor did not specify	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Chips & Tech., 64K/25	64K/25	Not supported
<b>Input/Output</b>				
Bus Architecture	AT/separate memory bus	AT/separate memory bus	Vendor did not specify	Vendor did not specify
Bus Speed (MHz)	10	12.5, 8.33; 8	Vendor did not specify	Vendor did not specify
Total Expansion Slots	2 8-bit, 5 16-bit, 2 32-bit	2 8-bit, 5 16-bit, 1 32-bit	2 8-bit, 5 16-bit, 1 32-bit	2 8-bit, 6 16-bit
Available Expansion Slots	1 8-bit, 3 16-bit, 1 32-bit	1 8-bit, 3 16-bit, 1 32-bit	1 8-bit, 3 16-bit, 1 32-bit	1 8-bit, 4 16-bit
Serial Ports	2 on adapter	2 on adapter	2 on adapter	2 on adapter
Parallel Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	101-key keyboard port	101-key keyboard port	101-key keyboard port	101-key keyboard port
<b>Mass Storage</b>				
Internal Drive Bays Available	5 half-height	5 half-height	5 half-height	3 half-height, 1 third-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M
Hard Disk Interface	ST506/412	ST506/412	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	60M/28	60M/28	60M/28	40M/28
Optional Mass Storage	20M, 30M, 40M, 50M, 60M, 70M, 80M, 90M, 120M, 150M, 300M, tape drive	20M, 30M, 40M, 50M, 60M, 70M, 80M, 90M, 120M, 150M, 300M, tape drive	20M, 30M, 40M, 50M, 60M, 70M, 80M, 90M, 120M, 150M, 300M, tape drive	20M, 30M, 40M, 50M, 60M, 70M, 80M, 90M, 120M, 150M, 300M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/640 x 480	On included adapter/640 x 480	On included adapter/640 x 480	On included adapter/640 x 480
Display	Included, 14-inch, analog color	Included, 14-inch, analog color	Included, 14-inch, analog color	Included, 14-inch, analog color
<b>Local Area Network Support</b>				
Vendor LAN Options	None	None	None	None
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Dimensions (H x W x D, inches)	6 x 20 x 16	6 x 20 x 16	6 x 20 x 16	X 17 x 16
Weight (pounds)	47.00	47.00	47.00	45.00
AC Power Supply (watts)	200	200	200	200
<b>Software</b>				
Operating System(s) Bundled	None	None	None	None
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, Vendor MS-OS/2, UNIX, UNIX deriv.	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, Vendor MS-OS/2, UNIX, UNIX deriv.	MS-DOS	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, Vendor MS-OS/2, UNIX, UNIX deriv.
Additional Software Included	BIOS, setup, util./diagn.	BIOS, setup, util./diagn.	BIOS, setup, diagnostics, util./diagn.	BIOS, setup, util./diagn.
<b>Service/Support</b>				
Distribution Channels	Direct from vendor	Direct from vendor	Direct from vendor	Direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	2 years	2 years	2 years	2 years
Service Supported by	Vendor	Vendor	Vendor	Vendor
Service Features	Toll free, 30-day money back	Toll free, 30-day money back	Toll free, 30-day money back	Toll free, 30-day money back
<b>Base Price (\$)</b>	<b>2,485</b>	<b>3,085</b>	<b>4,285</b>	<b>1,885</b>

Vendor	Acma Computers, Inc.	Advanced Digital Corp.	Advanced Digital Corp.	Advanced Logic Research, Inc.
Product	Acma Diskless Workstation	Powerlite System 386SX 100	Powerlite System 486 100	MicroFlex 3300 Model 120
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/12	80386sx/16	I486/25	80386/33
Co-Processor Options	80287	80387SX	None	80387
Standard RAM (bytes)/Speed (ns)	640K/100	1.0M/80	4.0M/80	2.0M/60
RAM Expansion Capacity (bytes)	8.0M	5M	16.0M	Vendor did not specify
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	64M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Proprietary	Vendor did not specify	Intel, 128K/25
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	MCA
Bus Speed (MHz)	8	12.5	12.5	10
Total Expansion Slots	2 8-bit, 3 16-bit	4 16-bit	4 16-bit	4 16-bit, 2 32-bit
Available Expansion Slots	0 8-bit, 3 16-bit	3 16-bit	3 16-bit	Vendor did not specify
Serial Ports	2 on adapter	2 on main board	2 on main board	1 on main board
Parallel Ports	2 on adapter	1 on main board	1 on main board	1 on main board
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	101-key keyboard port	Mouse	Mouse	Mouse
<b>Mass Storage</b>				
Internal Drive Bays Available	2 third-height	Vendor did not specify	Vendor did not specify	Vendor did not specify
Diskette Drives Included (bytes)	None	Vendor did not specify	Vendor did not specify	1 1.44M
Diskette Drive Options (bytes)	720K, 1.44M	Vendor did not specify	Vendor did not specify	1.44M
Hard Disk Interface	ST506/412, AT/IDE; ESDI	None	SCSI	ESDI
Hard Disk Size (bytes)/AAT (ms)	None/28	Vendor did not specify	Vendor did not specify	120M
Optional Mass Storage	20M, 30M, 40M, 50M, 60M	40M, 100M	40M, 100M, 20M, 1G	70M, 120M, 150M
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/10	101/10	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/, 720 x 350	Integrated on system board/640 x 480 Optional	Integrated on system board/640 x 480 Optional	On included adapter/640 x 480
Display	Included, 12-inch, digital monochrome	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet	ARCnet	Ethernet, ARCnet	None
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Vendor Version	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Dimensions (H x W x D, inches)	2.5 x 16 x 16	4 x 13 x 15	4 x 13 x 15	6 x 17.6 x 15
Weight (pounds)	Vendor did not specify	12.00	12.00	50.00
AC Power Supply (watts)	190	80	80	200
<b>Software</b>				
Operating System(s) Bundled	None	None	None	None
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX, UNIX deriv.	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX, UNIX deriv.	MS-DOS, Vendor MS-OS/2, UNIX derivative
Additional Software Included	Util./diagn.	BIOS, diagnostics, util./diagn.	BIOS, diagnostics, util./diagn.	BIOS, setup
<b>Service/Support</b>				
Distribution Channels	Direct from vendor	Direct from vendor	Direct from vendor	Direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	2 years	1 year	1 year	1 year
Service Supported by	Vendor	Vendor, third party	Vendor, third party	Vendor
Service Features	Toll free, 30-day money back	On site, toll free	On site, toll free	On site
<b>Base Price (\$)</b>	1,060	1,575	6,195	7,990

Vendor	Advanced Logic Research, Inc.			
Product	MicroFlex 3300 Model 150	MicroFlex 3300 Model 340H	MicroFlex 3300 Model 650H	MicroFlex 3300 Model 70
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/33	80386/33	80386/33	80386/33
Co-Processor Options	80387	80387	80387	80387
Standard RAM (bytes)/Speed (ns)	2.0M/60	2.0M/60	2.0M/60	2.0M/60
RAM Expansion Capacity (bytes)	Vendor did not specify			
Maximum System RAM (bytes)	64M	64M	64M	64M
RAM Cache, Size (bytes)/Speed (ns)	Intel, 128K/25	Intel, 128K/25	Intel, 128K/25	Intel, 128K/25
<b>Input/Output</b>				
Bus Architecture	MCA	MCA	MCA	MCA
Bus Speed (MHz)	10	10	10	10
Total Expansion Slots	4 16-bit, 2 32-bit			
Available Expansion Slots	Vendor did not specify			
Serial Ports	1 on main board			
Parallel Ports	1 on main board			
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	Mouse	Mouse	Mouse	Mouse
<b>Mass Storage</b>				
Internal Drive Bays Available	Vendor did not specify			
Diskette Drives Included (bytes)	1 1.44M	1 1.44M	1 1.44M	1 1.44M
Diskette Drive Options (bytes)	1.44M	1.44M	1.44M	1.44M
Hard Disk Interface	ESDI	ESDI	ESDI	ESDI
Hard Disk Size (bytes)/AAT (ms)	150M	340M	650M	70M
Optional Mass Storage	70M, 120M, 150M	340M, 650M	340M, 650M	70M, 120M, 150M
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/640 x 480			
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	None	None	None	None
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify			
Dimensions (H x W x D, inches)	23 x 7.4 x 17.5	23 x 7.4 x 17.5	23 x 7.4 x 17.5	6 x 17.6 x 15
Weight (pounds)	80.00	80.00	80.00	50.00
AC Power Supply (watts)	300	300	300	200
<b>Software</b>				
Operating System(s) Bundled	None	None	None	None
Operating System(s) Supported	MS-DOS, Vendor MS-OS/2, UNIX derivative			
Additional Software Included	BIOS, setup	BIOS, setup	BIOS, setup	BIOS, setup
<b>Service/Support</b>				
Distribution Channels	Direct from vendor	Direct from vendor	Direct from vendor	Direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor	Vendor	Vendor	Vendor
Service Features	On site	On site	On site	On site
<b>Base Price (\$)</b>	8,990	10,990	12,990	5,795

Vendor	Amdel Corp.	Amdel Corp.	American Mitac Corp.	American Mitac Corp.
<b>Product</b>	<b>AM/212-01</b>	<b>AM/212-40</b>	<b>MPC2386</b>	<b>MPC2386-003</b>
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/12	80286/12	80386SX/16	80386SX/16
Co-Processor Options	80287	80287	None	None
<b>Standard RAM (bytes)/Speed (ns)</b>				
	1.0M	1.0M	1.0M/100	1.0M/100
<b>RAM Expansion Capacity (bytes)</b>				
Maximum System RAM (bytes)	4.0M	4.0M	8.0M	8.0M
RAM Cache, Size (bytes)/Speed (ns)	16.0M	16.0M	16.0M	16.0M
	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	MCA
Bus Speed (MHz)	Vendor did not specify	Vendor did not specify	10	10
Total Expansion Slots	3 8-bit, 4 16-bit	3 8-bit, 4 16-bit	1 8-bit, 5 16-bit	8 16-bit
Available Expansion Slots	3 8-bit, 4 16-bit	3 8-bit, 4 16-bit	Vendor did not specify	Vendor did not specify
Serial Ports	1 on adapter	1 on adapter	2 on main board	1 on main board
Parallel Ports	1 on adapter	1 on adapter	1 on main board	1 on main board
Other I/O Devices Included	None	None	Vendor did not specify	Vendor did not specify
Other I/O Interfaces	None	None	101-key keyboard port	Mouse, 101-key keyboard port
<b>Mass Storage</b>				
Internal Drive Bays Available	4 half-height	4 half-height	4 half-height	4 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.22M	1 1.44M
Diskette Drive Options (bytes)	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	1.44M	1.44M
Hard Disk Interface	AT/IDE	AT/IDE	AT/IDE	AT/IDE
Hard Disk Size (bytes)/AAT (ms)	None	40M	None	None
Optional Mass Storage	40M	40M	20M, 40M, 100M	20M, 40M, 100M
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	On included adapter/640 x 480	On included adapter/640 x 480
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	None	None	Vendor did not specify	Vendor did not specify
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify	Vendor did not specify	Not available	Not available
Dimensions (H x W x D, inches)	6.4 x 17.3 x 16.4	6.4 x 17.3 x 16.4	6.20 x 14.08 x 16.50	6.20 x 14.08 x 16.50
Weight (pounds)	33.00	33.00	25.00	Vendor did not specify
AC Power Supply (watts)	200	200	145	145
<b>Software</b>				
Operating System(s) Bundled	None	None	MS-DOS	MS-DOS
Operating System(s) Supported	Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2	Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2
Additional Software Included	BIOS, util./diagn., Basic	BIOS, util./diagn., Basic	Vendor did not specify	Util./diagn.
<b>Service/Support</b>				
Distribution Channels	Computer retail, direct from vendor	Computer retail, direct from vendor	Computer retail, VAR/VAD	Computer retail, VAR/VAD
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor	Vendor	Vendor, authorized dealers, third party	Vendor, authorized dealers, third party
Service Features	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Base Price (\$)</b>				
	Vendor did not specify	Vendor did not specify	2,495	2,695

Vendor	American Mitac Corp.	American Mitac Corp.	American Mitac Corp.	American Mitac Corp.
Product	MPC2400V	MPC2400VE	MPC3400E-1A	MPC4000E
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/12	80286/16	80386/20	80386/20
Co-Processor Options	80287	80287	80387	None
Standard RAM (bytes)/Speed (ns)	1.0M/100	1.0M/100	1.0M/80	1.0M/80
RAM Expansion Capacity (bytes)	8.0M	8.0M	8.0M	8.0M
Maximum System RAM (bytes)	16.0M	8.0M	16.0M	24M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Intel, 32K/30
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	10	10	10	10
Total Expansion Slots	1 8-bit, 5 16-bit	1 8-bit, 5 16-bit	1 8-bit, 4 16-bit	7 16-bit, 1 32-bit
Available Expansion Slots	Vendor did not specify	1 8-bit, 5 16-bit	Vendor did not specify	Vendor did not specify
Serial Ports	2 on main board	2 on main board	2 on main board	2 on main board
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on main board
Other I/O Devices Included	Vendor did not specify	None	Vendor did not specify	Vendor did not specify
Other I/O Interfaces	101-key keyboard port	Mouse, 101-key keyboard port, ext. video	101-key keyboard port	101-key keyboard port
<b>Mass Storage</b>				
Internal Drive Bays Available	2 half-height, 2 third-height	1 half-height, 1 third-height	2 half-height, 2 third-height	6 half-height
Diskette Drives Included (bytes)	1 1.2M; 1 1.44M	1 1.2M; 1 1.44M	1 1.2M; 1 1.44M	1 1.44M
Diskette Drive Options (bytes)	1.44M	1.2M, 1.44M	1.44M	1.44M
Hard Disk Interface	AT/IDE	None	AT/IDE	AT/IDE
Hard Disk Size (bytes)/AAT (ms)	None	Vendor did not specify	None	None
Optional Mass Storage	20M, 40M, 100M	40M, 100M	20M, 40M, 100M	20M, 40M, 100M
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/640 x 480	Adapter optional	Adapter optional	Adapter optional
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Vendor did not specify	None	Vendor did not specify	Vendor did not specify
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Floorstanding
Tempest Version	Not available	From manufacturer	Not available	Not available
Dimensions (H x W x D, inches)	6.20 x 14.08 x 16.50	6.2 x 14.8 x 16.6	6.20 x 14.08 x 16.50	19.00 x 9.00 x 16.50
Weight (pounds)	25.00	25.00	25.00	45.00
AC Power Supply (watts)	145	145	145	220
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	MS-DOS	MS-DOS	MS-DOS
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2 Util./diagn.	IBM PC-DOS, MS-DOS, UNIX derivative, C-DOS	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2 Util./diagn.
Additional Software Included		BIOS	None	
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers, third party	Vendor, authorized dealers, third party	Vendor, authorized dealers, third party	Vendor, authorized dealers, third party
Service Features	Vendor did not specify	On site, toll free	Vendor did not specify	Vendor did not specify
<b>Base Price (\$)</b>	1,195	2,295	3,350	3,995

Vendor	American Mitac Corp.	American Mitac Corp.	American Mitac Corp.	Amstrad, Inc.
Product	MPC4000F	MPC4000G	MPS3000F	PC1640
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/25	80386/33	80386/25	8086/8
Co-Processor Options	None	80387	80387	8087
Standard RAM (bytes)/Speed (ns)	1.0M/80	1.0M	1.0M	640K/150
RAM Expansion Capacity (bytes)	8.0M	8.0M	8.0M	640K
Maximum System RAM (bytes)	24M	24M	16.0M	640K
RAM Cache, Size (bytes)/Speed (ns)	Intel, 32K/25	Intel, 128K/20	Intel, 32K/30	Not supported
<b>Input/Output</b>				
Bus Architecture	Vendor did not specify	AT	MCA	XT
Bus Speed (MHz)	10	Vendor did not specify	Vendor did not specify	8
Total Expansion Slots	7 16-bit, 1 32-bit	7 16-bit, 1 32-bit	4 16-bit, 2 32-bit	4 8-bit
Available Expansion Slots	Vendor did not specify	7 16-bit, 1 32-bit	4 16-bit, 2 32-bit	Vendor did not specify
Serial Ports	2 on main board	2 on main board	1 on main board	1 on main board
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on main board
Other I/O Devices Included	Vendor did not specify	None	None	Vendor did not specify
Other I/O Interfaces	101-key keyboard port	101-key keyboard port	Mouse, 101-key keyboard port	Mouse, joystick
<b>Mass Storage</b>				
Internal Drive Bays Available	6 half-height	1 half-height	1 third-height	2 half-height
Diskette Drives Included (bytes)	1 1.44M	1 1.2M	1 720M; 1 1.44M	2 360K
Diskette Drive Options (bytes)	Vendor did not specify	1.2M	1.2M	Vendor did not specify
Hard Disk Interface	AT/IDE	None	None	Vendor did not specify
Hard Disk Size (bytes)/AAT (ms)	None	None	None	20M/60
Optional Mass Storage	20M, 40M, 100M	40M, 100M	40M, 100M	20M
<b>Keyboard</b>				
Availability	Included (detachable)	included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	84/10
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	Adapter optional	Vendor did not specify
Display	Optional	Optional	Optional	Vendor did not specify
<b>Local Area Network Support</b>				
Vendor LAN Options	Vendor did not specify	Token-ring	Token-ring	Vendor did not specify
<b>Product Design</b>				
Type of Unit	Desktop	Floorstanding	Desktop	Desktop
Tempest Version	Not available	From manufacturer	From manufacturer	Vendor did not specify
Dimensions (H x W x D, inches)	19.00 x 9.00 x 16.50	17 x 9 x 18	Vendor did not specify	5.30 x 14.60 x 15.10
Weight (pounds)	45.00	42.00	Vendor did not specify	20.00
AC Power Supply (watts)	220	200	145	264
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	MS-DOS	MS-DOS	MS-DOS
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2	IBM PC-DOS, MS-DOS, Vendor MS-OS/2, UNIX derivative	IBM PC-DOS, MS-DOS, Vendor MS-OS/2, UNIX derivative, C-DOS	Vendor did not specify
Additional Software Included	None	BIOS	BIOS	Vendor did not specify
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD	VAR/VAD
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	90 days
Service Supported by	Vendor, authorized dealers, third party	Vendor, authorized dealers, third party	Vendor, authorized dealers, third party	Vendor did not specify
Service Features	Vendor did not specify	On site, toll free	On site, toll free	Toll free
<b>Base Price (\$)</b>	5,195	5,995	4,995	899

Vendor	Amstrad, Inc.	Amstrad, Inc.	Amstrad, Inc.	Amstrad, Inc.
Product	PC20	PC2086	PC2286	PC2386
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	8086/8	8086/8	80286/12	80386/20
Co-Processor Options	8087	8087	80287	80387
Standard RAM (bytes)/Speed (ns)	512K/150	640K/65	1.0M	4.0M/40
RAM Expansion Capacity (bytes)	640K	640K	4.0M	16.0M
Maximum System RAM (bytes)	640K	640K	4.0M	Vendor did not specify
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	XT	XT	AT	AT
Bus Speed (MHz)	4.77	8	Vendor did not specify	Vendor did not specify
Total Expansion Slots	2 8-bit	3 8-bit	5 16-bit	4 16-bit
Available Expansion Slots	Vendor did not specify	Vendor did not specify	4 16-bit	1 8-bit
Serial Ports	1 on main board	1 on main board	1 on main board	1 on main board
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on main board
Other I/O Devices Included	Mouse	Vendor did not specify	Vendor did not specify	Vendor did not specify
Other I/O Interfaces	Vendor did not specify	Mouse	Vendor did not specify	Mouse
<b>Mass Storage</b>				
Internal Drive Bays Available	2 half-height	Vendor did not specify	1 full-height	1 full-height, 1 half-height
Diskette Drives Included (bytes)	1 720K	1 720M	2 1.44M	1 1.44M
Diskette Drive Options (bytes)	360K, 720K	Vendor did not specify	Vendor did not specify	Vendor did not specify
Hard Disk Interface	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Hard Disk Size (bytes)/AAT (ms)	30M/150	30M/65	40M/65	65/40
Optional Mass Storage	20M	Vendor did not specify	40M	Vendor did not specify
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/320 x 200	Vendor did not specify	Vendor did not specify	Vendor did not specify
Display	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Local Area Network Support</b>				
Vendor LAN Options	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Dimensions (H x W x D, inches)	17.75 x 13.25 x 11.90	5.50 x 14.40 x 15.60	6.30 x 16.40 x 19.10	6.30 x 16.40 x 19.10
Weight (pounds)	12.00	Vendor did not specify	Vendor did not specify	Vendor did not specify
AC Power Supply (watts)	180	180	180	180
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	MS-DOS	MS-DOS	MS-DOS
Operating System(s) Supported	MS-DOS	Vendor did not specify	Vendor did not specify	Vendor did not specify
Additional Software Included	Gem	Vendor did not specify	Windows	Windows
<b>Service/Support</b>				
Distribution Channels	VAR/VAD	VAR/VAD	VAR/VAD	Vendor did not specify
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	90 days	1 year	1 year	1 year
Service Supported by	Vendor did not specify	Vendor did not specify	Vendor, authorized dealers	Vendor did not specify
Service Features	Toll free	Toll free	Toll free	Toll free
<b>Base Price (\$)</b>	Vendor did not specify	Vendor did not specify	2,000	6,000

Vendor	Apple Computer, Inc.	Apple Computer, Inc.	Apple Computer, Inc.	Apple Computer, Inc.
Product	Macintosh II	Macintosh II Hard Disk 40	Macintosh II Hard Disk 80	Macintosh IIfx
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	68020/15.7	68020/15.7	68020/15.7	68030/25
Co-Processor Options	68881	68881	68881	68882
Standard RAM (bytes)/Speed (ns)	1.0M	1.0M	4.0M	1.0M/80
RAM Expansion Capacity (bytes)	8.0M	8.0M	8.0M	8.0M
Maximum System RAM (bytes)	8.0M	8.0M	8.0M	8.0M
RAM Cache, Size (bytes)/Speed (ns)	Optional PMMU	Optional PMMU	Optional PMMU	Proprietary
<b>Input/Output</b>				
Bus Architecture	NuBus	NuBus	NuBus	NuBus
Bus Speed (MHz)	Vendor did not specify			
Total Expansion Slots	6 32-bit	6 32-bit	6 32-bit	3 32-bit
Available Expansion Slots	6 32-bit	6 32-bit	6 32-bit	3 32-bit
Serial Ports	2 on main board			
Parallel Ports	None	None	None	None
Other I/O Devices Included	Mouse	Mouse	Mouse	Mouse
Other I/O Interfaces	SCSI, audio	SCSI, audio	SCSI, audio	Ext. diskette drive, audio (AppleTalk), Apple Desktop Bus
<b>Mass Storage</b>				
Internal Drive Bays Available	Vendor did not specify	Vendor did not specify	Vendor did not specify	1 third-height
Diskette Drives Included (bytes)	1 800K (3.5-inch)	1 800K (3.5-inch)	1 800K (3.5-inch)	1 1.44M
Diskette Drive Options (bytes)	Vendor did not specify	Vendor did not specify	Vendor did not specify	1.4M
Hard Disk Interface	SCSI	SCSI	SCSI	SCSI
Hard Disk Size (bytes)/AAT (ms)	None/65 - 20	40M/65 - 20	80M/65 - 20	None
Optional Mass Storage	20M, 40M, 80M, 160M, tape drive, CD-ROM	20M, 40M, 80M, 160M, tape drive, CD-ROM	20M, 40M, 80M, 160M, tape drive, CD-ROM	20M, 40M, 80M, 160, tape drive, CD-ROM
<b>Keyboard</b>				
Availability	Optional	Optional	Optional	Optional
Number of Keys/Function Keys	Vendor did not specify	Vendor did not specify	Vendor did not specify	Optional
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	Adapter optional	Integrated on system board/640 x 480
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, Token-ring, AppleTalk	Ethernet, Token-ring, AppleTalk	Ethernet, Token-ring, AppleTalk	EtherTalk, TokenTalk, AppleTalk, IBM SNA
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Through VARs	Through VARs	Through VARs	Through VARs
Dimensions (H x W x D, inches)	5.51 x 18.66 x 14.37	5.51 x 18.66 x 14.37	5.51 x 18.66 x 14.37	5.5 x 11.9 x 14.4
Weight (pounds)	24.00	26.00	24.00	14.00
AC Power Supply (watts)	250	250	250	90
<b>Software</b>				
Operating System(s) Bundled	Apple System/Finder	Apple System/Finder	Apple System/Finder	Apple System/Finder
Operating System(s) Supported	Vendor did not specify	Vendor did not specify	Vendor did not specify	A/UX
Additional Software Included	Util./diagn., HyperCard	Util./diagn., HyperCard	Util./diagn., HyperCard	Util./diagn., HyperCard
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD, direct from vendor			
Parts Warranty	90 days	90 days	90 days	90 days
Labor Warranty	90 days	90 days	90 days	90 days
Service Supported by	Authorized dealers, third party	Authorized dealers, third party	Authorized dealers, third party	Authorized dealers
Service Features	Vendor did not specify			
<b>Base Price (\$)</b>				
	4,869/available for GSA	6,169/available for GSA	8,069/available for GSA	6,269

Vendor	Apple Computer, Inc.	Apple Computer, Inc.	Apple Computer, Inc.	Apple Computer, Inc.
Product	Macintosh IIcx 1/40	Macintosh IIcx 4/80	Macintosh IIcx 4/80/AUX	Macintosh IIcx
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	68030/25	68030/25	68030/25	68030/15.667
Co-Processor Options	68882	68882	68882	68882
Standard RAM (bytes)/Speed (ns)	1.0M/80	4.0M/80	4.0M/80	1.0M
RAM Expansion Capacity (bytes)	8.0M	8.0M	8.0M	8.0M
Maximum System RAM (bytes)	8.0M	8.0M	8.0M	32
RAM Cache, Size (bytes)/Speed (ns)	Proprietary	Proprietary	Proprietary	Not supported
<b>Input/Output</b>				
Bus Architecture	NuBus	NuBus	NuBus	NuBus
Bus Speed (MHz)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Total Expansion Slots	3 32-bit	3 32-bit	3 32-bit	3 32-bit
Available Expansion Slots	3 32-bit	3 32-bit	3 32-bit	3 32-bit
Serial Ports	2 on main board	2 on main board	2 on main board	2 on main board
Parallel Ports	None	None	None	None
Other I/O Devices Included	Mouse	Mouse	Mouse	Mouse
Other I/O Interfaces	Mouse	Ext. diskette drive, audio, network interface (AppleTalk), Apple Desktop Bus	Ext. diskette drive, audio, network interface (AppleTalk), Apple Desktop Bus	SCSI, ext. diskette drive, audio, ADB
<b>Mass Storage</b>				
Internal Drive Bays Available	1 third-height	1 third-height	1 third-height	1 third-height
Diskette Drives Included (bytes)	1 1.44M	1 1.44M	1 1.44M	1 1.44M
Diskette Drive Options (bytes)	1.4M	1.4M	1.4M	1.4M
Hard Disk Interface	SCSI	SCSI	SCSI	SCSI
Hard Disk Size (bytes)/AAT (ms)	40M	80M	80M	None
Optional Mass Storage	20M, 40M, 80M, 160, tape drive, CD-ROM	20M, 40M, 80M, 160, tape drive, CD-ROM	20M, 40M, 80M, 160, tape drive, CD-ROM	20M, 40M, 80M, 160M, tape drive, CD-ROM
<b>Keyboard</b>				
Availability	Optional	Optional	Optional	Optional
Number of Keys/Function Keys	Optional	Optional	Optional	Optional
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/640 x 480	Integrated on system board/640 x 480	Integrated on system board/640 x 480	Adapter optional
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	EtherTalk, TokenTalk, AppleTalk, IBM SNA	EtherTalk, TokenTalk, AppleTalk, IBM SNA	EtherTalk, TokenTalk, AppleTalk, IBM SNA	Ethernet, Token-ring, AppleTalk
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Through VARs	Through VARs	Through VARs	Through VARs
Dimensions (H x W x D, inches)	5.5 x 11.9 x 14.4	5.5 x 11.9 x 14.4	5.5 x 11.9 x 14.4	5.50 x 11.90 x 14.40
Weight (pounds)	14.00	14.00	14.00	14.00
AC Power Supply (watts)	90	90	90	90
<b>Software</b>				
Operating System(s) Bundled	Apple System/Finder	Apple System/Finder	A/UX	Apple System/Finder
Operating System(s) Supported	A/UX	A/UX	Apple System/Finder	A/UX
Additional Software Included	Util./diagn., HyperCard	Util./diagn., HyperCard	Util./diagn., Hyper Card	Util./diagn., HyperCard
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor	Computer retail	Computer retail, VAR/VAD, direct from vendor
Parts Warranty	Vendor did not specify	90 days	Vendor did not specify	90 days
Labor Warranty	Vendor did not specify	90 days	Vendor did not specify	90 days
Service Supported by	Authorized dealers, third party	Authorized dealers, third party	Authorized dealers, third party	Authorized dealers, third party
Service Features	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Base Price (\$)</b>	6,969	8,669	9,152	4,669/available for GSA

Vendor	Apple Computer, Inc.	Apple Computer, Inc.	Apple Computer, Inc.	Apple Computer, Inc.
Product	Macintosh IIfx 1/40	Macintosh IIfx 4/80	Macintosh IIfx	Macintosh IIfx Hard Disk 80
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	68030/15.667	68030/15.667	68030/15.667	68030/15.667
Co-Processor Options	68882	68882	68882	68882
Standard RAM (bytes)/Speed (ns)	1.0M	4.0M	1.0M	4.0M
RAM Expansion Capacity (bytes)	8.0M	8.0M	8.0M	8.0M
Maximum System RAM (bytes)	32	32	128M	128M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Varies	Varies
<b>Input/Output</b>				
Bus Architecture	NuBus	NuBus	NuBus	NuBus
Bus Speed (MHz)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Total Expansion Slots	3 32-bit	3 32-bit	6 32-bit	6 32-bit
Available Expansion Slots	3 32-bit	3 32-bit	6 32-bit	6 32-bit
Serial Ports	2 on main board	2 on main board	2 on main board	2 on main board
Parallel Ports	None	None	None	None
Other I/O Devices Included	Mouse	Mouse	Mouse	Mouse
Other I/O Interfaces	SCSI, ext. diskette drive, audio, ADB	SCSI, ext. diskette drive, audio, ADB	SCSI, audio, ADB	SCSI, audio, ADB
<b>Mass Storage</b>				
Internal Drive Bays Available	1 third-height	1 third-height	1 third-height	1 third-height
Diskette Drives Included (bytes)	1 1.44M	1 1.44M	1 1.44M	1 1.44M
Diskette Drive Options (bytes)	1.4M, 800K	1.4M, 800K	1.4M	1.4M
Hard Disk Interface	SCSI	SCSI	SCSI	SCSI
Hard Disk Size (bytes)/AAT (ms)	40M	80M	None/optional	80M
Optional Mass Storage	20M, 40M, 80M, 160M, tape drive, CD-ROM	20M, 40M, 80M, 160M, tape drive, CD-ROM	20M, 40M, 80M, 160M, tape drive, CD-ROM	20M, 40M, 80M, 160M, tape drive, CD-ROM
<b>Keyboard</b>				
Availability	Optional	Optional	Optional	Optional
Number of Keys/Function Keys	Optional	Optional	Varies	Varies
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	Adapter optional	Adapter optional
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, Token-ring, AppleTalk	Ethernet, Token-ring, AppleTalk	Ethernet, Token-ring, AppleTalk, IBM SNA, remote systems	Ethernet, Token-ring, AppleTalk, IBM SNA, remote systems
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Through VARs	Through VARs	Through VARs	Through VARs
Dimensions (H x W x D, inches)	5.50 x 11.90 x 14.40	5.50 x 11.90 x 14.40	5.51 x 18.66 x 14.37	5.51 x 18.66 x 14.37
Weight (pounds)	14.00	14.00	24.00	26.00
AC Power Supply (watts)	90	90	230	230
<b>Software</b>				
Operating System(s) Bundled	Apple System/Finder	Apple System/Finder	Apple System/Finder	Apple System/Finder
Operating System(s) Supported	A/UX	A/UX	A/UX	A/UX
Additional Software Included	Util./diagn., HyperCard	Util./diagn., HyperCard	Util./diagn., HyperCard	Util./diagn., HyperCard
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor
Parts Warranty	90 days	90 days	90 days	90 days
Labor Warranty	90 days	90 days	90 days	90 days
Service Supported by	Authorized dealers, third party	Authorized dealers, third party	Authorized dealers, third party	Authorized dealers, third party
Service Features	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Base Price (\$)</b>	5,369/available for GSA	7,069/available for GSA	5,269/available for GSA	7,669/available for GSA

Vendor	Apple Computer, Inc.	Apple Computer, Inc.	Apple Computer, Inc.	Apple Computer, Inc.
Product	Macintosh Plus	Macintosh SE	Macintosh SE Hard Disk 20	Macintosh SE Hard Disk 40
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	68000/7.83	68000/7.83	68000/7.83	68000/7.83
Co-Processor Options	None	None	None	None
Standard RAM (bytes)/Speed (ns)	1.0M	1.0M	1.0M	2.0M
RAM Expansion Capacity (bytes)	4.0M	4.0M	4.0M	4.0M
Maximum System RAM (bytes)	4.0M	4.0M	4.0M	4.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	Proprietary	Macintosh SE	Macintosh SE	Macintosh SE
Bus Speed (MHz)	Vendor did not specify			
Total Expansion Slots	None	1 16-bit, 32-bit	1 16-bit	1 16-bit
Available Expansion Slots	Vendor did not specify	1 16-bit, 32-bit	1 16-bit	1 16-bit
Serial Ports	2 on main board			
Parallel Ports	None	None	None	None
Other I/O Devices Included	Mouse	Mouse	Mouse	Mouse
Other I/O Interfaces	Mouse, SCSI, ext. diskette drive, audio	SCSI, ext. diskette drive, audio, ADB	SCSI, ext. diskette drive, audio, ADB	SCSI, ext. diskette drive, audio, ADB
<b>Mass Storage</b>				
Internal Drive Bays Available	None	None	None	None
Diskette Drives Included (bytes)	1 800K (3.5-inch)	2 800K (3.5-inch)	1 800K	2 800K (3.5-inch)
Diskette Drive Options (bytes)	Vendor did not specify			
Hard Disk Interface	SCSI	SCSI	SCSI	SCSI
Hard Disk Size (bytes)/AAT (ms)	None	None	20M	40M
Optional Mass Storage	20M, 40M, 80M, 160M, tape drive, CD-ROM			
<b>Keyboard</b>				
Availability	Included (detachable)	Optional	Optional	Optional
Number of Keys/Function Keys	78/0	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/512 x 342	Integrated on system board/, 512 x 342	Integrated on system board/512 x 342	Integrated on system board/512 x 342
Display	Included, 9-inch	Included, 9-inch	Included, 9-inch	Included, 9-inch
<b>Local Area Network Support</b>				
Vendor LAN Options	AppleTalk	Ethernet, Token-ring, AppleTalk	Ethernet, Token-ring, AppleTalk	Ethernet, Token-ring, AppleTalk
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	From manufacturer	Through VARs	Through VARs	Through VARs
Dimensions (H x W x D, inches)	13.50 x 9.70 x 10.90	13.60 x 9.60 x 10.90	13.60 x 9.60 x 10.90	13.60 x 9.60 x 10.90
Weight (pounds)	16.00	17.00	21.00	17.00
AC Power Supply (watts)	60	100	100	100
<b>Software</b>				
Operating System(s) Bundled	Apple System/Finder	Apple System/Finder	Apple System/Finder	Apple System/Finder
Operating System(s) Supported	Vendor did not specify			
Additional Software Included	Util./diagn., HyperCard	Util./diagn., HyperCard	Util./diagn., HyperCard	Util./diagn., HyperCard
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD, direct from vendor			
Parts Warranty	90 days	90 days	90 days	90 days
Labor Warranty	90 days	90 days	90 days	90 days
Service Supported by	Authorized dealers, third party			
Service Features	Vendor did not specify			
<b>Base Price (\$)</b>	1,799/available for GSA	2,889/available for GSA	3,489/available for GSA	4,089/available for GSA

Vendor	Apple Computer, Inc.	Apple Computer, Inc.	Apple Computer, Inc.	Arche Technologies, Inc.
Product	Macintosh SE/30	Macintosh SE/30 Hard Disk 40	Macintosh SE/30 Hard Disk 80	Legacy 386-33
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	68030/15.667	68030/15.667	68030/15.667	80386/33, keyboard selectable
Co-Processor Options	68882	68882	68882	80387, Weitek 3167
Standard RAM (bytes)/Speed (ns)	1.0M/120	1.0M	4.0M/120	1.0M/80
RAM Expansion Capacity (bytes)	8.0M	8.0M	8.0M	8.0M
Maximum System RAM (bytes)	128M	128M	128M	32M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Proprietary, 128K/25
<b>Input/Output</b>				
Bus Architecture	Macintosh SE/30	Macintosh SE/30	Macintosh SE/30	AT
Bus Speed (MHz)	Vendor did not specify	Vendor did not specify	Vendor did not specify	8, 11, Selectable
Total Expansion Slots	1 32-bit	1 32-bit	1 32-bit	6 16-bit, 2 32-bit
Available Expansion Slots	1 32-bit	1 32-bit	1 32-bit	4 16-bit, 2 32-bit
Serial Ports	2 on main board			
Parallel Ports	None	None	None	1 on main board; 1 on adapter
Other I/O Devices Included	Mouse	Mouse	Mouse	None
Other I/O Interfaces	SCSI, ext. diskette drive, audio, ADB	SCSI, ext. diskette drive, audio, ADB	SCSI, ext. diskette drive, audio, ADB	None
<b>Mass Storage</b>				
Internal Drive Bays Available	1 half-height	1 half-height	1 half-height	5 half-height
Diskette Drives Included (bytes)	1 1.44M	1 1.44M	1 1.44M	1 1.2M
Diskette Drive Options (bytes)	1.4M, 800K	Vendor did not specify	1.4M, 800K	360K, 1.2M, 720K, 1.44M
Hard Disk Interface	SCSI	SCSI	SCSI	ST506/412, AT/IDE, ESDI
Hard Disk Size (bytes)/AAT (ms)	None	40M	80M	18, 28, 65
Optional Mass Storage	20M, 40M, 80M, 160M, tape drive, CD-ROM	20M, 40M, 80M, 160M, tape drive, CD-ROM	20M, 40M, 80M, 160M, tape drive, CD-ROM	20M, 40M, 80M, 120M, tape drive
<b>Keyboard</b>				
Availability	Optional	Optional	Optional	Included (detachable)
Number of Keys/Function Keys	Optional	Vendor did not specify	Optional	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/512 x 342	Integrated on system board/512 x 342	Integrated on system board/512 x 342	On included adapter/720 X 348
Display	Included, 9-inch	Included, 9-inch	Included, 9-inch	Included, 14-inch, digital monochrome
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, Token-ring, AppleTalk	Ethernet, Token-ring, AppleTalk	Ethernet, Token-ring, AppleTalk	Ethernet, ARCnet
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Through VARs	Through VARs	Through VARs	Vendor did not specify
Dimensions (H x W x D, inches)	13.60 x 9.60 x 10.90	13.60 x 9.60 x 10.90	13.60 x 9.60 x 10.90	6.25 x 21 x 16.25
Weight (pounds)	21.00	21.00	21.00	30.00
AC Power Supply (watts)	75	75	75	275
<b>Software</b>				
Operating System(s) Bundled	Apple System/Finder	Apple System/Finder	Apple System/Finder	None
Operating System(s) Supported	Vendor did not specify	Vendor did not specify	Vendor did not specify	Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2, UNIX
Additional Software Included	Util./diagn., HyperCard	Util./diagn., HyperCard	Util./diagn., HyperCard	BIOS, setup, diagnostics, FastLane Disk Cache
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD
Parts Warranty	90 days	90 days	90 days	2 years
Labor Warranty	90 days	90 days	90 days	2 years
Service Supported by	Authorized dealers, third party	Authorized dealers, third party	Authorized dealers, third party	Vendor, authorized dealers
Service Features	Vendor did not specify	Vendor did not specify	Vendor did not specify	Toll free
<b>Base Price (\$)</b>	4,369/available for GSA	4,869/available for GSA	6,569/available for GSA	5,995/available for GSA

Vendor	Arche Technologies, Inc.	Arche Technologies, Inc.	Arche Technologies, Inc.	Arche Technologies, Inc.
Product	Legacy 486	Pro-File 386-25	Pro-File 386-33	Pro-File 386SX
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	I486/25	80386/25	80386/338	80386sx/16
Co-Processor Options	On chip	80387	80387,Weitek 3167	80387SX
Standard RAM (bytes)/Speed (ns)	4.0M/80	1.0M/80	1.0M/80	1.0M/100
RAM Expansion Capacity (bytes)	16.0M	8.0M	8.0M	8.0M
Maximum System RAM (bytes)	64M	16.0M	32M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Proprietary, 256K/25	Not supported	Proprietary, 128/25	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	12.5	8	8	8
Total Expansion Slots	6 16-bit, 2 32-bit	7 16-bit	6 16-bit, 2 32-bit	3 8-bit, 5 16-bit
Available Expansion Slots	4 16-bit, 2 32-bit	5 16-bit	4 16-bit, 2 32-bit	2 8-bit, 4 16-bit
Serial Ports	2 on main board	2 on main board	2 on main board	2 on main board
Parallel Ports	1 on main board; 1 on adapter	1 on main board; 1 on adapter	1 on main board; 1 on adapter	1 on main board; 1 on adapter
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	Vendor did not specify	None	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	5 half-height	1 full-height, 5 half-height,	1 full-height, 5 half-height,	1 full-height, 5 half-height,
		2 third-height	2 third-height	2 third-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M
Hard Disk Interface	ST506/412, AT/IDE, ESDI	ST506/412, AT/IDE, ESDI	ST506/412, AT/IDE, ESDI	ST506/412
Hard Disk Size (bytes)/AAT (ms)	18, 28, 65	18, 28, 65	18, 28, 65	18, 28, 65
Optional Mass Storage	20M, 80M, 120M, tape drive	20M, 40M, 80M, 120M, tape drive	20M, 40M, 80M, 120M, tape drive	20M, 40M, 80M, 120M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/720 X 348	On included adapter/720	On included adapter/720 X 348	On included adapter/720 X 368
Display	Included, 14-inch, digital mono	Included, 14-inch, digital monochrome	Digital monochrome	Included, 14-inch, digital monochrome
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, ARCnet	Ethernet, ARCnet	Ethernet, ARCnet	Ethernet, ARCnet
<b>Product Design</b>				
Type of Unit	Desktop	Floorstanding	Floorstanding	Desktop
Tempest Version	Not available	Not available	Not available	Vendor did not specify
Dimensions (H x W x D, inches)	6.35 x 21 x 16.25	19.5 x 5.5 x 24	19.5 x 5.5 x 24	19.5 x 5.5 x 243
Weight (pounds)	30.00	52.00	52.00	52.00
AC Power Supply (watts)	275	275	275	275
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify	None	None	None
Operating System(s) Supported	Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2, UNIX, UNIX derivative	Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2, UNIX, UNIX derivative	Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2, UNIX, UNIX derivative	Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2, UNIX
Additional Software Included	BIOS, setup, diagnostics, FastLane Disk Cache	BIOS, setup, diagnostics, FastLane Disk Cache	BIOS, setup, diagnostics, FastLane Disk Cache	BIOS, setup, diagnostics, FastLane Disk Cache
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD
Parts Warranty	2 years	2 years	2 years	2 years
Labor Warranty	2 years	2 years	2 years	2 years
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers
Service Features	Toll free	Toll free	Toll free	Toll free
<b>Base Price (\$)</b>	To be announced	2,995/available for GSA	6,395/available for GSA	2,395/available for GSA

Vendor	Arche Technologies, Inc.	Arche Technologies, Inc.	Arche Technologies, Inc.	Arche Technologies, Inc.
Product	Pro-File 486	Rival 286 Plus	Rival 386-25	Rival 386-33
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	1486/33	80286/12	80386/25	80386/338
Co-Processor Options	None	80287	80387	8087, Weitek 3167
Standard RAM (bytes)/Speed (ns)	4.0M/80	640K/100	1.0M/80	1.0M/80
RAM Expansion Capacity (bytes)	16.0M	4.0M	8.0M	8.0M
Maximum System RAM (bytes)	64M	18.0M	18.0M	16M
RAM Cache, Size (bytes)/Speed (ns)	Proprietary, 256K/25	Not supported	Not supported	Proprietary, 64K/25
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	12.5, selectable	8	8	8, 11, selectable
Total Expansion Slots	6 16-bit, 2 32-bit	2 8-bit, 6 16-bit	8-bit, 7 16-bit	6 16-bit, 2 32-bit
Available Expansion Slots	4 16-bit, 2 32-bit	1 8-bit, 5 16-bit	8-bit, 5 16-bit	4 16-bit, 2 32-bit
Serial Ports	2 on main board	2 on main board	2 on main board	2 on main board
Parallel Ports	1 on main board; 1 on adapter	1 on main board; 1 on adapter	1 on main board; 1 on adapter	1 on main board; 1 on adapter
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	None	None	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	1 full-height, 5 half-height, 2 third-height	3 half-height	3 half-height	3 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M
Hard Disk Interface	ST506/412, AT/IDE, ESDI	ST506/412, AT/IDE, ESDI	ST506/412, AT/IDE, ESDI	ST506/412, AT/IDE, EDI
Hard Disk Size (bytes)/AAT (ms)	18, 28, 65	18, 28, 65	18, 28, 65	18, 28
Optional Mass Storage	20M, 40M, 80M, 120M, tape drive	20M, 40M, 80M, 120M, tape drive	20M, 40M, 80M, 120M, tape drive	20M, 40M, 80M, 120M
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/720 X 348	On included adapter/720 X 368	On included adapter/720 X 365	On included adapter/720 X 348
Display	Included, 14-inch, digital monochrome	Included, 14-inch, digital monochrome	Included, 14-inch, digital monochrome	Included, 14-inch, digital monochrome
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, ARCnet	Ethernet, ARCnet	Ethernet, ARCnet	Ethernet, ARCnet
<b>Product Design</b>				
Type of Unit	Floorstanding	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Dimensions (H x W x D, inches)	19.5 x 5.5 x 24	6.18 x 17.13 x 16.5	6.18 x 17.13 x 16.5	6.18 x 17.13 x 16.5
Weight (pounds)	52.00	28.00	28.00	28.00
AC Power Supply (watts)	275	200	200	200
<b>Software</b>				
Operating System(s) Bundled	None	None	None	Vendor did not specify
Operating System(s) Supported	Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2, UNIX, UNIX derivative	Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2, UNIX, UNIX derivative	Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2, UNIX derivative	Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2, UNIX, UNIX derivative
Additional Software Included	BIOS, setup, diagnostics, FastLane Disk Cache	BIOS, setup, diagnostics, FastLane Disk Cache	BIOS, setup, diagnostics, FastLane Disk Cache	BIOS, setup, diagnostics, FastLane Disk Cache
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD
Parts Warranty	2 years	2 years	2 years	2 years
Labor Warranty	2 years	2 years	2 years	2 years
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers
Service Features	Toll free	Toll free	Toll free	Toll free
<b>Base Price (\$)</b>	To be announced/avail. for GSA	1,595/available for GSA	2,595/available for GSA	4,995/available for GSA

Vendor	Arche Technologies, Inc.	Arche Technologies, Inc.	Arche Technologies, Inc.	Area Electronics Systems, Inc.
Product	Rival 386SX	Triumph 280 Plus	Triumph 88 Plus	Topline 286-12
Processor/Memory CPU/Clock Speed (MHz)	80386sx/16	80286/12	NEC V-20/10	80286/12
Co-Processor Options	80387SX	80287	8087	80287
Standard RAM (bytes)/Speed (ns)	1.0M/100	512K/100	512K/100	512K/100
RAM Expansion Capacity (bytes)	8.0M	8.0M	640K	8.0M
Maximum System RAM (bytes)	16.0M	16.0M	4.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
Input/Output Bus Architecture	AT	AT	XT	AT
Bus Speed (MHz)	8	8	4.77	8
Total Expansion Slots	3 8-bit, 5 16-bit	2 8-bit, 3 16-bit	5 8-bit	2 8-bit, 6 16-bit
Available Expansion Slots	2 8-bit, 4 16-bit	2 8-bit, 2 16-bit	4 8-bit	2 8-bit, 6 16-bit
Serial Ports	2 on main board	2 on main board	2 on main board	2 on adapter
Parallel Ports	1 on main board; 1 on adapter	1 on main board; 1 on adapter	1 on main board	1 on adapter
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	None	None	None	None
Mass Storage				
Internal Drive Bays Available	3 half-height	2 half-height, 2 third-height	2 half-height, 2 third-height	1 full-height, 1 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M
Hard Disk Interface	ST506/412, AT/IDE, ESDI	ST506/412, AT/IDE, ESDI	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	18, 28, 65	18, 28, 65	18, 28, 65	40M/28
Optional Mass Storage	20M, 40M, 80M, 120M, tape drive	20M, 40M, 80M, 120M, tape drive	20M, 40M, 80M, 120M, tape drive	30M, 40M, 60M, 70M, 100M, 150M
Keyboard Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
Video/Display Video Controller/Resolution (pixels)	On included adapter/720 X 368	On included adapter/720 X 368	On included adapter/, 720 X 368	On included adapter/Hercules compatible
Display	Included, 14-inch, digital monochrome	Included, 14-inch, digital monochrome	Included, 14-inch, digital monochrome	Included, 12-inch, digital monochrome
Local Area Network Support Vendor LAN Options	Ethernet, ARCnet	Ethernet, ARCnet	Ethernet, ARCnet	None
Product Design Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Vendor did not specify	Not available	Not available
Dimensions (H x W x D, inches)	6.18 x 17.13 x 16.5	3.18 x 17.13 x 15.63	3.88 x 16.13 x 15.63	6.1 x 17.1 x 16.5
Weight (pounds)	28.00	Vendor did not specify	Vendor did not specify	35.00
AC Power Supply (watts)	200	150	150	200
Software Operating System(s) Bundled	Enhanced MS-DOS, MS-DOS, vendor MS-OS/2, UNIX, UNIX derivative	None	None	MS-DOS
Operating System(s) Supported	Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2, UNIX, UNIX derivative	Enhanced MS-DOS, MS-DOS, UNIX, UNIX derivative	Enhanced MS-DOS, MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS
Additional Software Included	BIOS, setup, diagnostics, FastLane Disk Cache	BIOS, setup, diagnostics, FastLane Disk Cache	BIOS, setup, diagnostics, FastLane Disk Cache	None
Service/Support Distribution Channels	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD, direct from vendor
Parts Warranty	2 years	2 years	2 years	1 year
Labor Warranty	2 years	2 years	2 years	1 year
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers, third party
Service Features	Toll free	Toll free	Toll free	On site, toll free, 30-day money back
Base Price (\$)	1,995/available for GSA	1,395/available for GSA	To be announced	900

Vendor	Area Electronics Systems, Inc.			
Product	Topline 286-16	Topline 286.ALL.12	Topline 286.ALL.16	Topline 386.20
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/16	80286/12	80286/16	80386/20
Co-Processor Options	80287	80287	80287	80387, Weitek 1167, Weitek 3167
Standard RAM (bytes)/Speed (ns)	512K/80	512K/100	512K/100	1.0M/80
RAM Expansion Capacity (bytes)	8.0M	8.0M	8.0M	8.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	Vendor did not specify	2 8-bit, 6 16-bit	2 8-bit, 6 16-bit	2 8-bit, 5 16-bit, 1 32-bit
Available Expansion Slots	Vendor did not specify	2 8-bit, 6 16-bit	2 8-bit, 6 16-bit	2 8-bit, 5 16-bit, 1 32-bit
Serial Ports	2 on adapter	2 on main board	2 on adapter	2 on adapter
Parallel Ports	1 on adapter	1 on main board	1 on adapter	1 on adapter
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	None	Game	Game	None
<b>Mass Storage</b>				
Internal Drive Bays Available	1 full-height, 1 half-height	1 full-height, 1 half-height	1 full-height, 1 half-height	5 full-height, 6 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	Vendor did not specify
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	1.2M
Hard Disk Interface	ST506/412	AT/IDE	AT/IDE	ST506/412
Hard Disk Size (bytes)/AAT (ms)	None/28	40M/28	40M/28	40M/28
Optional Mass Storage	40M, 60M, 70M, 100M, 150M	40M, 60M, 70M, 80M	30M, 40M, 60M, 70M, 80M	40M, 60M, 70M, 100M, 150M, 300M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/640 x 480	On included adapter/Hercules compatible	On included adapter/Hercules compatible	On included adapter/800 x 600
Display	Included, 14-inch, analog color	Included, 14-inch, digital monochrome	Included, 14-inch, digital monochrome	Included, 14-inch, multifrequency
<b>Local Area Network Support</b>				
Vendor LAN Options	None	None	None	Vendor did not specify
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	Not available
Dimensions (H x W x D, inches)	6.1 x 17.1 x 16.5			
Weight (pounds)	35.00	35.00	35.00	Vendor did not specify
AC Power Supply (watts)	200	200	200	200
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	MS-DOS	MS-DOS	MS-DOS
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS
Additional Software Included	None	None	None	None
<b>Service/Support</b>				
Distribution Channels	Computer retail	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers, third party			
Service Features	On site, toll free, 30-day money back			
<b>Base Price (\$)</b>	1,800	900	850	3,000

Vendor	Area Electronics Systems, Inc.			
Product	Topline 386.25	Topline 386.25C	Topline 386.33C	Topline 386E
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/25	80386/25	80386/33	80386/33
Co-Processor Options	80387, Weitek 1167, Weitek 3167	80387, Weitek 1167, Weitek 3167	80387	80387, Weitek 1167, Weitek 3167
Standard RAM (bytes)/Speed (ns)	1.0M/80	1.0M/100	4.0M/80	4.0M/80
RAM Expansion Capacity (bytes)	8.0M	8.0M	8.0M	16.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Intel, 32K/30	Intel, 32K/30	Intel, 64K/25
<b>Input/Output</b>				
Bus Architecture	AT	Vendor did not specify	AT	EISA
Bus Speed (MHz)	8	8	8	12.5
Total Expansion Slots	2 8-bit, 5 16-bit, 1 32-bit			
Available Expansion Slots	Vendor did not specify	2 8-bit, 5 16-bit, 1 32-bit	Vendor did not specify	2 8-bit, 5 16-bit, 1 32-bit
Serial Ports	2 on adapter	2 on adapter	2 on adapter	2 on adapter
Parallel Ports	Vendor did not specify	1 on adapter	1 on adapter	1 on adapter
Other I/O Devices Included	None	Mouse	Mouse	Mouse
Other I/O Interfaces	None	Mouse	Mouse	Mouse
<b>Mass Storage</b>				
Internal Drive Bays Available	3 full-height, 6 half-height	3 full-height, 6 half-height	3 full-height, 6 half-height	2 full-height, 4 half-height, 2 third-height
Diskette Drives Included (bytes)	1 1.2M	1 1.44M	1 1.44M	1 1.44M
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M			
Hard Disk Interface	ST506/412	ST506/412	ST506/412	None
Hard Disk Size (bytes)/AAT (ms)	40M/28	70M/28	150M/28	None
Optional Mass Storage	40M, 60M, 70M, 100M, 150M, 300M, tape drive	40M, 60M, 70M, 100M, 150M, 300M, tape drive	40M, 60M, 70M, 100M, 150M, 300M, tape drive	40M, 70M, 80M, 100M, 150M, 300M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12, 2	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/800 x 600	On included adapter/1,024 x 768	Adapter optional/1,024 x 768	On included adapter/1,024 x 768
Display	Included, 14-inch, multifrequency	Included, 14-inch, multifrequency	Included, 14-inch, multifrequency	Included, 14-inch, multifrequency
<b>Local Area Network Support</b>				
Vendor LAN Options	None	None	None	None
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Floorstanding	Floorstanding
Tempest Version	Not available	Not available	Not available	Not available
Dimensions (H x W x D, inches)	6.1 x 17.1 x 16.5	6.1 x 17.1 x 16.5	21.2 x 7 x 16.9	21.2 x 7 x 16.9
Weight (pounds)	45.00	43.00	50.00	50.00
AC Power Supply (watts)	200	200	200	220
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	MS-DOS
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	None	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS
Additional Software Included	None	None	None	None
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD, direct from vendor			
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers, third party	Authorized dealers	Authorized dealers	Authorized dealers
Service Features	On site, toll free, 30-day money back			
<b>Base Price (\$)</b>	3,500	3,500	4,000	5,000

Vendor	Area Electronics Systems, Inc.	Ark Science Corp.	Ark Science Corp.	Ark Science Corp.
<b>Product</b>	<b>Topline 386SX</b>	<b>286-12</b>	<b>386-24</b>	<b>MI-386-20</b>
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386sx/16	80286/12	80386/25	80386/20
Co-Processor Options	80387SX	80287	80387, 80287	80387
Standard RAM (bytes)/Speed (ns)	1.0M/80	512K/100	1.0M/80	1.0M/100
RAM Expansion Capacity (bytes)	8.0M	4.0M	8.0M	8.0M
Maximum System RAM (bytes)	16.0M	8.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Chips & Tech., 64K/30
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8.33	Vendor did not specify	8	10, 8
Total Expansion Slots	2 8-bit, 6 16-bit	3 8-bit, 5 16-bit, 0 32-bit	1 8-bit, 4 16-bit, 1 32-bit	1 8-bit, 6 16-bit, 1 32-bit
Available Expansion Slots	2 8-bit, 6 16-bit	3 8-bit, 4 16-bit, 0 32-bit	1 8-bit, 2 16-bit, 1 32-bit	1 8-bit, 5 16-bit, 1 32-bit
Serial Ports	2 on adapter	2 on adapter	2 on main board	2 on adapter
Parallel Ports	1 on adapter	1 on adapter	1 on main board	1 on adapter
Other I/O Devices Included	None	Vendor did not specify	Vendor did not specify	Vendor did not specify
Other I/O Interfaces	None	None	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	1 full-height, 1 half-height	1 half-height	1 half-height	1 half-height
Diskette Drives Included (bytes)	None	1 1.2M; 1 1.44M	1 1.2M; 1 1.44M	1 1.2M; 1 1.44M
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M	Vendor did not specify	Vendor did not specify	Vendor did not specify
Hard Disk Interface	ST506/412	ST506/412	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	40M/28	40M/28	40M/28	40M/28
Optional Mass Storage	40M, 60M, 70M, 100M, 150M, tape drive	None	None	None
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/640 x 480	Adapter optional	Adapter optional	Adapter optional
Display	Included, 14-inch, analog color	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	None	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Product Design</b>				
Type of Unit	Desktop	Floorstanding	Floorstanding	Floorstanding
Tempest Version	Not available	Vendor did not specify	Not available	Not available
Dimensions (H x W x D, inches)	6.1 x 17.1 x 16.5	16.875 x 7.50 x 15.75	16.875 x 7.50 x 15.75	24.25 x 7.375 x 16.50
Weight (pounds)	38.00	35.00	35.00	35.00
AC Power Supply (watts)	200	200	200	200
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	Vendor did not specify	MS-DOS	MS-DOS
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX
Additional Software Included	None	None	None	None
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers, third party	Vendor	Vendor	Vendor
Service Features	On site, toll free, 30-day money back	30-day money back	30-day money back	30-day money back
<b>Base Price (\$)</b>	<b>2,500</b>	<b>1,120</b>	<b>1,850</b>	<b>2,190</b>

Vendor	Art Science Corp.	AT&T	AT&T	AT&T
Product	XT-10	6286 WGS	6386/25 WGS CPU311	6386/25 WGS CPU313
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	8088/10	80286/12	80386/25	80386/25
Co-Processor Options	8087	80287	80387, Weitek 3167	80387, Weitek 3167
<b>Standard RAM (bytes)/Speed (ns)</b>				
	640K/120	1.0M	4.0M	4.0M
<b>RAM Expansion Capacity (bytes)</b>				
Maximum System RAM (bytes)	640K	8M	8.0M	8.0M
RAM Cache, Size (bytes)/Speed (ns)	Vendor did not specify	16.0M	32M	32M
	Vendor did not specify	Not supported	Intel, 64K	Intel, 64K
<b>Input/Output</b>				
Bus Architecture	XT	AT	AT	AT
Bus Speed (MHz)	4.77	Vendor did not specify	Vendor did not specify	Vendor did not specify
Total Expansion Slots	6 8-bit	3 8-bit, 5 16-bit	1 8-bit, 5 16-bit, 2 32-bit	1 8-bit, 5 16-bit, 2 32-bit
Available Expansion Slots	4 8-bit	3 8-bit, 5 16-bit	1 8-bit, 3 16-bit, 2 32-bit	1 8-bit, 3 16-bit, 2 32-bit
Serial Ports	1 on adapter	1 on main board	2 on main board	2 on main board
Parallel Ports	1 on adapter	1 on main board	1 on main board	1 on main board
Other I/O Devices Included	Vendor did not specify	Vendor did not specify	Mouse	Mouse
Other I/O Interfaces	None	None	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	1 half-height	3 half-height	1 full-height, 3 half-height	1 full-height, 3 half-height
Diskette Drives Included (bytes)	1 360K	1 1.44M	1 1.44M	1 1.44M
Diskette Drive Options (bytes)	1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	1.2M, 1.44M	1.2M, 1.44M
Hard Disk Interface	ST506/412	None	ESDI	ESDI
Hard Disk Size (bytes)/AAT (ms)	20M/65	None	None	80M
Optional Mass Storage	None	20M, 40M, tape drive	300M, 135M, tape drive	300M, 135M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter	Adapter optional	On included adapter/800 x 600	On included adapter/800 x 600
Display	Included, 12-inch, analog monochrome	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Vendor did not specify	Starlan	Starlan	Starlan
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Vendor did not specify	Vendor did not specify	Vendor did not specify
Dimensions (H x W x D, inches)	5 x 19 x 18	5.50 x 14.00 x 15.40	6.5 x 21.25 x 18.5	6.5 x 21.25 x 18.5
Weight (pounds)	Vendor did not specify	26.00	42.00	42.00
AC Power Supply (watts)	150	135	Vendor did not specify	Vendor did not specify
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	Vendor did not specify	None	None
Operating System(s) Supported	IBM PC-DOS, MS-DOS	MS-DOS, Vendor MS-OS/2, UNIX derivative	MS-DOS, Vendor MS-OS/2, UNIX	MS-DOS, Vendor MS-OS/2, UNIX
Additional Software Included	None	None	BIOS, setup, util./diagn.	BIOS, setup, util./diagn.
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor	Vendor	Vendor, authorized dealers	Vendor, authorized dealers
Service Features	30-day money back	On site, toll free	On site, toll free	On site, toll free
<b>Base Price (\$)</b>				
	700	2,095	6,695/available for GSA	8,495/available for GSA

Vendor	AT&T	AT&T	AT&T	AT&T
<b>Product</b>	6386/25 WGS CPU314	6386/SX WGS CPU301	6386/SX WGS CPU302	6386/SX WGS CPU303
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/25	80386sx/16	80386sx/16	80386sx/16
Co-Processor Options	80387, Weitek 3167	80387SX	80387SX	80387SX
Standard RAM (bytes)/Speed (ns)	4.0M	2.0M	2.0M	2.0M
RAM Expansion Capacity (bytes)	8.0M	8.0M	8.0M	8.0M
Maximum System RAM (bytes)	32M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Intel, 64K	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	Vendor did not specify			
Total Expansion Slots	1 8-bit, 5 16-bit, 2 32-bit	1 8-bit, 3 16-bit	1 8-bit, 3 16-bit	1 8-bit, 3 16-bit
Available Expansion Slots	1 8-bit, 3 16-bit, 2 32-bit	1 8-bit, 3 16-bit	1 8-bit, 3 16-bit	1 8-bit, 3 16-bit
Serial Ports	2 on main board			
Parallel Ports	1 on main board			
Other I/O-Devices Included	Mouse	Mouse	Mouse	Mouse
Other I/O Interfaces	None	None	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	1 full-height, 3 half-height	2 half-height, 1 third-height	2 half-height, 1 third-height	2 half-height, 1 third-height
Diskette Drives Included (bytes)	1 1.44M	1 1.44M	1 1.44M	1 1.44M
Diskette Drive Options (bytes)	1.2M, 1.44M	1.2M, 1.44M	1.2M, 1.44M	1.2M, 1.44M
Hard Disk Interface	ESDI	AT/IDE	AT/IDE	AT/IDE
Hard Disk Size (bytes)/AAT (ms)	135M	None	40M	80M
Optional Mass Storage	300M, 135M, tape drive	40M, 80M, tape drive	40M, 80M, tape drive	40M, 80M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/800 x 600	Integrated on system board/800 x 600	Integrated on system board/800 x 600	Integrated on system board/800 x 600
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Starlan	Starlan	Starlan	Starlan
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify			
Dimensions (H x W x D, inches)	6.5 x 21.25 x 18.5	6 x 14 x 15.75	6 x 14 x 15.75	6 x 14 x 15.75
Weight (pounds)	42.00	21.50	21.50	21.50
AC Power Supply (watts)	Vendor did not specify			
<b>Software</b>				
Operating System(s) Bundled	None	None	None	None
Operating System(s) Supported	MS-DOS, Vendor MS-OS/2, UNIX			
Additional Software Included	BIOS, setup, util./diagn.	BIOS, setup, util./diagn.	BIOS, setup, util./diagn.	BIOS, setup, util./diagn.
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD, direct from vendor			
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers
Service Features	On site, toll free			
<b>Base Price (\$)</b>	8,995/available for GSA	2,995/available for GSA	3,995/available for GSA	4,795/available for GSA

Vendor	AT&T	AT&T	AT&T	AT&T
Product	6386E/33 WGS CPU324	6386E/33 WGS Model 5 Base System	6386E/33 WGS Model 5 Multiuser System	6386E/33 WGS Model 5 Server System
Processor/Memory CPU/Clock Speed (MHz)	80386/33	80386/33	80386/33	80386/33
Co-Processor Options	80387	80387	80387	80387
Standard RAM (bytes)/Speed (ns)	4.0M	4.0M	8M	8M
RAM Expansion Capacity (bytes)	8.0M	8.0M	8.0M	8.0M
Maximum System RAM (bytes)	40M	40M	40M	40M
RAM Cache, Size (bytes)/Speed (ns)	Intel, 64K	Intel, 64K	Intel, 64K	Intel, 64K
Input/Output Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	Vendor did not specify			
Total Expansion Slots	1 8-bit, 7 16-bit, 2 32-bit			
Available Expansion Slots	1 8-bit, 5 16-bit, 2 32-bit			
Serial Ports	2 on main board	2 on main board	2 on main board; 16 on adapter	2 on main board
Parallel Ports	1 on main board			
Other I/O Devices Included	Mouse	Mouse	Mouse	Mouse
Other I/O Interfaces	None	None	None	Ntwrk adp incl Starlan
Mass Storage				
Internal Drive Bays Available	2 full-height, 4 half-height			
Diskette Drives Included (bytes)	None	1 1.44M	None	None
Diskette Drive Options (bytes)	1.2M, 1.44M	1.2M, 1.44M	1.2M, 1.44M	1.2M, 1.44M
Hard Disk Interface	ESDI	SCSI	ESDI	ESDI
Hard Disk Size (bytes)/AAT (ms)	135M/18	300M/18	135M/18	135M/18
Optional Mass Storage	300M, tape drive	300M, tape drive	300M, tape drive	300M, tape drive
Keyboard Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
Video/Display Video Controller/Resolution (pixels)	On included adapter/800 x 600			
Display	Optional	Optional	Optional	Optional
Local Area Network Support Vendor LAN Options	Starlan	Starlan	Starlan	Starlan
Product Design Type of Unit	Floorstanding	Floorstanding	Floorstanding	Floorstanding
Tempest Version	Vendor did not specify			
Dimensions (H x W x D, inches)	25.5 x 7.75 x 29.38			
Weight (pounds)	80.00	80.00	80.00	80.00
AC Power Supply (watts)	Vendor did not specify			
Software Operating System(s) Bundled	None	UNIX	None	None
Operating System(s) Supported	MS-DOS, Vendor MS-OS/2, UNIX			
Additional Software Included	BIOS, setup, util./diagn.	BIOS, setup, util./diagn.	BIOS, setup, util./diagn.	BIOS, setup, util./diagn.
Service/Support Distribution Channels	Computer retail, VAR/VAD, direct from vendor			
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers
Service Features	On site, toll free			
Base Price (\$)	12,095/available for GSA	17,400/available for GSA	21,875/available for GSA	22,225/available for GSA

Vendor	AT&T	Atari Corp.	Atari Corp.	Atronics International, Inc.
Product	6386E/33 WGS CPU325	1040 STE	TT030/2	ATI-386SX-16
<b>Processor/Memory</b> CPU/Clock Speed (MHz)	80386/33	68000/8	68030/16	80386sx/16
Co-Processor Options	80387	None	68881, 68882	80287, 80387SX
Standard RAM (bytes)/Speed (ns)	4.0M	1.0M/120	2.0M/100	1.0M/70
RAM Expansion Capacity (bytes)	8.0M	1.0M	8.0M	4.0M
Maximum System RAM (bytes)	40M	4.0M	8.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Intel, 64K	Not supported	On chip, 512K/Brust fill	Not supported
<b>Input/Output</b> Bus Architecture	AT	Vendor did not specify	A24/D16 VME	AT
Bus Speed (MHz)	Vendor did not specify	Vendor did not specify	Async	8
Total Expansion Slots	1 8-bit, 7 16-bit, 2 32-bit	Vendor did not specify	8-bit, 1 16-bit	2 8-bit, 6 16-bit, 0 32-bit
Available Expansion Slots	1 8-bit, 5 16-bit, 2 32-bit	Vendor did not specify	8-bit, 1 16-bit	0 8-bit, 5 16-bit, 0 32-bit
Serial Ports	2 on main board	1 on main board	2 on main board	2 on adapter
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on adapter
Other I/O Devices Included	Mouse	Mouse	Mouse	Vendor did not specify
Other I/O Interfaces	None	Mouse, ext. diskette drive, ext. video, ext. hard disk, audio, MIDI	Mouse, SCSI, ext. diskette drive, ext. video, ext. hard disk, audio, network interface (LocalTalk), MIDI	101-key keyboard port
<b>Mass Storage</b> Internal Drive Bays Available	2 full-height, 4 half-height	1 half-height	2 half-height	5 half-height
Diskette Drives Included (bytes)	None	1 720K	1 1.44M	1 1.2M
Diskette Drive Options (bytes)	1.2M, 1.44M	720K	720K, 1.44M	1.44M
Hard Disk Interface	ESDI	ACSI	SCSI, ACSI	ST506/412
Hard Disk Size (bytes)/AAT (ms)	300M/18	None/28	40M/28	40M/28
Optional Mass Storage	300M, tape drive	30M, 60M, CD-ROM	40M, 60M, 80M, 120M, CD-ROM	50M, 60M, 70M, 80M, 90M, 100M, 120M, 150M, 300M, WORM
<b>Keyboard</b> Availability	Included (detachable)	Included (fixed position)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	94/10	94/10	101/12
<b>Video/Display</b> Video Controller/Resolution (pixels)	On included adapter/800 x 600	Integrated on system board/640 x 400	Integrated on system board/, 1280 X 960	On included adapter/320 x 200
Display	Optional	Optional	Optional	Included, 14-inch digital monochrome
<b>Local Area Network Support</b> Vendor LAN Options	Starlan	None	Ethernet	Vendor did not specify
<b>Product Design</b> Type of Unit	Floorstanding	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify	Not available	Not available	Vendor did not specify
Dimensions (H x W x D, inches)	25.5 x 7.75 x 29.38	2.75 x 18.75 x 11.5	3.75 x 19.5 x 11.25	5.00 x 21.00 x 16.50
Weight (pounds)	80.00	9.50	15.00	Vendor did not specify
AC Power Supply (watts)	Vendor did not specify	60	60	220
<b>Software</b> Operating System(s) Bundled	None	TOS	TOS	Vendor did not specify
Operating System(s) Supported	MS-DOS, Vendor MS-OS/2, UNIX	MS-DOS, TOS	MS-DOS, UNIX, TOS	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX, UNIX deriv.
Additional Software Included	BIOS, setup, util./diagn.	BIOS, operating system, comm., util./diagn., desk accessory	BIOS, operating system, comm., util./diagn., desk accessory	Vendor did not specify
<b>Service/Support</b> Distribution Channels	Computer retail, VAR/VAD, direct from vendor	Computer retail	Computer retail	VAR/VAD, direct from vendor
Parts Warranty	1 year	90 days	90 days	1 year
Labor Warranty	1 year	90 days	90 days	1 year
Service Supported by	Vendor, authorized dealers	Authorized dealers	Authorized dealers	Third party
Service Features	On site, toll free	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Base Price (\$)</b>	15,095/available for GSA	899.95	2,999.95	2,485/available for GSA

Vendor	Austin Computer Systems	Austin Computer Systems	Austin Computer Systems	Austin Computer Systems
Product	Austin 286-12.5 Cache	Austin 286-16 Cache	Austin 386-20 Cache	Austin 386-33 Cache
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/12.5	80286/16	80386/20	80386/33
Co-Processor Options	80287	80287, 80C287	80387	80387
Standard RAM (bytes)/Speed (ns)	1.0M/100	1.0M/80	1.0M/80	1.0M/80
RAM Expansion Capacity (bytes)	4.0M	1.0M, 4.0M, 16.0M	1.0M	1.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Proprietary, 32K/100	Proprietary, 8K/80	Proprietary, 64K/30	Intel, 64K/25
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	1 8-bit, 3 16-bit	8-bit, 5 16-bit	2 8-bit, 6 16-bit	2 8-bit, 5 16-bit, 1 32-bit
Available Expansion Slots	1 8-bit, 3 16-bit	8-bit, 5 16-bit	1 8-bit, 5 16-bit,	1 8-bit, 4 16-bit, 0 32-bit
Serial Ports	2 on main board	2 on main board	2 on adapter	1 on adapter
Parallel Ports	1 on main board	1 on main board	1 on adapter	1 on adapter
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	None	None	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	3 half-height, 1 third-height	3 half-height, 1 third-height	1 full-height, 3 half-height	1 full-height, 3 half-height
Diskette Drives Included (bytes)	1 1.2M; 1 1.44M	1 1.2M; 1 1.44M	1 1.2M; 1 1.44M	1 1.2M; 1 1.44M
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M
Hard Disk Interface	AT/IDE	AT/IDE	AT/IDE	AT/IDE
Hard Disk Size (bytes)/AAT (ms)	40M/28	40M/28	40M/28	40M/28
Optional Mass Storage	70M, 100M, tape drive	70M, 100M, tape drive	70M, 100M, 150M, 300M, tape drive	70M, 100M, 150M, 300M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/800 x 600	Integrated on system board/800 x 600	On included adapter/800 x 600	On included adapter/800 x 600
Display	Included, 14-inch, analog color	Included, 14-inch, analog color	Included, 14-inch, analog color	Included, 14-inch, analog color
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, Token-ring, ARCnet	Ethernet, Token-ring, ARCnet	Ethernet, Token-ring, ARCnet	Ethernet, Token-ring, ARCnet
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	Not available
Dimensions (H x W x D, inches)	8.5 x 16 x 16	8.5 x 16 x 16	6.5 x 21 x 18	6.5 x 21 x 18
Weight (pounds)	25.00	25.00	Vendor did not specify	Vendor did not specify
AC Power Supply (watts)	200	200	200	200
<b>Software</b>				
Operating System(s) Bundled	None	None	None	None
Operating System(s) Supported	Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2, UNIX derivative	Enhanced MS-DOS, MS-DOS, UNIX, UNIX derivative	Enhanced MS-DOS, MS-DOS, UNIX, UNIX derivative	Enhanced MS-DOS, MS-DOS, UNIX, UNIX derivative
Additional Software Included	Util./diagn.	Util./diagn.	Util./diagn.	Util./diagn.
<b>Service/Support</b>				
Distribution Channels	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Third party	Third party	Third party	Third party
Service Features	On site, toll free, 30-day money back	On site, toll free, 30-day money back	On site, toll free, 30-day money back	On site, toll free, 30-day money back
<b>Base Price (\$)</b>	1,995	2,195	2,995	4,795

Vendor	Austin Computer Systems	Austin Computer Systems	Blackhip Computer Systems, Inc.	Broadax Systems, Inc.
Product	Austin 386-SX	Austin 486 Cache	Blackship 286-25 MHz	BSI 386 25 MHz System BSI 386-25
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386sx/16	—/25	80286/25	80386/25
Co-Processor Options	80387SX	Integrated	80287	80387, 80287
Standard RAM (bytes)/Speed (ns)	1.0M/100	4.0M/60	1.0M/80	1.0M/80
RAM Expansion Capacity (bytes)	1.0M	4.0M	4.0M	8.0M
Maximum System RAM (bytes)	16.0M	32M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Proprietary, 64K/25	Chips & Technologies	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	2 8-bit, 6 16-bit	8-bit, 5 16-bit, 3 32-bit	2 8-bit, 5 16-bit, 1 32-bit	2 8-bit, 5 16-bit, 1 32-bit
Available Expansion Slots	1 8-bit, 5 16-bit	8-bit, 3 16-bit, 2 32-bit	0 8-bit, 4 16-bit, 0 32-bit	2 8-bit, 5 16-bit, 1 32-bit
Serial Ports	2 on adapter	2 on adapter	2 on adapter	1 on adapter
Parallel Ports	1 on adapter	2 on adapter	1 on adapter	1 on adapter
Other I/O Devices Included	None	None	Vendor did not specify	Vendor did not specify
Other I/O Interfaces	None	None	101-key keyboard port, ext. video, game port	101-key keyboard port, ext. video
<b>Mass Storage</b>				
Internal Drive Bays Available	3 half-height, 1 third-height	1 full-height, 3 half-height	2 half-height, 1 third-height	2 half-height, 1 third-height
Diskette Drives Included (bytes)	1 1.2M; 1 1.44M	1 1.2M; 1 1.44M	1 1.2M	1
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.44M
Hard Disk Interface	AT/IDE	ESDI	ST506/412	Vendor did not specify
Hard Disk Size (bytes)/AAT (ms)	40M/28	150M/18	40M/28	30M/, 25
Optional Mass Storage	70M, 100M, tape drive	40M, 70M, 100M, 300M, tape drive	40M, 70M, 80M, 120M, 150M, 300M, tape drive	20M, 30M, 50M, 60M, 70M, 80M, 90M, 100M, 120M, 150M, 300M
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/800 x 600	On included adapter/800 x 600	On included adapter/text mode only	On included adapter
Display	Included, 14-inch, analog color	Included, 14-inch, analog color	Included, 14-inch digital monochrome	Inch
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, Token-ring, ARCnet	Ethernet, Token-ring, ARCnet	Ethernet, Token-ring, ARCnet	Ethernet, Token-ring, ARCnet
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	From manufacturer
Dimensions (H x W x D, inches)	6.5 x 16 x 16	6.5 x 21 x 18	6.50 x 21.00 x 16.50	6.13 x 21.13 x 16.50
Weight (pounds)	25.00	Vendor did not specify	50.00	40.00
AC Power Supply (watts)	200	220	220	200
<b>Software</b>				
Operating System(s) Bundled	None	None	Vendor did not specify	Vendor did not specify
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX, UNIX deriv.	Enhanced MS-DOS, MS-DOS, UNIX, UNIX derivative	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX, UNIX deriv.	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2
Additional Software Included	Util./diagn.	Util./diagn.	Util./diagn.	None
<b>Service/Support</b>				
Distribution Channels	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor	Direct from vendor	Computer retail, VAR/VAD
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	90 days
Service Supported by	Third party	Third party	Vendor	Vendor
Service Features	On site, toll free, 30-day money back	On site, toll free, 30-day money back	Vendor did not specify	Vendor did not specify
<b>Base Price (\$)</b>	2,495	14,995	1,295	2,109

Vendor	Canon U.S.A., Inc.	Canon U.S.A., Inc.	Canon U.S.A., Inc.	Cardinal Technologies, Inc.
<b>Product</b>	<b>A200 EXII</b>	<b>A200 SX</b>	<b>A-200SX/25</b>	<b>PC50plus</b>
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/12	80386/16	80386/25	80386x/16
Co-Processor Options	80287	80387	80387	Vendor did not specify
Standard RAM (bytes)/Speed (ns)	1.0M/100	1.0M/100	2.0M	1.0M
RAM Expansion Capacity (bytes)	1.0M	1.0M	8.0M	8.0M
Maximum System RAM (bytes)	Vendor did not specify	16.0M	8.0M	8.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Intel, 32K	Vendor did not specify
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	8	Vendor did not specify	Vendor did not specify
Total Expansion Slots	2 8-bit, 2 16-bit, 0 32-bit	2 8-bit, 5 16-bit, 1 32-bit	1 8-bit, 6 16-bit, 2 32-bit	4 16-bit
Available Expansion Slots	2 8-bit, 1 16-bit, 0 32-bit	2 8-bit, 3 16-bit, 1 32-bit	Vendor did not specify	4 16-bit
Serial Ports	1 on main board	1 on adapter	2 on main board	1 on main board
Parallel Ports	1 on main board	1 on adapter	1 on main board	1 on main board
Other I/O Devices Included	Vendor did not specify	None	None	Vendor did not specify
Other I/O Interfaces	101-key keyboard port	101-key keyboard port	None	Mouse, ext. video
<b>Mass Storage</b>				
Internal Drive Bays Available	1 half-height	1 full-height	2 half-height	Vendor did not specify
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.44M
Diskette Drive Options (bytes)	None	None	Vendor did not specify	Vendor did not specify
Hard Disk Interface	ST506/412	Vendor did not specify	Vendor did not specify	Vendor did not specify
Hard Disk Size (bytes)/AAT (ms)	40M/28	40M/28	100M/25	40M
Optional Mass Storage	None	None	None	20M, 40M
<b>Keyboard</b>				
Availability	Optional	Optional	Optional	Included (detachable)
Number of Keys/Function Keys	Vendor did not specify	Vendor did not specify	101/12	101
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/640 x 350	Adapter optional	Adapter optional	Integrated on system board/1,024 x 768
Display	Included, 14-inch, multifrequency	Included, 14-inch, multifrequency	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Vendor did not specify	Vendor did not specify	None	Vendor did not specify
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Vendor did not specify	Vendor did not specify
Dimensions (H x W x D, inches)	4.75 x 14.13 x 16.13	6.50 x 21.00 x 17.00	6.5 x 21 x 17	5.625 x 14 x 15.5
Weight (pounds)	28.00	42.00	37.50	19.50
AC Power Supply (watts)	Vendor did not specify	200	200	Vendor did not specify
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	MS-DOS	MS-DOS	Vendor did not specify
Operating System(s) Supported	IBM PC-DOS, Enhanced MS-DOS, MS-DOS, UNIX	IBM PC-DOS, Enhanced MS-DOS, MS-DOS, UNIX	MS-DOS	MS-DOS
Additional Software Included	Util./diagn.	Util./diagn.	BIOS	Operating system
<b>Service/Support</b>				
Distribution Channels	Computer retail	Computer retail	Computer retail, general retail	Vendor did not specify
Parts Warranty	1 year	1 year	1 year	Vendor did not specify
Labor Warranty	1 year	Vendor did not specify	1 year	Vendor did not specify
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor	Vendor did not specify
Service Features	Vendor did not specify	Vendor did not specify	On site	Vendor did not specify
<b>Base Price (\$)</b>	<b>3,330/available for GSA</b>	<b>5,500/available for GSA</b>	<b>7,995/available for GSA</b>	<b>Vendor did not specify</b>

Vendor	Chartered Electronics Inc.	Chartered Electronics Inc.	Chartered Electronics Inc.	Chartered Electronics Inc.
Product	CEI 286 SINGA 286/12	CEI 286 SINGA NEAT 286/20	CEI 386 SINGA 386/20	CEI 386 SINGA 386/25
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/12	80C286/20	80386/20	80386/25
Co-Processor Options	80287	80287	80287, 80387, Weitek 1167, Weitek 3167	80387, 80287
Standard RAM (bytes)/Speed (ns)	1.0M/120	1.0M/100	1.0M/100	1.0M/80
RAM Expansion Capacity (bytes)	16.0M	8.0M	16.0M	16.0M
Maximum System RAM (bytes)	16.0M	8.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	10, 8	10, 8	12.5, 8
Total Expansion Slots	2 8-bit, 6 16-bit	2 8-bit, 6 16-bit,	2 8-bit, 4 16-bit, 1 32-bit	2 8-bit, 5 16-bit, 1 32-bit
Available Expansion Slots	Vendor did not specify	Vendor did not specify	2 8-bit, 4 16-bit, 1 32-bit	2 8-bit, 5 16-bit, 1 32-bit
Serial Ports	2 on adapter	2 on adapter	2 on adapter	2 on adapter
Parallel Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	None	None	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	1 full-height, 2 half-height, 2 third-height	1 full-height, 2 half-height, 2 third-height	1 full-height, 2 half-height, 2 third-height	1 full-height, 2 half-height, 3 third-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	1.2M, 1.44M	1.2M, 1.44M	1.2M, 1.44M	1.2M, 1.44M
Hard Disk Interface	None	None	None	None
Hard Disk Size (bytes)/AAT (ms)	None	None	None	None
Optional Mass Storage	None	None	None	None
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter	On included adapter	On included adapter	On included adapter/ optional
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	None	None	None	None
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	From manufacturer	From manufacturer	From manufacturer	From manufacturer
Dimensions (H x W x D, inches)	6.25 x 15.00 x 16.00	6.25 x 15.00 x 16.00	25 x 15 x 16	6.25 x 16.00 x 16.00
Weight (pounds)	32.00	32.00	Vendor did not specify	35.00
AC Power Supply (watts)	200	200	200	200, 220
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	MS-DOS	MS-DOS	MS-DOS
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, UNIX, UNIX derivative	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, UNIX, UNIX derivative	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, UNIX, UNIX derivative	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, UNIX, UNIX derivative
Additional Software Included	None	None	None	None
<b>Service/Support</b>				
Distribution Channels	VAR/VAD	VAR/VAD	VAR/VAD	VAR/VAD
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers
Service Features	Toll free, 30-day money back			
<b>Base Price (\$)</b>	795	995	1,395	1,695

Vendor	Chartered Electronics Inc.	Chartered Electronics Inc.	Citizen America Corp.	Citizen America Corp.
<b>Product</b>	CEI 386 SX SINGA P9	CEI 386-33 SINGA 386/33	286/16	386SX/16
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386sx/20	80386/33	80286/16	80386sx/16
Co-Processor Options	80387SX	80387, Weitek 1167, Weitek 3167	None	None
Standard RAM (bytes)/Speed (ns)	1.0M/100	1.0M/100	1.0M/100	1.0M/100
RAM Expansion Capacity (bytes)	8.0M	16.0M	8.0M	8.0M
Maximum System RAM (bytes)	8.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Proprietary, 64K/25	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT/separate memory bus, AT	AT	AT
Bus Speed (MHz)	10, 8	8	8	8
Total Expansion Slots	2 8-bit, 6 16-bit,	2 8-bit, 5 16-bit	8-bit, 5 16-bit	8-bit, 5 16-bit
Available Expansion Slots	Vendor did not specify	Vendor did not specify	8-bit, 5 16-bit	8-bit, 5 16-bit
Serial Ports	2 on adapter	2 on adapter	2 on main board	2 on main board
Parallel Ports	1 on adapter	1 on adapter	1 on main board	1 on main board
Other I/O Devices Included	None	Optional	None	None
Other I/O Interfaces	None	101-key keyboard port, ext. video	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	1 full-height, 2 half-height, 2 third-height	Vendor did not specify	3 half-height, 1 third-height	3 half-height, 1 third-height
Diskette Drives Included (bytes)	1 1.2M	Opt. 1.2M or 1.44M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	1.2M, 1.44M	360K, 1.2M, 720K, 1.44M	None	None
Hard Disk Interface	None	Optional	AT/IDE	AT/IDE
Hard Disk Size (bytes)/AAT (ms)	None	Optional	None	None
Optional Mass Storage	None	20M, 40M, 80M, 100M, 120M, 300M	None	None
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter	On included adapter/640 x 480	Adapter optional	Adapter optional
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	None	Optional	None	None
<b>Product Design</b>				
Type of Unit	Desktop	Floorstanding	Desktop	Desktop
Tempest Version	From manufacturer	From manufacturer	Not available	Not available
Dimensions (H x W x D, inches)	25 x 15 x 16	23.5 x 6.5 x 29.5	Vendor did not specify	Vendor did not specify
Weight (pounds)	32.00	Vendor did not specify	Vendor did not specify	Vendor did not specify
AC Power Supply (watts)	200	220	140	140
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	Optional	MS-DOS	MS-DOS
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, UNIX, UNIX derivative	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2	Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2, UNIX derivative
Additional Software Included	None	BIOS, setup, diagnostics, util./diagn., Setup program	BIOS, setup, diagnostics, operating system, util./diagn., Turbo Pascal	BIOS, setup, diagnostics, operating system, util./diagn., Turbo Pascal
<b>Service/Support</b>				
Distribution Channels	VAR/VAD	VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers	Authorized dealers	Authorized dealers, third party	Authorized dealers, third party
Service Features	Toll free, 30-day money back	30-day money back	Vendor did not specify	Vendor did not specify
<b>Base Price (\$)</b>	1,095	3,695	Vendor did not specify	Vendor did not specify

Vendor	Club American Technology, Inc.			
Product	210	210D	212	212D
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/10	80286/10	80286/12	80286/12
Co-Processor Options	80287	80287	80287	80287
Standard RAM (bytes)/Speed (ns)	512K/120	512K/120	1.0M/100	1.0M/100
RAM Expansion Capacity (bytes)	1.0M	1.0M	1.0M	1.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	8	12	12
Total Expansion Slots	2 8-bit, 6 16-bit	2 8-bit, 6 16-bit	4 8-bit, 4 16-bit	4 8-bit, 4 16-bit
Available Expansion Slots	2 8-bit, 5 16-bit	2 8-bit, 5 16-bit	4 8-bit, 3 16-bit	4 8-bit, 3 16-bit
Serial Ports	On main board	1 on adapter	1 on adapter	1 on adapter
Parallel Ports	On main board	1 on adapter	1 on adapter	1 on adapter
Other I/O Devices Included	Vendor did not specify			
Other I/O Interfaces	None	None	None	Vendor did not specify
<b>Mass Storage</b>				
Internal Drive Bays Available	5 half-height	3 half-height	3 half-height	3 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M			
Hard Disk Interface	ST506/412	ST506/412	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	None	None	None	None
Optional Mass Storage	20M, 40M, 70M, 90M, 100M, 150M, 300M, 650M, tape drive	20M, 40M, 70M, 90M, 100M, 150M, 300M, 650M, tape drive	20M, 40M, 70M, 90M, 120M, 150M, 650M, tape drive	20M, 40M, 70M, 100M, 150M, 300M, 650M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	Adapter optional	Adapter optional
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, ARCnet	Ethernet, ARCnet	Ethernet, ARCnet	Ethernet, ARCnet
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	Not available
Dimensions (H x W x D, inches)	5.75 x 21.25 x 16.50	6.20 x 17.20 x 16.50	5.75 x 21.25 x 16.50	6.20 x 17.20 x 16.50
Weight (pounds)	50.00	40.00	40.00	40.00
AC Power Supply (watts)	200	200	200	200
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify			
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX, UNIX deriv.	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX, UNIX deriv.	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX, UNIX deriv.	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2 None
Additional Software Included	None	None	None	None
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD, direct from vendor			
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Third party	Third party	Vendor, authorized dealers, third party	Vendor, authorized dealers, third party
Service Features	On site, 30-day money back	30-day money back	On site, 30-day money back	On site, 30-day money back
<b>Base Price (\$)</b>	842	803	1,092	1,053

Vendor	Club American Technology, Inc.			
<b>Product</b>	3168X	320	325C	325CT
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386sx/16	80386/20	80386/25	80386/25
<b>Co-Processor Options</b>	80387SX	80387	80387	80387
<b>Standard RAM (bytes)/Speed (ns)</b>	1.0M/80	1.0M/80	1.0M/80	1.0M/80
<b>RAM Expansion Capacity (bytes)</b>	2.0M	1.0M	2.0M	2.0M
<b>Maximum System RAM (bytes)</b>	16.0M	16.0M	16.0M	16.0M
<b>RAM Cache, Size (bytes)/Speed (ns)</b>	Not supported	Not supported	Proprietary, 64K/25	Proprietary, 64K/25
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	8	12.5, 8.33	12.5, 8.33
Total Expansion Slots	2 8-bit, 6 16-bit	8-bit, 6 16-bit, 2 32-bit	1 8-bit, 6 16-bit, 1 32-bit	1 8-bit, 6 16-bit, 1 32-bit
Available Expansion Slots	2 8-bit, 5 16-bit	8-bit, 5 16-bit, 2 32-bit	1 8-bit, 5 16-bit, 1 32-bit	1 8-bit, 5 16-bit, 1 32-bit
Serial Ports	1 on adapter	2 on main board	1 on adapter	1 on adapter
Parallel Ports	1 on adapter	1 on main board	1 on adapter	1 on adapter
Other I/O Devices Included	Vendor did not specify			
Other I/O Interfaces	None	None	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	3 half-height	5 half-height	5 half-height	5 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M			
Hard Disk Interface	ST506/412	ST506/412	ESDI	ESDI
Hard Disk Size (bytes)/AAT (ms)	None	None	None	None
Optional Mass Storage	20M, 40M, 70M, 90M, 100M, 150M, 300M, 650M, tape drive	20M, 40M, 70M, 90M, 100M, 150M, 300M, 650M, tape drive	20M, 40M, 70M, 90M, 100M, 150M, 300M, 650M, tape drive	20M, 40M, 70M, 90M, 100M, 150M, 300M, 650M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	Adapter optional	Adapter optional
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, ARCnet	Ethernet, ARCnet	Ethernet, ARCnet	Ethernet, ARCnet
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Floorstanding
Tempest Version	Not available	Not available	Not available	Not available
Dimensions (H x W x D, inches)	6.20 x 17.20 x 16.50	5.75 x 21.25 x 16.50	5.75 x 21.25 x 16.50	25.00 x 7.00 x 18.50
Weight (pounds)	Vendor did not specify	50.00	Vendor did not specify	Vendor did not specify
AC Power Supply (watts)	200	200	200	250
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify			
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX, UNIX deriv.	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX, UNIX deriv.	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX, UNIX deriv.	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX, UNIX deriv.
Additional Software Included	None	None	None	None
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD, direct from vendor			
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers, third party			
Service Features	On site, 30-day money back			
<b>Base Price (?)</b>	1,345	1,855	2,571	2,857

Vendor	Club American Technology, Inc.	Club American Technology, Inc.	Club American Technology, Inc.	Club American Technology, Inc.
Product	333C	333CT	Club 316	Hawk II Tower
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/33	80386/33	80386/16	I486/25
Co-Processor Options	80387, Weitek 3167	80387	80287	Weitek 4167
Standard RAM (bytes)/Speed (ns)	2.0M/100	2.0M/100	1.0M/80	4.0M/100
RAM Expansion Capacity (bytes)	2.0M	2.0M	1.0M	8.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Proprietary, 64K/25	Proprietary, 64K/25	Proprietary, 64K/25	Proprietary, 256K/20
<b>Input/Output</b>				
Bus Architecture	AT	XT	AT	AT
Bus Speed (MHz)	16.66	16.66	8	12.5
Total Expansion Slots	1 8-bit, 6 16-bit, 1 32-bit	1 8-bit, 6 16-bit, 1 32-bit	2 8-bit, 6 16-bit	8-bit, 7 16-bit, 1 32-bit
Available Expansion Slots	0 8-bit, 5 16-bit, 1 32-bit	0 8-bit, 5 16-bit, 1 32-bit	2 8-bit, 5 16-bit	8-bit, 5 16-bit, 1 32-bit
Serial Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
Parallel Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
Other I/O Devices Included	None	None	Vendor did not specify	None
Other I/O Interfaces	101-key keyboard port	101-key keyboard port	None	101-key keyboard port
<b>Mass Storage</b>				
Internal Drive Bays Available	1 full-height, 3 half-height	2 full-height, 4 half-height	5 half-height	2 full-height, 4 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M
Hard Disk Interface	ESDI	ESDI	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	Vendor did not specify	None	None	71M/18
Optional Mass Storage	Tape drive	40M, 70M, 150M, 650M, tape drive	20M, 40M, 70M, 100M, 150M, 300M, 650M, tape drive	150M, 300M, 650M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	Adapter optional	On included adapter/1,024 x 768
Display	Included	Included	Optional	Included, 14-inch, multifrequency
<b>Local Area Network Support</b>				
Vendor LAN Options	None	None	Ethernet, ARCnet	None
<b>Product Design</b>				
Type of Unit	Desktop	Floorstanding	Desktop	Floorstanding
Tempest Version	Vendor did not specify	Not available	Not available	Not available
Dimensions (H x W x D, inches)	5.75 x 21.25 x 16.5	25 x 7 x 18.5	5.75 x 21.25 x 16.60	25 x 7 x 18.5
Weight (pounds)	50.00	70.00	Vendor did not specify	70.00
AC Power Supply (watts)	200	250	200	250
<b>Software</b>				
Operating System(s) Bundled	None	None	Vendor did not specify	None
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX, UNIX deriv.	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS
Additional Software Included	BIOS, setup, diagnostics	BIOS, setup, diagnostics	None	BIOS, setup, diagnostics
<b>Service/Support</b>				
Distribution Channels	Computer retail	Direct from vendor	Computer retail, VAR/VAD, direct from vendor	Computer retail, direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor	Vendor	Vendor, authorized dealers, third party	Vendor
Service Features	30-day money back	30-day money back	On site, 30-day money back	30-day money back
<b>Base Price (\$)</b>	3,642	3,975	1,971	4,995

Vendor	Comark Corp.	Comark Corp.	Commodore International Ltd.	Commodore International Ltd.
Product	IWS 286	IWS 386	Amiga A2000	Amiga A2000HD
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/20	80386/25	68000/7.14	68000/7.14
Co-Processor Options	80287	80387	68020, 68030	68020, 68030, 6888 1/2
Standard RAM (bytes)/Speed (ns)	1.0M/85	2.0M/85	1.0M/120	1.0M/120
RAM Expansion Capacity (bytes)	8.0M	16.0M	1.0M	9M
Maximum System RAM (bytes)	16.0M	16.0M	9M	9M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Proprietary, variable	Proprietary, variable
<b>Input/Output</b>				
Bus Architecture	AT passive backplane	AT passive backplane	Amiga	XT, Amiga Bus
Bus Speed (MHz)	8	8	Vendor did not specify	Vendor did not specify
Total Expansion Slots	2 8-bit, 8 16-bit	2 8-bit, 8 16-bit	2 8-bit, 2 16-bit	2 8-bit
Available Expansion Slots	Vendor did not specify	Vendor did not specify	2 8-bit	2 8-bit
Serial Ports	2 on adapter	1 on adapter	1 on main board	1 on main board
Parallel Ports	1 on adapter	1 on adapter	1 on main board	1 on main board
Other I/O Devices Included	None	None	Mouse	Mouse
Other I/O Interfaces	None	None	Mouse, ext. diskette drive, 101-key keyboard port, ext. video, audio	Mouse, SCSI, ext. diskette drive, 101-key keyboard port, ext. hard disk, audio
<b>Mass Storage</b>				
Internal Drive Bays Available	3 half-height	3 half-height	1 half-height, 2 third-height	1 half-height, 2 third-height
Diskette Drives Included (bytes)	1 1.44M	1 1.44M	1 880K	1 880K
Diskette Drive Options (bytes)	360K, 1.2M, 720K	360K, 1.2M, 720K	360K, 1.2M, 720K, 1.44M, 800, 400	360K, 1.2M, 720K, 1.44M, 800K, 400K
Hard Disk Interface	ST506/412	ST506/412	ST506/412, ESDI, SCSI	ST506/412, SCSI
Hard Disk Size (bytes)/AAT (ms)	40M/28	100M, 40M/28	None	40M/28
Optional Mass Storage	20M, 100M, tape drive	20M, tape drive	40M	None
<b>Keyboard</b>				
Availability	Included (fixed position)	Included (fixed position)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101, 84/15, 10	101/15	101/10	101/10
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/1,024 x 768	On included adapter	Integrated on system board/768 x 480	Integrated on system board/, 768 x 480
Display	Included, 19-inch, analog color	Included, 19-inch, analog color	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, ARCnet, MAP	Ethernet, ARCnet, MAP	Ethernet, ARCnet	Ethernet, ARCnet
<b>Product Design</b>				
Type of Unit	Floorstanding	Floorstanding	Desktop	Desktop
Tempest Version	Not available	Not available	Vendor did not specify	Not available
Dimensions (H x W x D, inches)	63 x 24 x 24.5	63 x 24 x 24.5	6.00 x 17.40 x 15.40	6.00 x 17.40 x 15.40
Weight (pounds)	275.00	275.00	22.00	25.00
AC Power Supply (watts)	200	200	200	200
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify	None	Amiga DOS	Amiga DOS
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, UNIX, UNIX derivative	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, UNIX, UNIX derivative	Vendor did not specify	IBM OS/2 Standard, MS-DOS, Vendor MS-OS/2, UNIX derivative
Additional Software Included	Windows, DesqView, util./diagn.	Windows, DesqView	Util./diagn., desk accessory	Util./diagn., desk accessory
<b>Service/Support</b>				
Distribution Channels	Direct from vendor	Direct from vendor	Computer retail, VAR/VAD	Computer retail, VAR/VAD
Parts Warranty	1 year	1 year	90 days	90 days
Labor Warranty	1 year	1 year	90 days	90 days
Service Supported by	Vendor	Vendor	Authorized dealers, third party	Authorized dealers, third party
Service Features	On site	On site	Vendor did not specify	Vendor did not specify
<b>Base Price (\$)</b>	14,000	6,000	2,195/available for GSA	2,999/available for GSA

Vendor	Commodore International Ltd.	Commodore International Ltd.	Compaq Computer Corp.	Compaq Computer Corp.
Product	Amiga A2500	Amiga A500	DESKPRO 286e 1	DESKPRO 286e 20
Processor/Memory CPU/Clock Speed (MHz)	68020/14.28	68000/7.14	80286/12	80286/12
Co-Processor Options	68881, 68851, 68030, 68882	68020, 68030	80287, 80C287	80287, 80C287
Standard RAM (bytes)/Speed (ns)	3M/120	512K/120	1.0M	1.0M
RAM Expansion Capacity (bytes) Maximum System RAM (bytes) RAM Cache, Size (bytes)/Speed (ns)	9M 9M Proprietary, variable	1.0M 9M Proprietary, variable	1.0M Vendor did not specify Not supported	1.0M Vendor did not specify Not supported
Input/Output Bus Architecture Bus Speed (MHz) Total Expansion Slots	XT, Amiga Bus Vendor did not specify 2 8-bit	AT Vendor did not specify 1 16-bit	Split AT 8 4 16-bit, 1 32-bit	Split AT 8 4 16-bit, 1 32-bit
Available Expansion Slots	2 8-bit	1 16-bit	4 16-bit, 1 32-bit	4 16-bit, 1 32-bit
Serial Ports	1 on main board	1 on main board	1 on main board	1 on main board
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on main board
Other I/O Devices Included	Mouse	Mouse	Vendor did not specify	Vendor did not specify
Other I/O Interfaces	Mouse, SCSI, ext. diskette drive, 101-key keyboard port, ext. video, ext. hard disk, audio	Mouse, 101-key keyboard port, expansion unit	Mouse	Mouse
Mass Storage Internal Drive Bays Available	1 half-height, 2 third-height	1 third-height	1 half-height, 3 third-height	1 half-height, 3 third-height
Diskette Drives Included (bytes)	1 880K	1 880K	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M, 800, 400	360K, 1.2M, 720K, 1.44M, 800K, 400K	360K, 1.44M	360K, 1.44M
Hard Disk Interface	ST506/412	ESDI, SCSI	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	40M/28	Vendor did not specify	None	20M/, 29
Optional Mass Storage	Vendor did not specify	20M	20M, 40M, 110M, tape drive	40M, 110M, tape drive
Keyboard Availability Number of Keys/Function Keys	Included (detachable) 101/10	Included (fixed position) 101/10	Included (detachable) 101/12	Included (detachable) 101/12
Video/Display Video Controller/Resolution (pixels) Display	Integrated on system board/768 x 480 Optional	Integrated on system board/768 x 480 Optional	Integrated on system board/640 x 480 Optional	Integrated on system board/640 x 480 Optional
Local Area Network Support Vendor LAN Options	Ethernet, ARCnet	Ethernet, ARCnet	Vendor did not specify	Vendor did not specify
Product Design Type of Unit Tempest Version Dimensions (H x W x D, inches) Weight (pounds) AC Power Supply (watts)	Desktop Vendor did not specify 6.00 x 17.40 x 15.40 26.00 200	Desktop Vendor did not specify 2.44 x 12.75 x 18.50 8.00 Vendor did not specify	Desktop Vendor did not specify 5.90 x 15.80 x 14.80 24.00 140	Desktop Vendor did not specify 5.90 x 15.80 x 14.80 28.00 140
Software Operating System(s) Bundled	Amiga LOS	Amiga DOS	Vendor did not specify	Vendor did not specify
Operating System(s) Supported	Vendor did not specify	MS-DOS	Enhanced MS-DOS, Vendor MS-OS/2	Enhanced MS-DOS, Vendor MS-OS/2
Additional Software Included	Util./diagn., desk accessory	Util./diagn., desk accessory	Util./diagn.	Util./diagn.
Service/Support Distribution Channels	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail	Computer retail
Parts Warranty Labor Warranty Service Supported by	90 days Vendor did not specify Authorized dealers, third party	90 days 90 days Authorized dealers, third party	1 year 1 year Authorized dealers	1 year 1 year Authorized dealers
Service Features	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Base Price (\$)	4,699/available for GSA	799/available for GSA	2,699	3,199/available for GSA

Vendor	Compaq Computer Corp.	Compaq Computer Corp.	Compaq Computer Corp.	Compaq Computer Corp.
Product	DESKPRO 286e 40	DESKPRO 386/20e 1	DESKPRO 386/20e 110	DESKPRO 386/20e 40
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/12	80386/20	80386/20	80386/20
Co-Processor Options	80287, 80C287	80387, Weitek 3167	80387, Weitek 3167	80387, Weitek 3167
Standard RAM (bytes)/Speed (ns)	1.0M	1.0M/100	1.0M/100	1.0M/100
RAM Expansion Capacity (bytes)	1.0M	4.0M	4.0M	4.0M
Maximum System RAM (bytes)	Vendor did not specify	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Intel, 32K/35	Intel, 32K/35	Intel, 32K/35
<b>Input/Output</b>				
Bus Architecture	Split AT	Split AT	Split AT	Split AT
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	4 16-bit, 1 32-bit	4 16-bit, 1 32-bit	4 16-bit, 1 32-bit	4 16-bit, 1 32-bit
Available Expansion Slots	8-bit, 4 16-bit, 1 32-bit	8-bit, 4 16-bit, 1 32-bit	4 16-bit, 1 32-bit	4 16-bit, 1 32-bit
Serial Ports	1 on main board	1 on main board	1 on main board	1 on main board
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on main board
Other I/O Devices Included	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Other I/O Interfaces	Mouse	Mouse	Mouse	Mouse
<b>Mass Storage</b>				
Internal Drive Bays Available	1 half-height, 3 third-height	1 half-height, 3 third-height	1 half-height, 3 third-height	1 half-height, 3 third-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	360K, 1.44M	360K, 1.44M	360K, 1.44M	1.44M
Hard Disk Interface	ST506/412	ST506/412	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	40M/29	None	110M/, 25	40M/, 29
Optional Mass Storage	20M, 110M, tape drive	40M, 110M, tape drive	40M, tape drive	110M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/640 x 480	Integrated on system board/640 x 480	Integrated on system board/640 x 480	Integrated on system board/640 x 480
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Dimensions (H x W x D, inches)	5.90 x 15.80 x 14.80	5.90 x 15.80 x 14.80	5.90 x 15.80 x 14.80	5.90 x 15.80 x 14.80
Weight (pounds)	28.00	27.00	28.00	28.00
AC Power Supply (watts)	140	140	140	140
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Operating System(s) Supported	Enhanced MS-DOS, Vendor MS-OS/2	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative
Additional Software Included	Util./diagn.	Util./diagn.	Util./diagn.	Util./diagn.
<b>Service/Support</b>				
Distribution Channels	Computer retail	Computer retail	Computer retail	Computer retail
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Authorized dealers	Authorized dealers	Authorized dealers	Authorized dealers
Service Features	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Base Price (\$)</b>	3,599/available for GSA	5,199/available for GSA	6,999	6,099

Vendor	Compaq Computer Corp.	Compaq Computer Corp.	Compaq Computer Corp.	Compaq Computer Corp.
<b>Product</b>	<b>DESKPRO 386/25 110</b>	<b>DESKPRO 386/25 300</b>	<b>DESKPRO 386/25 60</b>	<b>DESKPRO 386/25 84</b>
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/25	80386/25	80386/25	80386sx/25
Co-Processor Options	80387	80387, Weitek 3167	80387, Weitek 3167	Vendor did not specify
Standard RAM (bytes)/Speed (ns)	1.0M/100	1.0M/100	1.0M/100	1.0M/100
RAM Expansion Capacity (bytes)	1.0M	1.0M	12M	1.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Intel, 32K/25	Intel, 32K/25	Intel, 32K/25	Intel, 32K/25
<b>Input/Output</b>				
Bus Architecture	Split AT	Split AT	Split AT	AT
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	2 8-bit, 5 16-bit, 1 32-bit			
Available Expansion Slots	2 8-bit, 3 16-bit			
Serial Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
Parallel Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
Other I/O Devices Included	Vendor did not specify			
Other I/O Interfaces	None	None	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	4 half-height	4 half-height	4 half-height	4 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	360K, 1.44M	360K, 1.44M	360K, 1.44M	360K, 1.44M
Hard Disk Interface	ST506/412	AT/IDE	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	110M/25	300M/19	60M/28	84/, 25
Optional Mass Storage	60M, 300M, tape drive	60M, 110M, tape drive	300M, 110M, tape drive	60M, 300M, 110M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/640 x 480			
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Vendor did not specify			
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify			
Dimensions (H x W x D, inches)	6.40 x 19.80 x 16.50	6.40 x 19.80 x 16.50	6.40 x 19.80 x 16.50	6.4 x 19.8 x 16.5
Weight (pounds)	42.00	44.00	42.00	42.00
AC Power Supply (watts)	192	192	192	192
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify			
Operating System(s) Supported	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative	IBM PC-DOS, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2, UNIX derivative
Additional Software Included	Util./diagn.	Util./diagn.	Util./diagn.	Util./diagn.
<b>Service/Support</b>				
Distribution Channels	Computer retail	Computer retail	Computer retail	Computer retail, VAR/VAD
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Authorized dealers	Authorized dealers	Authorized dealers	Authorized dealers
Service Features	Vendor did not specify			
<b>Base Price (\$)</b>	<b>8,999/available for GSA</b>	<b>11,999/available for GSA</b>	<b>8,299/available for GSA</b>	<b>8,499</b>

Vendor	Compaq Computer Corp.	Compaq Computer Corp.	Compaq Computer Corp.	Compaq Computer Corp.
Product	DESKPRO 386/33 320	DESKPRO 386/33 650	DESKPRO 386/33 84	DESKPRO 386S 1
Processor/Memory CPU/Clock Speed (MHz)	80386/33	80386/33	80386/33	80386sx/16
Co-Processor Options	80387, Weitek 3167	80387, Weitek 3167	80387, Weitek 3167	80387SX
Standard RAM (bytes)/Speed (ns)	2.0M/80	2.0M/80	2.0M/80	1.0M
RAM Expansion Capacity (bytes)	2.0M	2.0M	2.0M	1.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	13M
RAM Cache, Size (bytes)/Speed (ns)	Intel, 64K/25	Intel, 64K/25	Intel, 64K/25	Not supported
Input/Output Bus Architecture	Split AT 8	Split AT 8	Split AT 8	Split AT 8
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	1 8-bit, 6 16-bit, 1 32-bit	1 8-bit, 6 16-bit, 1 32-bit	1 8-bit, 6 16-bit, 1 32-bit	8-bit, 5 16-bit
Available Expansion Slots	1 8-bit, 5 16-bit, 1 32-bit	1 8-bit, 5 16-bit, 1 32-bit	1 8-bit, 5 16-bit, 1 32-bit	8-bit, 4 16-bit
Serial Ports	1 on main board			
Parallel Ports	1 on main board			
Other I/O Devices Included	Vendor did not specify			
Other I/O Interfaces	Mouse	Mouse	Mouse	Mouse
Mass Storage				
Internal Drive Bays Available	4 half-height	4 half-height	4 half-height, third-height	1 half-height, 3 third-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	360K, 1.44M	360K, 1.44M	360K, 1.44M	360K, 1.44M
Hard Disk Interface	ESDI	ESDI	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	320M	650M/, 18	84M/, 25	None
Optional Mass Storage	300M, tape drive	300M, tape drive	300M, tape drive	84M 110M, tape drive
Keyboard Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
Video/Display Video Controller/Resolution (pixels)	Integrated on system board/640 x 480			
Display	Optional	Optional	Optional	Optional
Local Area Network Support Vendor LAN Options	Vendor did not specify			
Product Design Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify			
Dimensions (H x W x D, inches)	6.50 x 19.20 x 17.70	6.50 x 19.20 x 17.70	6.50 x 19.20 x 17.70	5.90 x 15.80 x 14.80
Weight (pounds)	40.00	43.00	38.00	27.00
AC Power Supply (watts)	300	300	300	140
Software Operating System(s) Bundled	Vendor did not specify			
Operating System(s) Supported	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative			
Additional Software Included	Util./diagn.	Util./diagn.	Util./diagn.	Util./diagn.
Service/Support Distribution Channels	Computer retail	Computer retail	Computer retail	Computer retail
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Authorized dealers	Authorized dealers	Authorized dealers	Authorized dealers
Service Features	Vendor did not specify			
Base Price (\$)	14,999/available for GSA	17,999/available for GSA	10,499/available for GSA	3,299/available for GSA

Vendor	Compaq Computer Corp.	Compaq Computer Corp.	Compaq Computer Corp.	Compaq Computer Corp.
Product	DESKPRO 386S 40	DESKPRO 386S 84	DESKPRO 486/25 120	DESKPRO 486/25 320
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386sx/16	80386sx/16	1486/25	1486/25
Co-Processor Options	80387SX	80387SX	On chip, Weitek 4167	On chip, Weitek 4167
Standard RAM (bytes)/Speed (ns)	1.0M	1.0M	4.0M/80	4.0M/80
RAM Expansion Capacity (bytes)	1.0M	1.0M	1.0M	1.0M
Maximum System RAM (bytes)	13M	13M	100M	100M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Proprietary, 128K	Proprietary, 128K
<b>Input/Output</b>				
Bus Architecture	Split AT	Split AT	EISA	EISA
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	8-bit, 5 16-bit	8-bit, 5 16-bit	0 8-bit, 7 16-bit, 1 32-bit	0 8-bit, 7 16-bit, 1 32-bit
Available Expansion Slots	8-bit, 4 16-bit	8-bit, 4 16-bit	8-bit, 7 16-bit, 1 32-bit	7 16-bit, 1 32-bit
Serial Ports	1 on main board	1 on main board	1 on main board	1 on main board
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on main board
Other I/O Devices Included	Vendor did not specify	Vendor did not specify	None	None
Other I/O Interfaces	Mouse	Mouse	Mouse	Mouse
<b>Mass Storage</b>				
Internal Drive Bays Available	1 half-height, 3 third-height	1 half-height, 3 third-height	1 full-height, 4 half-height	1 full-height, 4 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	360K, 1.44M	360K, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M
Hard Disk Interface	ST506/412	ST506/412	ESDI	ESDI
Hard Disk Size (bytes)/AAT (ms)	40M/, 29	84M/, 25	120M/18	320M/18
Optional Mass Storage	110M, tape drive	40M, 110M, tape drive	120M, 300M, 210M, 320M, 650M, tape drive	120M, 210M, 320M, 650M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/640 x 480	Integrated on system board/640 x 480	Integrated on system board/640 x 480	Integrated on system board/640 x 480
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Vendor did not specify	Vendor did not specify	None	None
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify	Vendor did not specify	Not available	Not available
Dimensions (H x W x D, inches)	5.90 x 15.80 x 14.80	5.90 x 15.80 x 14.80	6.5 x 19.2 x 17.7	6.5 x 19.2 x 17.7
Weight (pounds)	28.00	28.00	40.40	40.40
AC Power Supply (watts)	140	140	300	300
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify	Vendor did not specify	None	None
Operating System(s) Supported	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative, COMPAQ LAN Manager	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative, Compaq LAN Manager
Additional Software Included	Util./diagn.	Util./diagn.	Util./diagn.	None, util./diagn.
<b>Service/Support</b>				
Distribution Channels	Computer retail	Computer retail	Computer retail	Computer retail
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Authorized dealers	Authorized dealers	Authorized dealers	Authorized dealers
Service Features	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Base Price (\$)</b>	4,199	4,699/available for GSA	13,999	17,499

Vendor	Compaq Computer Corp.	Compuadd Corp.	Compuadd Corp.	Compuadd Corp.
<b>Product</b>	<b>DESKPRO 486/25 650</b>	<b>212W 64760</b>	<b>288/12</b>	<b>288/16</b>
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	1486/25	80286/12	80286/12	80286/16
Co-Processor Options	On chip, Weitek 4167	80287	80287	80287
Standard RAM (bytes)/Speed (ns)	4.0M/80	512K/100	512K/80	1.0M/80
RAM Expansion Capacity (bytes)	1.0M	1.0M	1.0M	5.0M
Maximum System RAM (bytes)	100M	4.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Proprietary, 128K	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	EISA	AT	AT	AT
Bus Speed (MHz)	8	6	6	8
Total Expansion Slots	0 8-bit, 7 16-bit, 1 32-bit	2 8-bit, 3 16-bit	2 8-bit, 6 16-bit	2 8-bit, 6 16-bit
Available Expansion Slots	7 16-bit, 1 32-bit	2 8-bit, 3 16-bit	1 8-bit, 5 16-bit	1 8-bit, 5 16-bit
Serial Ports	1 on main board	2 on main board	Vendor did not specify	2 on main board
Parallel Ports	1 on main board	1 on main board	1 on adapter	1 on main board
Other I/O Devices Included	None	None	Vendor did not specify	Vendor did not specify
Other I/O Interfaces	Mouse	101-key keyboard port	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	1 full-height, 4 half-height	1 half-height, 1 third-height	1 full-height	1 full-height
Diskette Drives Included (bytes)	1 1.2M	None	1 360K; 1 1.2M	1 1.2M; 1 1.44M
Diskette Drive Options (bytes)	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M
Hard Disk Interface	ESDI	AT/IDE	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	650M/18	None	30M/65	40M/65
Optional Mass Storage	120M, 300M, 210M, 320M, 650M, tape drive	20M, 40M, 80M, 150M, 110M, tape drive	30M, 40M, 60M, 70M, 80M, 90M, 150M, 300M, 320M, tape drive	60M, 70M, 80M, 90M, 150M, 320M, tape drive
<b>Keyboard Availability</b>				
Number of Keys/Function Keys	Included (detachable) 101/12	Included (detachable) 101/12	Vendor did not specify Vendor did not specify	Included (detachable) 101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/640 x 480	Adapter optional	On included adapter/720 X 348	On included adapter/720 X 348
Display	Optional	Optional	Included, 12-inch, analog color	Included, 12-inch, digital monochrome
<b>Local Area Network Support</b>				
Vendor LAN Options	None	Ethernet, Token-ring, ARCnet	Vendor did not specify	Vendor did not specify
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	Not available
Dimensions (H x W x D, inches)	6.5 x 19.2 x 17.7	4.0 x 16.4 x 15.5	6.31 x 21.12 x 16.87	6.31 x 21.12 x 16.87
Weight (pounds)	40.40	Vendor did not specify	Vendor did not specify	Vendor did not specify
AC Power Supply (watts)	300	145	200	200
<b>Software</b>				
Operating System(s) Bundled	None	None	Vendor did not specify	Vendor did not specify
Operating System(s) Supported	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative, Compaq LAN Manager	IBM PC-DOS, MS-DOS	IBM PC-DOS, Enhanced MS-DOS, MS-DOS	IBM PC-DOS, Enhanced MS-DOS, MS-DOS
Additional Software Included	Util./diagn.	BIOS, setup, util./diagn.	Vendor did not specify	Vendor did not specify
<b>Service/Support</b>				
Distribution Channels	Computer retail	Vendor did not specify	Computer retail, direct from vendor	Computer retail, direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Authorized dealers	Vendor	Vendor	Vendor
Service Features	Vendor did not specify	Toll free, 30-day money back	Toll free	Toll free, 30-day money back
<b>Base Price (\$)</b>	<b>3,999</b>	<b>795</b>	<b>895</b>	<b>995</b>

Vendor	Compuadd Corp.	Compuadd Corp.	Compuadd Corp.	Compuadd Corp.
Product	286/20	316S 64787	386/16	386/20
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/20	80386sx/16	80386/16	80386/20
Co-Processor Options	80287	80387SX	80387, Weitek 3167	80387
Standard RAM (bytes)/Speed (ns)	1.0M/80	1.0M/100	1.0M/80	1.0M/80
RAM Expansion Capacity (bytes)	5.0M	1.0M	1.0M	16.0M
Maximum System RAM (bytes)	16.0M	4.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Proprietary, 32K/30
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	8	8	10
Total Expansion Slots	2 8-bit, 6 16-bit	3 8-bit, 2 16-bit	2 8-bit, 5 16-bit	1 8-bit, 6 16-bit
Available Expansion Slots	1 8-bit, 5 16-bit	Vendor did not specify	1 8-bit, 4 16-bit	8-bit, 5 16-bit
Serial Ports	2 on main board	2 on main board	On main board	2 on main board
Parallel Ports	1 on main board	1 on main board	1 on adapter	1 on main board; 1 on adapter
Other I/O Devices Included	Vendor did not specify	None	Vendor did not specify	Vendor did not specify
Other I/O Interfaces	None	101-key keyboard port	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	1 full-height	1 half-height, 1 third-height	1 full-height	1 full-height
Diskette Drives Included (bytes)	1 1.2M; 1 1.44M	1 1.2M	1 1.2M; 1 1.44M	1 1.2M; 1 1.44M
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M	1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M
Hard Disk Interface	ST506/412	AT/IDE	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	40M/65	None	40M/65	40M/65
Optional Mass Storage	60M, 70M, 80M, 90M, 150M, tape drive	20M, 40M, 80M, 150M, 110M, tape drive	70M, 80M, 90M, 150M, tape drive	70M, 80M, 90M, 150M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	Vendor did not specify	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/720 X 348	Adapter optional	On included adapter/720 X 348	On included adapter/720 X 348
Display	Included, 12-inch, digital monochrome	Optional	Included, 12-inch, digital monochrome	Included, 12-inch, digital monochrome
<b>Local Area Network Support</b>				
Vendor LAN Options	Vendor did not specify	Ethernet, Token-ring, ARCnet	Vendor did not specify	Vendor did not specify
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	Not available
Dimensions (H x W x D, inches)	6.31 x 21.12 x 16.87	4.0 x 16.4 x 15.5	6.31 x 21.12 x 16.87	6.31 x 21.12 x 16.87
Weight (pounds)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
AC Power Supply (watts)	200	145	200	200
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify	None	Vendor did not specify	Vendor did not specify
Operating System(s) Supported	IBM PC-DOS, Enhanced MS-DOS, MS-DOS	IBM PC-DOS, MS-DOS	IBM PC-DOS, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2	IBM PC-DOS, Enhanced MS-DOS, MS-DOS
Additional Software Included	Vendor did not specify	BIOS, setup, util./diagn.	Vendor did not specify	None
<b>Service/Support</b>				
Distribution Channels	Computer retail, direct from vendor	Vendor did not specify	Computer retail, direct from vendor	Computer retail, direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, third party	Third party	Vendor, third party	Vendor, third party
Service Features	On site, toll free, 30-day money back	On site, toll free, 30-day money back	On site, toll free, 30-day money back	On site, toll free, 30-day money back
Base Price (\$)	1,704	1,495	1,904	2,350

Vendor	Compuadd Corp.	Compuadd Corp.	Cordata, Inc.	Cordata, Inc.
<b>Product</b>	386/25	810 64700	Daewoo CPC-8105	Daewoo CPC-8110
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/25	NEC V-20/9.54	80386sx/16	80386sx/16
Co-Processor Options	80387	8087	80387SX	80387SX
Standard RAM (bytes)/Speed (ns)	1.0M/80	640K/100	1.0M	1.0M
RAM Expansion Capacity (bytes)	16.0M	640K	8.0M	8.0M
Maximum System RAM (bytes)	16.0M	640K	8.0M	8.0M
RAM Cache, Size (bytes)/Speed (ns)	Proprietary, 32K/30	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	XT	AT	AT
Bus Speed (MHz)	10	6	Vendor did not specify	Vendor did not specify
Total Expansion Slots	1 8-bit, 6 16-bit	5 8-bit, 16-bit	2 8-bit, 6 16-bit,	2 8-bit, 6 16-bit
Available Expansion Slots	8-bit, 5 16-bit	5 8-bit, 16-bit	2 8-bit, 6 16-bit,	2 8-bit, 6 16-bit
Serial Ports	2 on main board	2 on main board; 0 on adapter	2 on main board	2 on main board
Parallel Ports	1 on main board; 1 on adapter	1 on main board; 0 on adapter	1 on main board	1 on main board
Other I/O Devices Included	Vendor did not specify	None	None	None
Other I/O Interfaces	None	101-key keyboard port	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	1 full-height	1 half-height, 1 third-height	4 half-height	4 half-height
Diskette Drives Included (bytes)	1 1.2M; 1 1.44M	1 360K	1 1.2M	2 1.2M
Diskette Drive Options (bytes)	360K, 1.2M, 720K	1.2M, 1.44M	1.2M, 1.44M	1.2M, 1.44M
Hard Disk Interface	ST506/412	AT/IDE	AT/IDE	AT/IDE
Hard Disk Size (bytes)/AAT (ms)	40M/65	None	None	None
Optional Mass Storage	70M, 80M, 90M, 150M, tape drive	20M, 40M, tape drive	20M, 40M, tape drive	20M, 40M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/720 X 348	Integrated on system board/320 x 200	Integrated on system board/800 x 600	Integrated on system board/800 x 600
Display	Included, 12-inch, digital monochrome	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Vendor did not specify	Ethernet, Token-ring, ARCnet	None	None
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Vendor did not specify	Vendor did not specify
Dimensions (H x W x D, inches)	6.31 x 21.12 x 16.87	4.0 x 16.4 x 15.5	6.5 x 15.6 x 16.5	6.5 x 15.6 x 16.5
Weight (pounds)	Vendor did not specify	Vendor did not specify	28.00	28.00
AC Power Supply (watts)	200	145	200	200
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify	None	MS-DOS	MS-DOS
Operating System(s) Supported	IBM PC-DOS, Enhanced MS-DOS, MS-DOS	IBM PC-DOS, MS-DOS	MS-DOS	MS-DOS
Additional Software Included	Vendor did not specify	BIOS, util./diagn.	BIOS, util./diagn.	BIOS, util./diagn.
<b>Service/Support</b>				
Distribution Channels	Computer retail, direct from vendor	VAR/VAD, direct from vendor	Computer retail, VAR/VAD	Computer retail, VAR/VAD
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	Vendor	1 year	1 year
Service Supported by	Vendor, third party	Vendor	Authorized dealers	Authorized dealers
Service Features	On site, toll free, 30-day money back	Toll free, 30-day money back	Toll free	Toll free
<b>Base Price (\$)</b>	3,154	546	Vendor did not specify	Vendor did not specify

Vendor	Cordata, Inc.	Cordata, Inc.	Cordata, Inc.	Cordata, Inc.
Product	Daewoo CPC-8120	Daewoo CPC-8125	Daewoo CPC-8140	Daewoo CPC-8145
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386sx/16	80386sx/16	80386sx/16	80386sx/16
Co-Processor Options	80387SX	80387SX	80387SX	80387SX
<b>Standard RAM (bytes)/Speed (ns)</b>				
	1.0M	1.0M	1.0M	1.0M
<b>RAM Expansion Capacity (bytes)</b>				
Maximum System RAM (bytes)	8.0M	8.0M	8.0M	8.0M
<b>RAM Cache, Size (bytes)/Speed (ns)</b>				
	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
<b>Bus Architecture</b>				
Bus Speed (MHz)	AT	AT	AT	AT
Total Expansion Slots	Vendor did not specify 2 8-bit, 6 16-bit			
<b>Available Expansion Slots</b>				
	2 8-bit, 6 16-bit			
<b>Serial Ports</b>				
	2 on main board			
<b>Parallel Ports</b>				
	1 on main board			
<b>Other I/O Devices Included</b>				
	None	None	None	None
<b>Other I/O Interfaces</b>				
	None	None	None	None
<b>Mass Storage</b>				
<b>Internal Drive Bays Available</b>				
	4 half-height	4 half-height	4 half-height	4 half-height
<b>Diskette Drives Included (bytes)</b>				
	1 1.2M	2 1.2M	1 1.2M	2 1.2M
<b>Diskette Drive Options (bytes)</b>				
	1.2M, 1.44M	1.2M, 1.44M	1.2M, 1.44M	1.2M, 1.44M
<b>Hard Disk Interface</b>				
	AT/IDE	AT/IDE	AT/IDE	AT/IDE
<b>Hard Disk Size (bytes)/AAT (ms)</b>				
	20M	20M	40M	40M
<b>Optional Mass Storage</b>				
	20M, 40M, tape drive			
<b>Keyboard</b>				
<b>Availability</b>				
Number of Keys/Function Keys	Included (detachable) 101/12	Included (detachable) 101/12	Included (detachable) 101/12	Included (detachable) 101/12
<b>Video/Display</b>				
<b>Video Controller/Resolution (pixels)</b>				
Display	Integrated on system board/800 x 600 Optional			
<b>Local Area Network Support</b>				
<b>Vendor LAN Options</b>				
	None	None	None	None
<b>Product Design</b>				
<b>Type of Unit</b>				
Tempest Version	Desktop	Desktop	Desktop	Desktop
Dimensions (H x W x D, inches)	Vendor did not specify 6.5 x 15.6 x 16.5	Vendor did not specify 6.5 x 15.6 x 16.5	Vendor did not specify 6.5 x 15.6 x 16.5	Vendor did not specify 6.5 x 15.6 x 16.5
Weight (pounds)	28.00	28.00	28.00	28.00
AC Power Supply (watts)	200	200	200	200
<b>Software</b>				
<b>Operating System(s) Bundled</b>				
	MS-DOS	MS-DOS	MS-DOS	MS-DOS
<b>Operating System(s) Supported</b>				
	MS-DOS	MS-DOS	MS-DOS	MS-DOS
<b>Additional Software Included</b>				
	BIOS, util./diagn.	BIOS, util./diagn.	BIOS, util./diagn.	BIOS, util./diagn.
<b>Service/Support</b>				
<b>Distribution Channels</b>				
	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD
<b>Parts Warranty</b>				
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Authorized dealers	Authorized dealers	Authorized dealers	Authorized dealers
<b>Service Features</b>				
	Toll free	Toll free	Toll free	Toll free
<b>Base Price (\$)</b>				
	Vendor did not specify			

Vendor	Cordata, Inc.	Cordata, Inc.	Cordata, Inc.	Cordata, Inc.
Product	Daewoo CPC-8205	Daewoo CPC-8210	Daewoo CPC-8220	Daewoo CPC-8240
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386sx/16	80386sx/16	80386sx/16	80386sx/16
Co-Processor Options	80387SX	80387SX	80387SX	80387SX
<b>Standard RAM (bytes)/Speed (ns)</b>				
Standard RAM (bytes)/Speed (ns)	1.0M	1.0M	1.0M	1.0M
RAM Expansion Capacity (bytes)	8.0M	8.0M	8.0M	8.0M
Maximum System RAM (bytes)	8.0M	8.0M	8.0M	8.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	Vendor did not specify			
Total Expansion Slots	1 8-bit, 3 16-bit			
Available Expansion Slots	2 8-bit, 6 16-bit			
Serial Ports	2 on main board			
Parallel Ports	1 on main board			
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	None	None	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	4 half-height	4 half-height	4 half-height	4 half-height
Diskette Drives Included (bytes)	1 1.2M	2 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	1.2M, 1.44M	1.2M, 1.44M	1.2M, 1.44M	1.2M, 1.44M
Hard Disk Interface	AT/IDE	AT/IDE	AT/IDE	AT/IDE
Hard Disk Size (bytes)/AAT (ms)	None	None	20M	40M
Optional Mass Storage	20M, 40M, tape drive			
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/800 x 600			
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	None	None	None	None
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify			
Dimensions (H x W x D, inches)	5 x 16 x 18			
Weight (pounds)	32.00	32.00	32.00	32.00
AC Power Supply (watts)	200	200	200	200
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	MS-DOS	MS-DOS	MS-DOS
Operating System(s) Supported	MS-DOS	MS-DOS	MS-DOS	MS-DOS
Additional Software Included	BIOS, util./diagn.	BIOS, util./diagn.	BIOS, util./diagn.	BIOS, util./diagn.
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Authorized dealers	Authorized dealers	Authorized dealers	Authorized dealers
Service Features	Toll free	Toll free	Toll free	Toll free
<b>Base Price (\$)</b>	Vendor did not specify			

Vendor	CSR	CSR	CSR	CSR
Product	CSR 288/14 Deluxe	CSR 288/14 Slimline	CSR 288/20 Deluxe	CSR 288/20 Slimline
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/14	80286/14	80286/20	80286/20
Co-Processor Options	80287, 802C287, Weitek 1167	80287, 802C287, Weitek 1167	80287, 80C287, Weitek 1167	80287, 80C287, Weitek 1167
Standard RAM (bytes)/Speed (ns)	1.0M/100	1.0M/100	1.0M/100	1.0M/100
RAM Expansion Capacity (bytes)	8.0M	8.0M	8.0M	1.0M
Maximum System RAM (bytes)	8.0M	8.0M	8.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	2 8-bit, 6 16-bit	2 8-bit, 3 16-bit	2 16-bit, 6 32-bit	2 8-bit, 3 16-bit
Available Expansion Slots	1 8-bit, 4 16-bit	1 8-bit, 1 16-bit	1 8-bit, 4 16-bit	1 8-bit, 1 16-bit
Serial Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
Parallel Ports	1 on adapter	1 on main board; 1 on adapter	1 on adapter	1 on adapter
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	None	None	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	3 full-height, 2 half-height	Vendor did not specify	3 full-height, 2 half-height	Vendor did not specify
Diskette Drives Included (bytes)	Vendor did not specify			
Diskette Drive Options (bytes)	360K, 720K	360K, 720K	360K, 720K	360K, 720K
Hard Disk Interface	ST506/412	ST506/412	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	40M/22	40M/, 22ns	40M/22	40M/22
Optional Mass Storage	20M, 60M, 90M, 150M, 322M, tape drive	20M, 40M, 60M, 70M, 90M, 150M, 322M, tape drive	20M, 60M, 90M, 150M, 322M, tape drive	20M, 60M, 90M, 150M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/640 x 480	On included adapter/640 x 480	On included adapter/640 x 400	On included adapter/640 x 480
Display	Included, 14-inch, analog color			
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, ARCnet	Ethernet, ARCnet	Ethernet, ARCnet	Ethernet, ARCnet
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	From manufacturer	From manufacturer	From manufacturer	From manufacturer
Dimensions (H x W x D, inches)	5.5 x 21.0 x 16.5	4.5 x 17.0 x 15.5	5.5 x 21.0 x 16.5	4.5 x 17.0 x 15.5
Weight (pounds)	Vendor did not specify			
AC Power Supply (watts)	200	200	200	200
<b>Software</b>				
Operating System(s) Bundled	None	None	None	None
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS
Additional Software Included	None	None	None	None
<b>Service/Support</b>				
Distribution Channels	VAR/VAD, direct from vendor			
Parts Warranty	1 year on-site	1 year on-site	1 year on-site	1 year
Labor Warranty	1 year on parts	1 year on parts	1 year on-site	1 year
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers
Service Features	On site, toll free, 30-day money back			
<b>Base Price (\$)</b>	Vendor did not specify			

Vendor	CSR	CSR	CCS Custom Computer Systems, Inc.	CCS Custom Computer Systems, Inc.
Product	CSR 386/20 Deluxe 286/25C Deluxe	CSR 386/25C Deluxe	CCS 386-16S U1VM4	CCS 386-20c F2VMS
Processor/Memory CPU/Clock Speed (MHz)	80386/20	80386/25	80386sx/16	80386/20
Co-Processor Options	80387	80387	80387SX	80387, Weitek 3167
Standard RAM (bytes)/Speed (ns)	1.0M/100	1.0M/80	1.0M/100	2.0M/100
RAM Expansion Capacity (bytes)	1.0M	4.0M	8.0M	8.0M
Maximum System RAM (bytes)	32M	32M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Vendor did not specify	Austek, 32K/25	Not supported	Proprietary, 64K/35
Input/Output Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	2 8-bit, 6 16-bit	2 8-bit, 6 16-bit	2 8-bit, 6 16-bit	1 8-bit, 6 16-bit, 1 32-bit
Available Expansion Slots	1 8-bit, 4 16-bit	1 8-bit, 4 16-bit	1 8-bit, 4 16-bit	1 8-bit, 3 16-bit, 1 32-bit
Serial Ports	1 on adapter	1 on adapter	2 on adapter	2 on adapter
Parallel Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	None	Mouse	101-key keyboard port	SCSI, 101-key keyboard port, ext. video
Mass Storage Internal Drive Bays Available	1 full-height, 2 half-height	1 full-height, 2 half-height	2 half-height, 3 third-height	6 half-height
Diskette Drives Included (bytes)	Vendor did not specify	Vendor did not specify	1 1.2M; 1 1.44M	1 1.44M
Diskette Drive Options (bytes)	None	None	Vendor did not specify	None
Hard Disk Interface	ST506/412	ESDI	ST506/412	SCSI
Hard Disk Size (bytes)/AAT (ms)	Vendor did not specify	40M	40M/28	80M/28
Optional Mass Storage	20M, 40M, 60M, 90M, 150M, tape drive	20M, 40M, 60M, 90M, 150M, tape drive	20M, 80M, tape drive, CD-ROM	40M, 150M, 300M, tape drive
Keyboard Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
Video/Display Video Controller/Resolution (pixels)	On included adapter/640 x 400	On included adapter/640 x 400	On included adapter/800 x 600	On included adapter/640 x 480
Display	Included, 14-inch, analog color	Included, 14-inch, analog color	Included, 14-inch, analog color	Included, 14-inch, analog color
Local Area Network Support Vendor LAN Options	Ethernet, Token-ring, ARCnet	Ethernet, Token-ring, ARCnet	None	None
Product Design Type of Unit	Desktop	Desktop	Floorstanding	Floorstanding
Tempest Version	From manufacturer	From manufacturer	Vendor did not specify	Vendor did not specify
Dimensions (H x W x D, inches)	5.5 x 21.0 x 16.5	5.5 x 21.0 x 16.5	14 x 7 x 16	25 x 8 x 17
Weight (pounds)	Vendor did not specify	Vendor did not specify	20.00	40.00
AC Power Supply (watts)	200	200	200	220
Software Operating System(s) Bundled	None	None	None	None
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2, UNIX, UNIX derivative	Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2, UNIX, UNIX derivative
Additional Software Included	None	None	BIOS, setup, util./diagn.	BIOS, setup, util./diagn.
Service/Support Distribution Channels	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor	Computer retail, general retail, VAR/VAD	Computer retail, general retail, VAR/VAD
Parts Warranty	1 year on-site	1 year on-site	1 year	1 year
Labor Warranty	1 year parts	1 year parts	1 year	1 year
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor	Vendor
Service Features	Vendor did not specify	30-day money back	On site, 30-day money back	On site, 30-day money back
Base Price (\$)	Vendor did not specify	Vendor did not specify	2,805	4,422

Vendor	CCS Custom Computer Systems, Inc.	Data Bank Computer	Data General Corp.	Data General Corp.
Product	CCS 386-25C G2VME	DBC 386-33	Dasher/286	Dasher/386
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/25	80386/3325	80286/10	80386/16
Co-Processor Options	80387	80387	80287	80387
<b>Standard RAM (bytes)/Speed (ns)</b>				
	2.0M/80	1.0M/70	640K/120	1.0M/100
<b>RAM Expansion Capacity (bytes)</b>				
Maximum System RAM (bytes)	8.0M	16.0M	640K	1.0M
RAM Cache, Size (bytes)/Speed (ns)	16.0M Proprietary, 64K/25	16.0M Intel, 32K/35	8.0M Not supported	16.0M Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT passive backplane
Bus Speed (MHz)	12.5	12.5	10	Vendor did not specify
Total Expansion Slots	1 8-bit, 6 16-bit, 1 32-bit	5 8-bit, 2 16-bit, 1 32-bit	1 8-bit, 5 16-bit	1 8-bit, 3 16-bit, 10 32-bit
Available Expansion Slots	1 8-bit, 3 16-bit, 1 32-bit	5 8-bit, 1 16-bit	1 8-bit, 5 16-bit	Vendor did not specify
Serial Ports	2 on adapter	None	2 on main board	1 on main board
Parallel Ports	1 on adapter	None	1 on main board	1 on main board
Other I/O Devices Included	None	None	Vendor did not specify	Vendor did not specify
Other I/O Interfaces	101-key keyboard port	None	101-key keyboard port, ext. hard disk	101-key keyboard port
<b>Mass Storage</b>				
Internal Drive Bays Available	6 half-height	5 half-height	4 half-height	2 full-height, 2 half-height
Diskette Drives Included (bytes)	1 1.2M; 1 1.44M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	None	360K, 720K, 1.44M	360K, 1.2M, 720K	360K, 1.2M
Hard Disk Interface	ESDI	WD 1:1	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	150M/18	None	None	None
Optional Mass Storage	80M, 300M, tape drive, CD-ROM	20M, 30M, 40M, 50M, 60M, 70M, 80M, 90M, 100M, 120M, 150M, 300M, tape drive	20M, tape drive	20M, 40M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Optional	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	107/15	101/15
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/800 x 600	Adapter optional	Adapter optional/640 x 350	Adapter optional/1280 x 800
Display	Included, 14-inch, analog color	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	None	None	Ethernet, Token-ring, Starlan	Ethernet, Token-ring, Starlan
<b>Product Design</b>				
Type of Unit	Floorstanding	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify	Not available	Not available	Not available
Dimensions (H x W x D, inches)	25 x 8 x 17	Vendor did not specify	6.25 x 17.50 x 16.25	21.00 x 15.00 x 6.25
Weight (pounds)	40.00	49.00	30.00	Vendor did not specify
AC Power Supply (watts)	220	220	185	200
<b>Software</b>				
Operating System(s) Bundled	None	None	MS-DOS	Enhanced MS-DOS
Operating System(s) Supported	Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2, UNIX, UNIX derivative	IBM PC-DOS, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2, UNIX	MS-DOS, UNIX derivative	Enhanced MS-DOS, UNIX derivative, 386/ix
Additional Software Included	BIOS, setup, util./diagn.	None	None	None
<b>Service/Support</b>				
Distribution Channels	Computer retail, general retail, VAR/VAD	Direct from vendor	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor	Vendor	Vendor	Vendor
Service Features	On site, 30-day money back	30-day money back	On site, toll free	On site, toll free
<b>Base Price (\$)</b>				
	6,119	2,220	2,295	3,595/available for GSA

Vendor	Data General Corp.	Data General Corp.	Data Storage Marketing, Inc.	Data Storage Marketing, Inc.
Product	Dasher/386-25	Dasher/386SX	DataStor 286-12	DataStor 286-16D
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386sx/25	80386sx/16	80286/12	80286/16
Co-Processor Options	80387	80387SX	80287	80287
Standard RAM (bytes)/Speed (ns)	2.0M/100	2.0M/100	1.0M/100	1.0M/80
RAM Expansion Capacity (bytes)	4.0M	Vendor did not specify	8.0M	8.0M
Maximum System RAM (bytes)	16.0M	8.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Intel, 64K/35	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	Vendor did not specify	Vendor did not specify	10	10
Total Expansion Slots	1 8-bit, 5 16-bit, 2 32-bit	1 8-bit, 3 16-bit	3 8-bit, 5 16-bit	3 8-bit, 5 16-bit
Available Expansion Slots	Vendor did not specify	1 8-bit, 3 16-bit	2 8-bit, 4 16-bit	2 8-bit, 4 16-bit
Serial Ports	2 on main board	2 on main board	2 on adapter	2 on adapter
Parallel Ports	1 on main board	1 on main board	1 on adapter	1 on adapter
Other I/O Devices Included	None	Vendor did not specify	None	None
Other I/O Interfaces	101-key keyboard port	101-key keyboard port	101-key keyboard port (1 game port)	101-key keyboard port (1 game port)
<b>Mass Storage</b>				
Internal Drive Bays Available	5 half-height	4 half-height	5 half-height	5 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.44M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	1.2M	1.2M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M
Hard Disk Interface	ESDI	ST506/412	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	None	None	None	None
Optional Mass Storage	156M, 322M, tape drive	40M, 100M, tape drive	20M, 30M, 40M, 50M, 60M, 70M, 80M, 90M, 100M, 120M, 150M, 300M, tape drive, CD-ROM, WORM	20M, 30M, 40M, 50M, 60M, 70M, 80M, 90M, 100M, 120M, 150M, 300M, tape drive, CD-ROM, WORM
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional/640 x 480	Integrated on system board/640 x 480	Adapter optional	Adapter optional
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, Token-ring, Starlan	Ethernet, Token-ring, Starlan	Ethernet, Token-ring	Ethernet, Token-ring
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	Not available
Dimensions (H x W x D, inches)	6.5 x 21.3 x 18.7	6.25 x 17.5 x 16.25	6.5 x 19.5 x 16.1	6.5 x 19.5 x 16.1
Weight (pounds)	44.00	Vendor did not specify	35.00	35.00
AC Power Supply (watts)	220	185	200	200
<b>Software</b>				
Operating System(s) Bundled	MS-DOS, 386/IX	MS-DOS	None	None
Operating System(s) Supported	MS-DOS, 386/IX, VP/IX	MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS
Additional Software Included	Util./diagn., GW Basic	Setup, diagnostics, GW Basic	BIOS, setup, diagnostics, util./diagn.	BIOS, setup, diagnostics, util./diagn.
<b>Service/Support</b>				
Distribution Channels	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor	Vendor	Vendor, authorized dealers	Vendor, authorized dealers
Service Features	On site, toll free	On site, toll free	Toll free, 30-day money back	Toll free, 30-day money back
<b>Base Price (\$)</b>	6,700/available for GSA	2,900/available for GSA	810/available for GSA	879/available for GSA

Vendor	Data Storage Marketing, Inc.			
Product	DataStor 286-20D	DataStor 386-20	DataStor 386-20C	DataStor 386-25
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/20	80386/20	80386/20	80386/25
Co-Processor Options	80287	80387, Weitek 3167	80387, Weitek 3167	80387, Weitek 3167
Standard RAM (bytes)/Speed (ns)	1.0M/80	1.0M/80	1.0M/80	1.0M/70
RAM Expansion Capacity (bytes)	8.0M	8.0M	8.0M	8.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Chips & Tech., 32K/25	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	10	10	10	10
Total Expansion Slots	3 8-bit, 5 16-bit	7 16-bit, 1 32-bit	6 16-bit, 2 32-bit	7 16-bit, 1 32-bit
Available Expansion Slots	2 8-bit, 4 16-bit	5 16-bit, 1 32-bit	4 16-bit, 2 32-bit	5 16-bit, 1 32-bit
Serial Ports	2 on adapter	2 on adapter	2 on adapter	2 on adapter
Parallel Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
Other I/O Devices Included	None	None	Vendor did not specify	None
Other I/O Interfaces	101-key keyboard port (1 game port)			
<b>Mass Storage</b>				
Internal Drive Bays Available	5 half-height	5 half-height	5 half-height	5 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M			
Hard Disk Interface	ST506/412	ST506/412	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	None	None	None	None
Optional Mass Storage	20M, 30M, 40M, 50M, 60M, 70M, 80M, 90M, 100M, 120M, 150M, 300M, tape drive, CD-ROM, WORM	20M, 30M, 40M, 50M, 60M, 70M, 80M, 90M, 100M, 120M, 150M, 300M, tape drive, CD-ROM, WORM	20M, 30M, 40M, 50M, 60M, 70M, 80M, 90M, 100M, 120M, 150M, 300M, tape drive, CD-ROM, WORM	20M, 30M, 40M, 50M, 60M, 70M, 80M, 90M, 100M, 120M, 150M, 300M, tape drive, CD-ROM, WORM
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	Adapter optional	Adapter optional
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, Token-ring	Ethernet, Token-ring	Ethernet, Token-ring	Ethernet, Token-ring
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	Not available
Dimensions (H x W x D, inches)	6.5 x 19.5 x 16.1			
Weight (pounds)	35.00	35.00	35.00	35.00
AC Power Supply (watts)	200	200	200	200
<b>Software</b>				
Operating System(s) Bundled	None	None	None	None
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS
Additional Software Included	BIOS, setup, diagnostics, util./diagn.	BIOS, setup, diagnostics, util./diagn.	BIOS, setup, diagnostics	BIOS, setup, diagnostics
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD, direct from vendor			
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers
Service Features	Toll free, 30-day money back			
<b>Base Price (\$)</b>	989/available for GSA	1,595/available for GSA	1,825/available for GSA	1,795/available for GSA

Vendor	Data Storage Marketing, Inc.	Data Storage Marketing, Inc.	Dataworld	Daytronic Corp.
Product	DataStor 386-25C	DataStor 386-SXD	Data 386-25	Industrial Personal Computer IPC-2
Processor/Memory CPU/Clock Speed (MHz)	80386/25	80386sx/16	80386/25	8086/10
Co-Processor Options	80387, Weitek 3167	80387SX	80387	8087
Standard RAM (bytes)/Speed (ns)	1.0M/70	1.0M/80	1.0M/80	640K/120
RAM Expansion Capacity (bytes)	8.0M	8.0M	16.0M	640K
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	640K
RAM Cache, Size (bytes)/Speed (ns)	Chips & Tech., 32K/25	Not supported	Intel, 32K/35	Not supported
Input/Output				
Bus Architecture	AT	AT	AT	XT
Bus Speed (MHz)	10	10	8.33	10
Total Expansion Slots	6 16-bit, 2 32-bit	1 8-bit, 6 16-bit	2 8-bit, 5 16-bit, 1 32-bit	8 8-bit
Available Expansion Slots	4 16-bit, 2 32-bit	0 8-bit, 5 16-bit	0 32-bit	5 8-bit
Serial Ports	2 on adapter	2 on adapter	None; 2 on adapter	1 on adapter
Parallel Ports	1 on adapter	4 on adapter	None; 1 on adapter	1 on adapter
Other I/O Devices Included	None	None	Vendor did not specify	None
Other I/O Interfaces	101-key keyboard port (1 game port)	101-key keyboard port (1 game port)	Vendor did not specify	None
Mass Storage				
Internal Drive Bays Available	5 half-height	5 half-height	6 half-height	2 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	2 360K
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 1.44M	None
Hard Disk Interface	ST506/412	ST506/412	ST506/412	None
Hard Disk Size (bytes)/AAT (ms)	None	None	66/, 25	None
Optional Mass Storage	20M, 30M, 40M, 50M, 60M, 70M, 80M, 90M, 100M, 120M, 150M, 300M, tape drive, CD-ROM, WORM	20M, 30M, 40M, 50M, 60M, 70M, 80M, 90M, 100M, 120M, 150M, drive, 300M, tape drive, CD-ROM, WORM	20M, 40M, 150M, 300M, tape	None
Keyboard Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
Video/Display				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	On included adapter/1,024 x 768	On included adapter/640 x 350
Display	Optional	Optional	Included, 14-inch, multifrequency	Vendor did not specify
Local Area Network Support				
Vendor LAN Options	Ethernet, Token-ring	Ethernet, Token-ring	Vendor did not specify	None
Product Design				
Type of Unit	Desktop	Desktop	Floorstanding	Desktop
Tempest Version	Not available	Not available	Vendor did not specify	Not available
Dimensions (H x W x D, inches)	6.5 x 19.5 x 16.1	6.5 x 19.5 x 16.1	25.63 x 7.50 x 16.75	5.25 x 19.00 x 18.37
Weight (pounds)	35.00	35.00	55.00	Vendor did not specify
AC Power Supply (watts)	200	200	230	150
Software				
Operating System(s) Bundled	None	None	MS-DOS	MS-DOS
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, MS-DOS, Vendor MS-OS/2, UNIX, UNIX derivative	MS-DOS
Additional Software Included	BIOS, setup, diagnostics	BIOS, setup, diagnostics, util./diagn.	Comm., util./diagn.	None
Service/Support				
Distribution Channels	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor	Direct from vendor	Direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor	Vendor
Service Features	Toll free, 30-day money back	Toll free, 30-day money back	Toll free, 30-day money back	On site
Base Price (\$)	2,045/available for GSA	989/available for GSA	4,214	2,495

Vendor	Daytronic Corp.	Daytronic Corp.	Daytronic Corp.	Dell Computer Corp.
Product	Industrial Personal Computer IPC-386	Industrial Personal Computer IPC-AT	Industrial Personal Computer IPC-XT	Dell System 210 100MB/VGA Monochrome
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/16	80286/10	8088/10	80286/12.5
Co-Processor Options	80387	80287	8087	80287
Standard RAM (bytes)/Speed (ns)	640K/80	512K/100	640K/120	512K
RAM Expansion Capacity (bytes)	2.0M	512K	640K	6M
Maximum System RAM (bytes)	8.0M	640K	640K	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT passive backplane	AT passive backplane	XT	AT
Bus Speed (MHz)	16MHz	10	10	6.25
Total Expansion Slots	1 8-bit, 5 16-bit	1 8-bit, 5 16-bit	8 8-bit	3 16-bit,
Available Expansion Slots	1 8-bit	1 8-bit, 1 16-bit,	4 8-bit	3 16-bit,
Serial Ports	2 on adapter	2 on adapter	2 on adapter	2 on main board
Parallel Ports	1 on adapter	1 on adapter	1 on adapter	1 on main board
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	None	None	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	2 half-height	2 half-height	2 half-height	2 half-height, 1 third-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 360K	1 1.2M; 1 1.44M
Diskette Drive Options (bytes)	360K, 1.2M, 720K	360K, 720K, 1.44M	360K	1.44M
Hard Disk Interface	ST506/412	ST506/412	ST506/412	AT/IDE
Hard Disk Size (bytes)/AAT (ms)	40M/40	40M/40	20M/40	100M/25
Optional Mass Storage	20M, 100M	20M, 100M	40M, 100M	20M, 40M, 100M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/640 x 350	On included adapter/640 x 350	On included adapter/640 x 350	Integrated on system board/640 x 480
Display	Optional	Optional	Optional	Included, analog monochrome
<b>Local Area Network Support</b>				
Vendor LAN Options	None	None	None	Ethernet, Token-ring
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	Not available
Dimensions (H x W x D, inches)	5.25 x 19.00 x 15.50	5.25 x 19.00 x 15.50	5.25 x 19.00 x 18.37	4.0 x 15.1 x 15.6
Weight (pounds)	Vendor did not specify	Vendor did not specify	Vendor did not specify	21.70
AC Power Supply (watts)	150	150	150	85
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	MS-DOS	MS-DOS	None
Operating System(s) Supported	MS-DOS	MS-DOS	MS-DOS	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative
Additional Software Included	None	None	None	BIOS, setup, util./diagn., tutorial
<b>Service/Support</b>				
Distribution Channels	Direct from vendor	Direct from vendor	Direct from vendor	Direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor	Vendor	Vendor	Third party
Service Features	On site	On site	On site	On site, toll free, 30-day money back
<b>Base Price (\$)</b>	7,995	4,295	2,995	2,399

Vendor	Dell Computer Corp.	Dell Computer Corp.	Dell Computer Corp.	Dell Computer Corp.
Product	Dell System 210 20MB/VGA Monochrome	Dell System 210 40MB/VGA Monochrome	Dell System 220	Dell System 310 1MB/100MB/TTL Monochrome
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/12.5	80286/12.5	80286/20	80386/20
Co-Processor Options	80287	80287	80287	80387SX, Weitek 3167
Standard RAM (bytes)/Speed (ns)	512K	512K	1.0M	1.0M
RAM Expansion Capacity (bytes)	6M	6M	8.0M	8.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Intel, 32K/35
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	6.25	6.25	Vendor did not specify	8
Total Expansion Slots	3 16-bit	3 16-bit	3 16-bit	2 8-bit, 6 16-bit, 1 32-bit
Available Expansion Slots	3 16-bit	3 16-bit	3 16-bit	2 8-bit, 3 16-bit, 1 32-bit
Serial Ports	2 on main board	2 on main board	2 on main board	2 on adapter
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on adapter
Other I/O Devices Included	None	None	Vendor did not specify	None
Other I/O Interfaces	None	None	Vendor did not specify	None
<b>Mass Storage</b>				
Internal Drive Bays Available	2 half-height, 1 third-height	2 half-height, 1 third-height	1 half-height	5 half-height
Diskette Drives Included (bytes)	1 1.2M; 1 1.44M	1 1.2M; 1 1.44M	1 1.44M	1 1.2M; 1 1.44M
Diskette Drive Options (bytes)	1.44M	1.44M	1.2M, 1.44M	360K, 1.2M, 1.44M
Hard Disk Interface	AT/IDE	AT/IDE	AT/IDE	AT/IDE
Hard Disk Size (bytes)/AAT (ms)	20M/40	40M/, 29	None	100M/, 25
Optional Mass Storage	40M, 100M, tape drive	20M, 40M, 100M, tape drive	40M, 100M, tape drive	40M, 100M, 150M, 322M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/640 x 480	Integrated on system board/640 x 480	Integrated on system board/640 x 480	On included adapter/320 x 200
Display	Included, 12-inch, analog monochrome	Included, 12-inch, analog monochrome	Included, 12-inch, analog monochrome	Included, 12-inch, digital monochrome
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, Token-ring	Ethernet, Token-ring	Ethernet, Token-ring	Ethernet, Token-ring
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Vendor did not specify	Not available
Dimensions (H x W x D, inches)	4.0 x 15.1 x 15.6	4.0 x 15.1 x 15.6	Vendor did not specify	6.4 x 21.1 x 17.6
Weight (pounds)	21.70	21.70	Vendor did not specify	37.00
AC Power Supply (watts)	85	85	Vendor did not specify	200
<b>Software</b>				
Operating System(s) Bundled	None	None	Vendor did not specify	None
Operating System(s) Supported	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative	Enhanced MS-DOS, Vendor MS-OS/2	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative
Additional Software Included	BIOS, setup, util./diagn., tutorial	BIOS, setup, util./diagn., tutorial	None	BIOS, setup, util./diagn.
<b>Service/Support</b>				
Distribution Channels	Direct from vendor	Direct from vendor	Direct from vendor	Direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Third party	Third party	Third party	Third party
Service Features	On site, toll free, 30-day money back	On site, toll free, 30-day money back	On site, toll free, 30-day money back	On site, toll free, 30-day money back
<b>Base Price (\$)</b>	1,599	1,799	2,299	4,199

Vendor	Dell Computer Corp.	Dell Computer Corp.	Dell Computer Corp.	Dell Computer Corp.
Product	Dell System 310 1MB/160MB/TTL Monochrome	Dell System 310 1MB/322MB/TTL Monochrome	Dell System 310 1MB/40MB/TTL Monochrome	Dell System 310 2MB/100MB/TTL Monochrome
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/20	80386/20	80386/20	80386/20
Co-Processor Options	80387SX, Weitek 3167	80387SX, Weitek 3167	80387, Weitek 3167	80387SX, Weitek 3167
Standard RAM (bytes)/Speed (ns)	1.0M	1.0M	1.0M	2.0M
RAM Expansion Capacity (bytes)	8.0M	8.0M	8.0M	8.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Intel, 32K/35	Intel, 32K/35	Intel, 32K/35	Intel, 32K/35
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	2 8-bit, 6 16-bit, 1 32-bit			
Available Expansion Slots	2 8-bit, 3 16-bit, 1 32-bit			
Serial Ports	2 on adapter	2 on adapter	2 on main board	2 on adapter
Parallel Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	None	None	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	5 half-height	5 half-height	5 half-height	5 half-height
Diskette Drives Included (bytes)	1 1.2M; 1 1.44M			
Diskette Drive Options (bytes)	380K, 1.2M, 1.44M	380K, 1.2M, 1.44M	380K, 1.2M, 1.44M	380K, 1.2M, 1.44M
Hard Disk Interface	ESDI	ESDI	AT/IDE	AT/IDE
Hard Disk Size (bytes)/AAT (ms)	150M/18	322M/18	40M/28	100M/25
Optional Mass Storage	40M, 100M, 150M, 322M, tape drive			
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/320 x 200			
Display	Included, 12-inch, digital monochrome			
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, Token-ring	Ethernet, Token-ring	Ethernet, Token-ring	Ethernet, Token-ring
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	Not available
Dimensions (H x W x D, inches)	6.4 x 21.1 x 17.6			
Weight (pounds)	37.00	37.00	37.00	37.00
AC Power Supply (watts)	200	200	200	200
<b>Software</b>				
Operating System(s) Bundled	None	None	None	None
Operating System(s) Supported	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative			
Additional Software Included	BIOS, setup, util./diagn.	BIOS, setup, util./diagn.	BIOS, setup, util./diagn.	BIOS, setup, util./diagn.
<b>Service/Support</b>				
Distribution Channels	Direct from vendor	Direct from vendor	Direct from vendor	Direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Third party	Third party	Third party	Third party
Service Features	On site, toll free, 30-day money back			
<b>Base Price (\$)</b>	4,699	5,499	3,599	4,398

Vendor	Dell Computer Corp.	Dell Computer Corp.	Dell Computer Corp.	Dell Computer Corp.
Product	Dell System 310 2MB/150MB/TTL Monochrome	Dell System 310 2MB/322MB/TTL Monochrome	Dell System 310 2MB/40MB/TTL Monochrome	Dell System 316SX 2MB/100MB/VGA Monochrome
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/20	80386/20	80386/20	80386sx/16
Co-Processor Options	80387SX, Weitek 3167	80387SX, Weitek 3167	80387SX, Weitek 3167	80387SX
Standard RAM (bytes)/Speed (ns)	2.0M	2.0M	2.0M	2.0M
RAM Expansion Capacity (bytes)	8.0M	8.0M	8.0M	8.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Intel, 32K/35	Intel, 32K/35	Intel, 32K/35	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	2 8-bit, 6 16-bit, 1 32-bit	2 8-bit, 6 16-bit, 1 32-bit	2 8-bit, 6 16-bit, 1 32-bit	3 16-bit
Available Expansion Slots	2 8-bit, 3 16-bit, 1 32-bit	2 8-bit, 3 16-bit, 1 32-bit	2 8-bit, 3 16-bit, 1 32-bit	Vendor did not specify
Serial Ports	2 on adapter	2 on adapter	2 on adapter	2 on main board
Parallel Ports	1 on adapter	1 on adapter	1 on adapter	1 on main board
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	None	None	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	5 half-height	5 half-height	5 half-height	2 half-height, 1 third-height
Diskette Drives Included (bytes)	1 1.2M; 1 1.44M			
Diskette Drive Options (bytes)	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	1.44M
Hard Disk Interface	ESDI	Vendor did not specify	AT/IDE	AT/IDE
Hard Disk Size (bytes)/AAT (ms)	150M/18	322M/18	40M/28	100M/25
Optional Mass Storage	40M, 100M, 150M, 322M, tape drive	40M, 100M, 150M, 322M, tape drive	40M, 100M, 150M, 322M, tape drive	20M, 40M, 100M, 170M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/320 x 200	On included adapter/320 x 200	On included adapter/320 x 200	Integrated on system board/640 x 480
Display	Included, 12-inch, digital monochrome	Included, 12-inch, digital monochrome	Included, 12-inch digital monochrome	Included, 12-inch, analog monochrome
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, Token-ring	Ethernet, Token-ring	Ethernet, Token-ring	Ethernet, Token-ring
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	Not available
Dimensions (H x W x D, inches)	6.4 x 21.1 x 17.6	6.4 x 21.1 x 17.6	6.4 x 21.1 x 17.6	4.0 x 15.1 x 15.6
Weight (pounds)	37.00	37.00	37.00	21.70
AC Power Supply (watts)	200	200	200	85
<b>Software</b>				
Operating System(s) Bundled	None	None	None	None
Operating System(s) Supported	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative			
Additional Software Included	BIOS, setup, util./diagn., desk accessory	BIOS, setup, util./diagn.	BIOS, setup, util./diagn.	BIOS, setup, util./diagn., tutorial
<b>Service/Support</b>				
Distribution Channels	Direct from vendor	Direct from vendor	Direct from vendor	Direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Third party	Third party	Third party	Third party
Service Features	On site, toll free, 30-day money back			
<b>Base Price (\$)</b>	4,898	5,698	3,798	2,999

Vendor	Dell Computer Corp.	Dell Computer Corp.	Dell Computer Corp.	Dell Computer Corp.
<b>Product</b>	<b>Dell System 316SX 2MB/170MB/VGA Monochrome</b>	<b>Dell System 316SX 2MB/40MB/VGA Monochrome</b>	<b>Dell System 316SX 512KB/100MB/VGA Monochrome</b>	<b>Dell System 316SX 512KB/170MB/VGA Monochrome</b>
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386ax/16	80386ax/16	80386ax/16	80386ax/16
Co-Processor Options	80387SX	80387SX	80387SX	80387SX
Standard RAM (bytes)/Speed (ns)	2.0M	2.0M	512K	512K
RAM Expansion Capacity (bytes)	8.0M	8.0M	8.0M	8.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	3 16-bit	3 16-bit	3 16-bit,	3 16-bit
Available Expansion Slots	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Serial Ports	2 on main board	2 on main board	2 on main board	2 on main board
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on main board
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	None	None	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	2 half-height, 1 third-height	2 half-height, 1 third-height	2 half-height, 1 third-height	2 half-height, 1 third-height
Diskette Drives Included (bytes)	1 1.2M; 1 1.44M	1 1.2M; 1 1.44M	1 1.2M; 1 1.44M	1 1.2M; 1 1.44M
Diskette Drive Options (bytes)	1.44M	1.44M	1.44M	1.44M
Hard Disk Interface	AT/IDE	AT/IDE	AT/IDE	AT/IDE
Hard Disk Size (bytes)/AAT (ms)	170M/15	40M/28	100M/25	170M/15
Optional Mass Storage	20M, 40M, 100M, 170M, tape drive	20M, 40M, 100M, 170M, tape drive	20M, 40M, 100M, 170M, tape drive	20M, 40M, 100M, 170M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/640 x 480	Integrated on system board/640 x 480	Integrated on system board/640 x 480	Integrated on system board/640 x 480
Display	Included, 12-inch, analog monochrome	Included, 12-inch, analog monochrome	Included, 12-inch, analog monochrome	Included, 12-inch, analog monochrome
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, Token-ring	Ethernet, Token-ring	Ethernet, Token-ring	Ethernet, Token-ring
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	Not available
Dimensions (H x W x D, inches)	4.0 x 15.1 x 15.6	4.0 x 15.1 x 15.6	4.0 x 15.1 x 15.6	4.0 x 15.1 x 15.6
Weight (pounds)	21.70	21.70	21.70	21.70
AC Power Supply (watts)	85	85	85	85
<b>Software</b>				
Operating System(s) Bundled	None	None	None	None
Operating System(s) Supported	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative
Additional Software Included	BIOS, setup, util./diagn., tutorial	BIOS, setup, util./diagn., tutorial	BIOS, setup, util./diagn., tutorial	BIOS, setup, util./diagn., tutorial
<b>Service/Support</b>				
Distribution Channels	Direct from vendor	Direct from vendor	Direct from vendor	Direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Third party	Third party	Third party	Third party
Service Features	On site, toll free, 30-day money back	On site, toll free, 30-day money back	On site, toll free, 30-day money back	On site, toll free, 30-day money back
<b>Base Price (\$)</b>	<b>3,499</b>	<b>2,399</b>	<b>2,699</b>	<b>3,199</b>

Vendor	Dell Computer Corp.	Dell Computer Corp.	Dell Computer Corp.	Dell Computer Corp.
Product	Dell System 318SX 512KB/20MB/VGA Monochrome	Dell System 325 1MB/100MB/Super VGA Color	Dell System 325 1MB/100MB/VGA Monochrome	Dell System 325 1MB/150MB/VGA Monochrome
Processor/Memory CPU/Clock Speed (MHz)	80386sx/16	80386/25	80386/25	80386/25
Co-Processor Options	80387SX	80387SX, Weitek 3167	80387SX, Weitek 3167	80387SX, Weitek 3167
Standard RAM (bytes)/Speed (ns)	512K	1.0M	1.0M	1.0M
RAM Expansion Capacity (bytes)	8.0M	8.0M	8.0M	8.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Intel, 32K/25	Intel, 32K/25	Intel, 32K/25
Input/Output Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	3 16-bit	2 8-bit, 6 16-bit, 1 32-bit	2 8-bit, 6 16-bit, 1 32-bit	2 8-bit, 6 16-bit, 1 32-bit
Available Expansion Slots	Vendor did not specify	2 8-bit, 3 16-bit,	2 8-bit, 3 16-bit	2 8-bit, 3 16-bit
Serial Ports	2 on main board	2 on adapter	2 on adapter	2 on adapter
Parallel Ports	1 on main board	1 on adapter	1 on adapter	1 on adapter
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	None	None	None	None
Mass Storage Internal Drive Bays Available	2 half-height, 1 third-height	5 half-height	5 half-height	5 half-height
Diskette Drives Included (bytes)	1 1.2M; 1 1.44M			
Diskette Drive Options (bytes)	1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M
Hard Disk Interface	AT/IDE	AT/IDE	AT/IDE	ESDI
Hard Disk Size (bytes)/AAT (ms)	20M/40	100M/25	100M/25	150M/18
Optional Mass Storage	20M, 40M, 100M, 170M, tape drive	40M, 100M, 150M, 322M, tape drive	40M, 100M, 150M, 322M, tape drive	40M, 100M, 150M, 322M, tape drive
Keyboard Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
Video/Display Video Controller/Resolution (pixels)	Integrated on system board/640 x 480	On included adapter/800 x 600	On included adapter/640 x 480	On included adapter/640 x 480
Display	Included, 12-inch, analog monochrome	Included, 14-inch, analog color	Included, 12-inch, analog monochrome	Included, 12-inch, analog monochrome
Local Area Network Support Vendor LAN Options	Ethernet, Token-ring	Ethernet, Token-ring	Ethernet, Token-ring	Ethernet, Token-ring
Product Design Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	Not available
Dimensions (H x W x D, inches)	4.0 x 15.1 x 15.6	6.4 x 21.1 x 17.6	6.4 x 21.1 x 17.6	6.4 x 21.1 x 17.6
Weight (pounds)	21.70	55.00	55.00	55.00
AC Power Supply (watts)	85	200	200	200
Software Operating System(s) Bundled	None	None	None	None
Operating System(s) Supported	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative			
Additional Software Included	BIOS, setup, util./diagn., tutorial	BIOS, setup, util./diagn.	BIOS, setup, util./diagn.	BIOS, setup, util./diagn.
Service/Support Distribution Channels	Direct from vendor	Direct from vendor	Direct from vendor	Direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Third party	Third party	Third party	Third party
Service Features	On site, toll free, 30-day money back			
Base Price (\$)	1,899	5,199	4,799	5,299

Vendor	Dell Computer Corp.	Dell Computer Corp.	Dell Computer Corp.	Dell Computer Corp.
Product	Dell System 325 1MB/322MB/VGA Monochrome	Dell System 325 1MB/40MB/VGA Monochrome	Dell System 325 2MB/100MB/VGA Monochrome	Dell System 325 2MB/150MB/VGA Monochrome
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/25	80386/25	80386/25	80386/25
Co-Processor Options	80387SX, Weitek 3167	80387SX, Weitek 3167	80387SX, Weitek 3167	80387SX, Weitek 3167
Standard RAM (bytes)/Speed (ns)	1.0M	1.0M	2.0M	2.0M
RAM Expansion Capacity (bytes)	8.0M	8.0M	8.0M	8.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Intel, 32K/25	Intel, 32K/25	Intel, 32K/25	Intel, 32K/25
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	2 8-bit, 6 16-bit, 1 32-bit			
Available Expansion Slots	2 8-bit, 3 16-bit			
Serial Ports	2 on adapter	2 on adapter	2 on adapter	2 on adapter
Parallel Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	None	None	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	5 half-height	5 half-height	5 half-height	5 half-height
Diskette Drives Included (bytes)	1 1.2M; 1 1.44M			
Diskette Drive Options (bytes)	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M
Hard Disk Interface	ESDI	AT/IDE	AT/IDE	ESDI
Hard Disk Size (bytes)/AAT (ms)	322M/18	40M/28	100M/25	150M/18
Optional Mass Storage	40M, 100M, 150M, 322M, tape drive			
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/640 x 480			
Display	Included, 12-inch, analog monochrome			
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, Token-ring	Ethernet, Token-ring	Ethernet, Token-ring	Ethernet, Token-ring
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	Not available
Dimensions (H x W x D, inches)	6.4 x 21.1 x 17.6			
Weight (pounds)	55.00	55.00	55.00	55.00
AC Power Supply (watts)	200	200	200	200
<b>Software</b>				
Operating System(s) Bundled	None	None	None	None
Operating System(s) Supported	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative			
Additional Software Included	BIOS, setup, util./diagn.	BIOS, setup, util./diagn.	BIOS, setup, util./diagn.	BIOS, setup, util./diagn.
<b>Service/Support</b>				
Distribution Channels	Direct from vendor	Direct from vendor	Direct from vendor	Direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Third party	Third party	Third party	Third party
Service Features	On site, toll free, 30-day money back			
<b>Base Price (\$)</b>	<b>6,099</b>	<b>4,199</b>	<b>4,998</b>	<b>5,498</b>

Vendor	Dell Computer Corp.	Dell Computer Corp.	Dell Computer Corp.	Dell Computer Corp.
Product	Dell System 316SX 512KB/40MB/VGA Monochrome	Dell System 325 2MB/322MB/VGA Monochrome	Dell System 325 2MB/40MB/VGA Monochrome	System 316SX 2MB/20MB/VGA Monochrome
Processor/Memory CPU/Clock Speed (MHz)	80386ax/16	80386/25	80386/25	80386ax/16
Co-Processor Options	80387SX	80387SX, Weitek 3167	80387SX, Weitek 3167	80387SX
Standard RAM (bytes)/Speed (ns)	512K	2.0M	2.0M	2.0M
RAM Expansion Capacity (bytes)	8.0M	8.0M	8.0M	8.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not Supported	Intel, 32K/25	Intel, 32K/25	Not Supported
Input/Output Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	3 16-bit	2 8-bit, 6 16-bit, 1 32-bit	2 8-bit, 6 16-bit, 1 32-bit	3 16-bit
Available Expansion Slots	None	2 8-bit, 3 16-bit	2 8-bit, 3 16-bit	None
Serial Ports	2 on main board	2 on adapter	2 on adapter	2 on main board
Parallel Ports	1 on main board	1 on adapter	1 on adapter	1 on main board
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	None	None	None	None
Mass Storage Internal Drive Bays Available	2 half-height, 1 third-height	5 half-height	5 half-height	2 half-height, 1 third-height
Diskette Drives Included (bytes)	1 1.2M; 1 1.44M			
Diskette Drive Options (bytes)	1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	1.44M
Hard Disk Interface	AT/IDE	ESDI	AT/IDE	AT/IDE
Hard Disk Size (bytes)/AAT (ms)	40M/28	322M	40M/28	20M/40
Optional Mass Storage	20M, 40M, 100M, 170M, tape drive	40M, 100M, 150M, 322M, tape drive	40M, 100M, 150M, 322M, tape drive	20M, 40M, 100M, 170M, tape drive
Keyboard Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
Video/Display Video Controller/Resolution (pixels)	Integrated on system board/640 x 480	On included adapter/640 x 480	On included adapter/640 x 480	Integrated on system board/640 x 480
Display	Included, 12-inch, analog monochrome	Included, 12-inch, analog mono	Included, 12-inch, analog monochrome	Included, 12-inch, analog monochrome
Local Area Network Support Vendor LAN Options	Ethernet, Token-Ring	Ethernet, Token-Ring	Ethernet, Token-Ring	Ethernet, Token-Ring
Product Design Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	Not available
Dimensions (H x W x D, inches)	4.0 x 15.1 x 15.6	6.4 x 21.1 x 17.6	6.4 x 21.1 x 17.6	4.0 x 15.1 x 15.6
Weight (pounds)	21.70	55.00	55.00	21.70
AC Power Supply (watts)	85	200	200	85
Software Operating System(s) Bundled	None	None	None	None
Operating System(s) Supported	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative			
Additional Software Included	BIOS, setup, util./diagn., tutorial	BIOS, setup, util./diagn.	BIOS, setup, util./diagn.	BIOS, setup, util./diagn., tutorial
Service/Support Distribution Channels	Direct from vendor	Direct from vendor	Direct from vendor	Direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Third party	Third party	Third party	Third party
Service Features	On site, toll free, 30-day money back			
Base Price (\$)	2,099	6,298	4,398	2,199

Vendor	Delta Data Systems Corp.	Delta Data Systems Corp.	Delta Data Systems Corp.	Digitach Research Inc.
<b>Product</b>	<b>Tempest 286 8700T</b>	<b>Tempest 386-16 8732T-16</b>	<b>Tempest 386-25 8732T-25</b>	<b>Digitach DR-80386/33</b>
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/12	80386/16	80386/25	80386/33
Co-Processor Options	80287	80387	80387	80387
Standard RAM (bytes)/Speed (ns)	1.0M/120	1.0M/100	1.0M/80	1.0M/60
RAM Expansion Capacity (bytes)	16.0M	16.0M	16.0M	16.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Zymos, 32K/25	Intel, 32K/25
<b>Input/Output</b>				
Bus Architecture	AT passive backplane	AT passive backplane	AT passive backplane	AT
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	4 8-bit, 8 16-bit	4 8-bit, 8 16-bit	4 8-bit, 8 16-bit	2 8-bit, 5 16-bit, 1 32-bit
Available Expansion Slots	4 8-bit, 6 16-bit	4 8-bit, 6 16-bit	4 8-bit, 5 16-bit	1 8-bit, 4 16-bit, 0 32-bit
Serial Ports	2 on main board	2 on main board	2 on main board	On main board
Parallel Ports	1 on main board	1 on main board	1 on main board	On main board
Other I/O Devices Included	Vendor did not specify	Vendor did not specify	Vendor did not specify	None
Other I/O Interfaces	101-key keyboard port	101-key keyboard port	101-key keyboard port	None
<b>Mass Storage</b>				
Internal Drive Bays Available	1 full-height, 2 half-height	1 full-height, 2 half-height	1 full-height, 2 half-height	5 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	1.44M
Hard Disk Interface	ST506/412	ST506/412	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	None	None	None	80M/28
Optional Mass Storage	40M, 80M, 120M, 300M, tape drive	40M, 80M, 120M, 300M, tape drive	40M, 80M, 120M, 300M, tape drive	150M, 300M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	Adapter optional	On included adapter/, 720 x 358 monochrome
Display	Optional	Optional	Optional	Included, 12-inch digital monochrome
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet	Ethernet	Ethernet	Ethernet, ARCnet
<b>Product Design</b>				
Type of Unit	Floorstanding	Floorstanding	Floorstanding	Desktop
Tempest Version	From manufacturer	From manufacturer	From manufacturer	Vendor did not specify
Dimensions (H x W x D, inches)	26.00 x 10.00 x 27.00	26.00 x 10.00 x 27.00	26.00 x 10.00 x 27.00	Vendor did not specify
Weight (pounds)	58.00	58.00	58.00	Vendor did not specify
AC Power Supply (watts)	230	230	230	220
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	MS-DOS	MS-DOS	MS-DOS
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, Vendor MS-OS/2, UNIX, UNIX deriv.	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, Vendor MS-OS/2, UNIX, UNIX deriv.	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, Vendor MS-OS/2, UNIX, UNIX deriv.	MS-DOS, Vendor MS-OS/2, UNIX derivative
Additional Software Included	Util./diagn.	Util./diagn.	Util./diagn.	None
<b>Service/Support</b>				
Distribution Channels	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor	Direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	90 days	90 days	90 days	1 year
Service Supported by	Vendor, third party	Vendor, third party	Vendor, third party	Vendor
Service Features	On site	On site	On site	On site
<b>Base Price (\$)</b>	<b>3,983/available for GSA</b>	<b>5,549/available for GSA</b>	<b>7,092</b>	<b>4,255</b>

Vendor	DSC Communications	Electrified Discounters Inc.	Electrified Discounters Inc.	Emerald Computers, Inc.
Product	DSC NEXOS Network Server-386	Quadrant AT	Super System 10	LANstation I
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/20	80286/6	8088/10	80286/16
Co-Processor Options	80387	80287	8087	80287
Standard RAM (bytes)/Speed (ns)	2.0M/80	512K/150	512K/150	1.0M/80
RAM Expansion Capacity (bytes)	16.0M	1.0M	640K	4.0M
Maximum System RAM (bytes)	16.0M	1.0M	640K	4.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	XT	AT
Bus Speed (MHz)	8	6	10	8
Total Expansion Slots	1 8-bit, 6 16-bit, 1 32-bit	2 8-bit, 6 16-bit	8 8-bit	1 16-bit
Available Expansion Slots	0 8-bit, 3 16-bit, 0 32-bit	2 8-bit, 6 16-bit	8 8-bit	1 16-bit
Serial Ports	2 on adapter	1 on adapter	1 on adapter	2 on main board
Parallel Ports	3 on adapter	1 on adapter	1 on adapter	1 on main board
Other I/O Devices Included	Vendor did not specify	None	None	None
Other I/O Interfaces	Network interface (Ethernet, ARCnet, or Token Ring)	101-key keyboard port	101-key keyboard port	None
<b>Mass Storage</b>				
Internal Drive Bays Available	6 half-height	3 half-height	4 half-height	Vendor did not specify
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 360K	Vendor did not specify
Diskette Drive Options (bytes)	None	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	None
Hard Disk Interface	ESDI	ST506/412	Vendor did not specify	AT/IDE
Hard Disk Size (bytes)/AAT (ms)	130/18	20M/65	None	None/40
Optional Mass Storage	260M or 520M, tape drive	30M, 40M, 50M, 60M, 70M	20M, 30M, 40M, 50M, 60M	20M, none
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	84/10	101/12	85/10
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/text mode only	On included adapter/640 x 400	Adapter optional	Integrated on system board/640 x 350
Display	Included, 14-inch digital monochrome	Included, optional, digital color	Included, optional	Included, 5.5-inch, electroluminescent
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, Token-ring, ARCnet	None	None	Ethernet, Token-ring, ARCnet
<b>Product Design</b>				
Type of Unit	Floorstanding	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	Vendor did not specify
Dimensions (H x W x D, inches)	26.25 x 10.50 x 19.50	5 x 22 x 17	5 x 22 x 17	9.75 x 14.5 x 5.75
Weight (pounds)	Vendor did not specify	30.00	20.00	10.50
AC Power Supply (watts)	238	200	150	40
<b>Software</b>				
Operating System(s) Bundled	NEXOS	Vendor did not specify	MS-DOS	Vendor did not specify
Operating System(s) Supported	IBM PC-DOS, MS-DOS, NEXOS, NOVELL	IBM PC-DOS, MS-DOS	IBM PC-DOS, Enhanced MS-DOS, MS-DOS	MS-DOS, Vendor MS-OS/2, DR-DOS
Additional Software Included	Comm., util./diagn., desk accessory	BIOS	None	BIOS, setup, util./diagn.
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD, direct from vendor	Direct from vendor	Direct from vendor	Direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	Vendor	Vendor	Vendor
Service Supported by	Vendor, authorized dealers, third party	Vendor	Vendor	Vendor
Service Features	On site, toll free	Vendor did not specify	Vendor did not specify	Toll free
<b>Base Price (\$)</b>	11,495	1,024	665	2,095

Vendor	Emerson Computer Corporation	Epson America, Inc.	Epson America, Inc.	Epson America, Inc.
Product	386T33 H4	Equity 386/20	Equity 386SX	Equity I+
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/33	80386/20	80386sx/16	8088/10
Co-Processor Options	80387, Weitek 3167	80387	80387SX	8087
Standard RAM (bytes)/Speed (ns)	4.0M/80	1.0M/80	1.0M/70	640K/120
RAM Expansion Capacity (bytes)	8.0M	16.0M	14M	640K
Maximum System RAM (bytes)	24M	16.0M	14M	640K
RAM Cache, Size (bytes)/Speed (ns)	Chips & Technologies, 64K	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	XT
Bus Speed (MHz)	12.5, 8	8.33	8	10
Total Expansion Slots	1 8-bit, 5 16-bit, 2 32-bit	3 8-bit, 6 16-bit	1 8-bit, 4 16-bit	5 8-bit, 16-bit
Available Expansion Slots	1 8-bit, 5 16-bit, 8 32-bit	2 8-bit, 6 16-bit	1 8-bit, 4 16-bit	5 8-bit, 16-bit
Serial Ports	2 on main board	1 on main board	1 on main board	1 on main board
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on main board
Other I/O Devices Included	None	Vendor did not specify	Vendor did not specify	Vendor did not specify
Other I/O Interfaces	Mouse	101-key keyboard port	Mouse, 101-key keyboard port	None
<b>Mass Storage</b>				
Internal Drive Bays Available	Vendor did not specify	5 half-height	3 half-height	2 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.44M	1 360K
Diskette Drive Options (bytes)	1.2M, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 720K
Hard Disk Interface	None	None	AT/IDE	ST506/412
Hard Disk Size (bytes)/AAT (ms)	None	None	Vendor did not specify	None
Optional Mass Storage	40M, 100M, 200M	40M, 90M, tape drive	40M, 100M	None
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	Adapter optional/640 x 480	Adapter optional
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	None	Vendor did not specify	None	Vendor did not specify
<b>Product Design</b>				
Type of Unit	Floorstanding	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Vendor did not specify	Not available
Dimensions (H x W x D, inches)	23.0 x 6.6 x 16.7	6.60 x 19.60 x 17.40	6.1 x 15.7 x 16.4	5.70 x 14.40 x 14.80
Weight (pounds)	Vendor did not specify	32.00	21.60	20.00
AC Power Supply (watts)	240	193	110	80
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	MS-DOS	MS-DOS	MS-DOS
Operating System(s) Supported	MS-DOS	MS-DOS, Vendor MS-OS/2, UNIX derivative	IBM OS/2 Standard, MS-DOS, Vendor MS-OS/2, UNIX derivative	Vendor did not specify
Additional Software Included	BIOS, setup, util./diagn., Quattro, Reflex, PFS: Professional Write	Util./diagn.	BIOS, util./diagn.	Util./diagn.
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers, third party	Authorized dealers	Authorized dealers	Authorized dealers
Service Features	On site, toll free	Toll free	Vendor did not specify	Toll free
<b>Base Price (\$)</b>	4,995	3,599	2,299	1,099/available for GSA

Vendor	Epson America, Inc.	Epson America, Inc.	Epson America, Inc.	Epson America, Inc.
Product	Equity Ie	Equity II+	Equity IIe	Equity III+
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	8086/10	80286/12	80286/812	80286/12
Co-Processor Options	8087	80287	80287	80287
Standard RAM (bytes)/Speed (ns)	640K/120	640K/120	1.0M	640K/120
RAM Expansion Capacity (bytes)	640K	640K	5M	640K
Maximum System RAM (bytes)	640K	15.5M	5M	15.5M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Input/Output</b>				
Bus Architecture	XT	AT	AT	AT
Bus Speed (MHz)	10	12	8	12
Total Expansion Slots	4 8-bit, 16-bit	3 8-bit, 3 16-bit	1 8-bit, 4 16-bit	3 8-bit, 6 16-bit
Available Expansion Slots	4 8-bit, 16-bit	3 8-bit, 2 16-bit	1 8-bit, 4 16-bit	3 8-bit, 6 16-bit
Serial Ports	1 on main board	1 on adapter	1 on main board	1 on adapter
Parallel Ports	1 on main board	1 on adapter	1 on main board	1 on adapter
Other I/O Devices Included	Vendor did not specify	Vendor did not specify	None	Vendor did not specify
Other I/O Interfaces	Mouse, 101-key keyboard port, ext. video	Vendor did not specify	Mouse, 101-key keyboard port	None
<b>Mass Storage</b>				
Internal Drive Bays Available	1 half-height, 1 third-height	3 half-height	Vendor did not specify	5 half-height
Diskette Drives Included (bytes)	1 720K	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	720K	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M
Hard Disk Interface	ST506/412	ST506/412	Vendor did not specify	ST506/412
Hard Disk Size (bytes)/AAT (ms)	None	None	None	None
Optional Mass Storage	20M	40M	40M	40M
<b>Keyboard</b>				
Availability	Included (fixed position)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/640 x 480	Adapter optional	Adapter optional	Adapter optional
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Vendor did not specify	Not available
Dimensions (H x W x D, inches)	4.50 x 13.76 x 15.94	6.10 x 15.70 x 16.30	6.1 x 15.7 x 16.4	6.60 x 19.60 x 19.40
Weight (pounds)	16.00	20.00	21.55	32.00
AC Power Supply (watts)	62	110	110	192
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	MS-DOS	MS-DOS, UNIX derivative	MS-DOS
Operating System(s) Supported	Vendor did not specify	Vendor MS-OS/2	MS-DOS, MS OS/2	Vendor MS-OS/2
Additional Software Included	Util./diagn.	Util./diagn.	BIOS, diagnostics	Util./diagn.
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Authorized dealers	Authorized dealers	Authorized dealers, third party	Authorized dealers
Service Features	Toll free	Toll free	Vendor did not specify	Toll free
<b>Base Price (\$)</b>	1,149/available for GSA	1,599	1,799	2,199

Vendor	Everex Systems, Inc.	First Class Systems, Inc.	First Class Systems, Inc.	Fortis Information Systems, Inc.
Product	Step 486is	F16/SX	F20/DX	CP286B
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	I486/25	80386SX/15	80386/20	80286/12
Co-Processor Options	None	80387SX	80387	80287
Standard RAM (bytes)/Speed (ns)	4.0M/100	1.0M/—	4.0M/—	512K/100
RAM Expansion Capacity (bytes)	8.0M	4.0M	8.0M	1.0M
Maximum System RAM (bytes)	16.0M	16.0M	32.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Proprietary, 256K/35	Not supported	Optional 64K/30	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	MCA	MCA	AT
Bus Speed (MHz)	12.5	10	10	8
Total Expansion Slots	2 8-bit, 6 16-bit, 1 32-bit	3 16-bit	3 16-bit, 2 32-bit	3 8-bit, 5 16-bit
Available Expansion Slots	1 8-bit, 5 16-bit, 1 32-bit	3 16-bit	3 16-bit, 2 32-bit	3 8-bit, 5 16-bit
Serial Ports	1 on main board	1 on main board	1 on main board	2 on adapter
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on adapter
Other I/O Devices Included	None	Mouse	Mouse	None
Other I/O Interfaces	None	None	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	5 half-height	Vendor did not specify	Vendor did not specify	4 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.44M	1 1.44M	Vendor did not specify
Diskette Drive Options (bytes)	1.2M	Vendor did not specify	Vendor did not specify	1.2M
Hard Disk Interface	None	SCSI	SCSI	ST506/412
Hard Disk Size (bytes)/AAT (ms)	None	40M/19	80M/19	None
Optional Mass Storage	160M, 330M, tape drive	80M, tape drive	140M, tape drive	20M, 40M
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Integrated on system board/ 800 x 600	Integrated on system board/ 800 x 600	Adapter optional
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet	Ethernet, Token-Ring	Ethernet, Token-Ring	None
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify	Vendor did not specify	Vendor did not specify	From manufacturer
Dimensions (H x W x D, inches)	6 x 21.25 x 16.5	Vendor did not specify	Vendor did not specify	6.25 x 17 x 16.5
Weight (pounds)	31.50	Vendor did not specify	Vendor did not specify	43.00
AC Power Supply (watts)	200	100	100	200
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	None	None	MS-DOS
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX, UNIX deriv.	MS-DOS	MS-DOS	IBM PC-DOS, MS-DOS
Additional Software Included	BIOS, setup, diagnostics, util./diagn.	None	None	Setup
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor	Computer retail
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers, third party	Vendor did not specify	Vendor did not specify	Vendor
Service Features	On site	Vendor did not specify	Vendor did not specify	Toll free
<b>Base Price (\$)</b>	9,699	4,260	8,250	1,049

Vendor	Fortis Information Systems, Inc.	Fortis Information Systems, Inc.	Fortron Corp.	Fortron Corp.
Product	CP286L	CP386T	NetSet 386 Model 320 333	NetSet 386 Model 325 333
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/12	80386/25	80386/20	80386/25
Co-Processor Options	80287	80387, 80287, Weitek 1167	80387, Weitek 1167, Weitek 3176	80387, Weitek 1167, Weitek 3167
Standard RAM (bytes)/Speed (ns)	512K/100	1.0M/80	4.0M/60	4.0M/80
RAM Expansion Capacity (bytes)	1.0M	8.0M	16.0M	16.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Proprietary, 64K/35	Proprietary, 64K/25
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	2 8-bit, 3 16-bit	2 8-bit, 5 16-bit, 1 32-bit	2 8-bit, 5 16-bit, 1 32-bit	2 8-bit, 5 16-bit, 1 32-bit
Available Expansion Slots	2 8-bit, 3 16-bit	2 8-bit, 5 16-bit, 1 32-bit	1 8-bit, 4 16-bit, 1 32-bit	1 8-bit, 4 16-bit, 1 32-bit
Serial Ports	2 on main board	2 on adapter	2 on adapter	2 on adapter
Parallel Ports	1 on main board	1 on adapter	1 on adapter	1 on adapter
Other I/O Devices Included	None	None	None	Vendor did not specify
Other I/O Interfaces	None	None	101-key keyboard port	101-key keyboard port
<b>Mass Storage</b>				
Internal Drive Bays Available	2 half-height, 2 third-height	2 full-height, 4 half-height	1 full-height, 2 half-height, 2 third-height	1 full-height, 2 half-height, 2 third-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1	1
Diskette Drive Options (bytes)	1.2M, 1.44M	1.2M, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M
Hard Disk Interface	ST506/412	None	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	None	None	70M/28	70M/28
Optional Mass Storage	20M, 40M	20M, 40M, 80M	20M, 30M, 40M, 50M, 60M, 70M, 80M, 90M, 100M, 120M, 150M, 300M, 680M, tape drive	20M, 30M, 40M, 50M, 60M, 70M, 80M, 90M, 100M, 120M, 150M, 300M, 680M, tape drives
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (fixed position)	Included (fixed position)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	On included adapter/800 x 600	On included adapter/800 x 600
Display	Optional	Optional	Included, 14-inch	Included, 14-inch
<b>Local Area Network Support</b>				
Vendor LAN Options	None	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Product Design</b>				
Type of Unit	Desktop	Floorstanding	Floorstanding	Floorstanding
Tempest Version	From manufacturer	From manufacturer	From manufacturer	From manufacturer
Dimensions (H x W x D, inches)	4 x 16.25 x 15.5	23 x 5.5 x 19	23.25 x 6.50 x 19.25	23.25 x 6.50 x 19.25
Weight (pounds)	30.00	53.00	70.00	70.00
AC Power Supply (watts)	150	200	220	220
<b>Software</b>				
Operating System(s) Bundled	IBM PC-DOS, MS-DOS	MS-DOS	None	None
Operating System(s) Supported	IBM PC-DOS, MS-DOS	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, Vendor MS-OS/2 Setup	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX, UNIX deriv. Util./diagn.	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX, UNIX deriv. Util./diagn.
Additional Software Included	BIOS, setup			
<b>Service/Support</b>				
Distribution Channels	Computer retail	Computer retail	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor	Vendor	Third party	Third party
Service Features	Toll free	Toll free	On site, toll free, 30-day money back	On site, toll free, 30-day money back
<b>Base Price (\$)</b>	959	2,195	3,500	4,500

Vendor	Fortron Corp.	Fountain Technologies, Inc.	GCH Systems, Inc.	GCH Systems, Inc.
<b>Product</b>	<b>NetSet 386 Model 333</b>	<b>FTN-386SX</b>	<b>Easy Data 216HI</b>	<b>Easy Data 316SX</b>
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/33	80386sx/16	80286/16	80286/16
Co-Processor Options	80387, Weitek 3167	80387SX	80287	None
Standard RAM (bytes)/Speed (ns)	4.0M/60	1.0M/80	1.0M/100	2.0M/100
RAM Expansion Capacity (bytes)	16.0M	4.0M	4.0M	8.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Proprietary, 64K/25	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	2 8-bit, 5 16-bit, 1 32-bit	6 16-bit, 2 32-bit	2 8-bit, 6 16-bit, 0 32-bit	2 8-bit, 6 16-bit, 0 32-bit
Available Expansion Slots	1 8-bit, 4 16-bit, 1 32-bit	6 16-bit, 2 32-bit	1 8-bit, 5 16-bit, 0 32-bit	2 8-bit, 5 16-bit, 0 32-bit
Serial Ports	2 on adapter	None	None; 2 on adapter	None; 2 on adapter
Parallel Ports	1 on adapter	None	None; 1 on adapter	None; 1 on adapter
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	101-key keyboard port	None	Ext. video	Ext. video
<b>Mass Storage</b>				
Internal Drive Bays Available	1 full-height, 2 half-height, 2 third-height	1 full-height, 3 half-height	5 half-height	5 half-height
Diskette Drives Included (bytes)	1	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M	1.2M	1.44M	1.44M
Hard Disk Interface	ST506/412	ESDI	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	70M/28	None	None	None
Optional Mass Storage	20M, 30M, 40M, 50M, 60M, 70M, 80M, 90M, 100M, 120M, 150M, 300M, 680M, tape drive	20M, 40M, 80M, 300M, tape drive	30M, 70M, tape drive	40M, 80M, tape drive
<b>Keyboard</b>				
Availability	Included (fixed position)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/800 x 600	Adapter optional	Adapter optional	Adapter optional
Display	Included, 14-inch	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Vendor did not specify	Ethernet, ARCnet	Vendor did not specify	None
<b>Product Design</b>				
Type of Unit	Floorstanding	Desktop	Desktop	Desktop
Tempest Version	From manufacturer	Vendor did not specify	Vendor did not specify	Not available
Dimensions (H x W x D, inches)	23.25 x 6.50 x 19.25	Vendor did not specify	7.0 x 15.0 x 16.0	7.0 x 15.0 x 16.0
Weight (pounds)	70.00	Vendor did not specify	50.00	Vendor did not specify
AC Power Supply (watts)	220	200	200	200
<b>Software</b>				
Operating System(s) Bundled	None	None	None	None
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX, UNIX deriv.	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX, UNIX deriv.	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS
Additional Software Included	Util./diagn.	BIOS	BIOS, setup, diagnostics, operating system, util./diagn.	BIOS, setup, diagnostics, operating system, util./diagn.
<b>Service/Support</b>				
Distribution Channels	VAR/VAD, direct from vendor	Computer retail, general retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Third party	Vendor, authorized dealers	Vendor did not specify	Third party
Service Features	On site, toll free, 30-day money back	On site	On site, 30-day money back	On site, 30-day money back
<b>Base Price (\$)</b>	<b>6,500</b>	<b>1,500</b>	<b>1,176</b>	<b>1,875</b>

Vendor	GCH Systems, Inc.	GCH Systems, Inc.	GCH Systems, Inc.	GCH Systems, Inc.
Product	Easy Data 320	Easy Data 320HI	Easy Data 325	Easy Data 325HI
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/33	80386/20	80386/25	80386/25
Co-Processor Options	80387	80387	80387, Weitek 3167	80387, Weitek 3167
Standard RAM (bytes)/Speed (ns)	2.0M/100	2.0M/100	4.0M/100	4.0M/100
RAM Expansion Capacity (bytes)	8.0M	8.0M	16.0M	16.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Intel, 32K/25	Intel, 32K/25
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	10	10	10	10
Total Expansion Slots	2 8-bit, 5 16-bit, 1 32-bit	2 8-bit, 6 16-bit, 1 32-bit	2 8-bit, 5 16-bit, 1 32-bit	2 8-bit, 5 16-bit, 1 32-bit
Available Expansion Slots	1 8-bit, 4 16-bit, 1 32-bit	2 8-bit, 5 16-bit, 1 32-bit	1 8-bit, 4 16-bit, 0 32-bit	1 8-bit, 4 16-bit, 0 32-bit
Serial Ports	None; 2 on adapter			
Parallel Ports	None; 1 on adapter			
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	Ext. video	Ext. video	Ext. video	Ext. video
<b>Mass Storage</b>				
Internal Drive Bays Available	5 half-height	5 half-height	5 half-height	5 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M; 1 1.44M	1 1.2M; 1 1.44M
Diskette Drive Options (bytes)	1.44M	1.44M	None	None
Hard Disk Interface	ST506/412	ESDI	ESDI	ESDI
Hard Disk Size (bytes)/AAT (ms)	None	None	None	None
Optional Mass Storage	40M, 80M, tape drive, CD-ROM	40M, 80M, tape drive	150M, 300M, tape drive, CD-ROM	150M, 300M, tape drive, CD-ROM
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	Adapter optional	Adapter optional
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	None	None	Vendor did not specify	None
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Vendor did not specify	Vendor did not specify	Not available
Dimensions (H x W x D, inches)	7.0 x 21.5 x 17.5	7.0 x 15.0 x 16.0	7.0 x 21.5 x 17.5	7.0 x 15.0 x 16.0
Weight (pounds)	50.00	50.00	Vendor did not specify	50.00
AC Power Supply (watts)	200	200	200	Vendor did not specify
<b>Software</b>				
Operating System(s) Bundled	None	None	None	UNIX
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS
Additional Software Included	BIOS, setup, diagnostics, operating system, util./diagn.			
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Third party	Third party	Third party	Third party
Service Features	On site, 30-day money back			
<b>Base Price (\$)</b>	2,190	2,190	4,599	4,599

Vendor	GCH Systems, Inc.	GMX, Inc.	Herko Electronics, Inc.	Hetra Computer & Communications Industries, Inc.
Product	Easy Data 333	Micro-20 M20	HEI 386/20 VFS	Tempest PC 105T-286
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/33	68030/20	80386/20	80286/10
Co-Processor Options	80387	None	Weitek 1167, 80387	80287
Standard RAM (bytes)/Speed (ns)	4.0M/100	2.0M/80	1.0M/80	1.0M/120
RAM Expansion Capacity (bytes)	16.0M	2.0M, 4.0M	16.0M	16.0M
Maximum System RAM (bytes)	16.0M	4.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Intel, 32K/20	Not supported	Chips & Tech., 64K/25	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	Proprietary	AT	AT passive backplane
Bus Speed (MHz)	10	12.5	8	8
Total Expansion Slots	2 8-bit, 5 16-bit, 1 32-bit	3 16-bit	7 16-bit, 1 32-bit	8 16-bit
Available Expansion Slots	1 8-bit, 4 16-bit	3 16-bit	5 16-bit	7 16-bit
Serial Ports	2 on adapter	1 on main board	On main board	2 on adapter
Parallel Ports	1 on adapter	1 on main board	1 on adapter	1 on adapter
Other I/O Devices Included	None	None	Vendor did not specify	Mouse
Other I/O Interfaces	Ext. video	SCSI	101-key keyboard port, numeric keypad port	Mouse, 101-key keyboard port, ext. video, network interface (Ethernet)
<b>Mass Storage</b>				
Internal Drive Bays Available	5 half-height	3 full-height	1 full-height, 3 half-height	4 half-height
Diskette Drives Included (bytes)	1 1.2M; 1 1.44M	None	1	None
Diskette Drive Options (bytes)	None	720K	360K, 720K	360K, 1.2M, 720K, 1.44M
Hard Disk Interface	ESDI	None	ESDI	ST506/412, SCSI
Hard Disk Size (bytes)/AAT (ms)	None	None	760M/18	None
Optional Mass Storage	150M, 300M, tape drive, CD-ROM	40M, tape drive	80M, 150M, tape drive, CD-ROM	20M, 30M, 40M, 100M, tape drive, Bernoulli cartridge
<b>Keyboard</b>				
Availability	Included (detachable)	Optional	Included (detachable)	Optional
Number of Keys/Function Keys	101/12	Vendor did not specify	84, 101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	On included adapter/800 x 600	Adapter optional
Display	Optional	Optional	Included, 14-inch, multifrequency	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	None	Ethernet, ARCnet	Ethernet, ARCnet	Ethernet
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Floorstanding	Desktop
Tempest Version	Not available	Not available	Vendor did not specify	From manufacturer
Dimensions (H x W x D, inches)	7.0 x 21.5 x 17.5	17.4 x 17 x 23	21.00 x 7.00 x 16.50	6.50 x 17.50 x 17.50
Weight (pounds)	50.00	50.00	50.00	43.00
AC Power Supply (watts)	200	200	220	220
<b>Software</b>				
Operating System(s) Bundled	UNIX	None	MS-DOS	Vendor did not specify
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	OS9, Uriflex	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX	IBM OS/2 Standard, MS-DOS
Additional Software Included	BIOS, setup, diagnostics, util./diagn.	Diagnostics, util./diagn.	Util./diagn., desk accessory	Vendor did not specify
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD	Direct from vendor	Computer retail, VAR/VAD, direct from vendor	Direct from vendor
Parts Warranty	1 year	90 days	1 year	90 days
Labor Warranty	1 year	90 days	1 year	90 days
Service Supported by	Third party	Vendor	Vendor, authorized dealers, third party	Vendor
Service Features	On site, 30-day money back	Vendor did not specify	On site	On site, toll free
<b>Base Price (\$)</b>	5,769/available for GSA	Vendor did not specify	4,409/available for GSA	3,600

Vendor	Hetra Computer & Communications Industries, Inc.	Hetra Computer & Communications Industries, Inc.	Hewlett-Packard Company	Hewlett-Packard Company
Product	Tempest PC 105T-386/16	Tempest PC 105T-386/20	Vectra 486 PC Model 150	Vectra 486 PC Model 330
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/16	80386/20	1486/25	1486/25
Co-Processor Options	80387	80387	None	None
Standard RAM (bytes)/Speed (ns)	2.0M/80	2.0M/100	2.0M	2.0M
RAM Expansion Capacity (bytes)	16.0M	16.0M	2.0M	2.0M
Maximum System RAM (bytes)	16.0M	16.0M	64M	64M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Vendor did not specify	Vendor did not specify
<b>Input/Output</b>				
Bus Architecture	AT passive backplane	AT	EISA	EISA
Bus Speed (MHz)	8	8	Vendor did not specify	Vendor did not specify
Total Expansion Slots	8 16-bit	8 16-bit	16-bit, 8 32-bit	16-bit, 8 32-bit
Available Expansion Slots	7 16-bit	7 16-bit	16-bit, 7 32-bit	16-bit, 7 32-bit
Serial Ports	2 on main board	2 on main board	2 on main board	2 on main board
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on main board
Other I/O Devices Included	Mouse	None	None	None
Other I/O Interfaces	Mouse, SCSI, 101-key keyboard port, ext. video, network interface (Ethernet)	Mouse, 101-key keyboard port, ext. video	Mouse	Mouse
<b>Mass Storage</b>				
Internal Drive Bays Available	4 half-height	4 half-height	6 half-height	6 half-height
Diskette Drives Included (bytes)	None	None	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M
Hard Disk Interface	ST506/412	Vendor did not specify	Vendor did not specify	Vendor did not specify
Hard Disk Size (bytes)/AAT (ms)	None	None	152M/17	330M/15 ms
Optional Mass Storage	20M, 30M, 40M, 100M, tape drive, Bernoulli cartridge	20M, 40M, 100M, tape drive, Bernoulli cartridge	84M, 108M, 152M, 670M, tape drive	84M, 108M, 152M, 670M, tape drive
<b>Keyboard</b>				
Availability	Optional	Optional	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/10	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	Adapter optional	Adapter optional
Display	Optional	Included, optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet	Ethernet	Starlan	Starlan
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Floorstanding	Floorstanding
Tempest Version	From manufacturer	From manufacturer	Vendor did not specify	Vendor did not specify
Dimensions (H x W x D, inches)	6.50 x 17.50 x 17.50	6.5 x 17.5 x 17.5	24 x 8.3 x 20	24 x 8.3 x 20
Weight (pounds)	43.00	43.00	60.00	60.00
AC Power Supply (watts)	220	220	260	260
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify	None	None	None
Operating System(s) Supported	IBM OS/2 Standard, MS-DOS	MS-DOS	Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2, UNIX	Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2, UNIX
Additional Software Included	Vendor did not specify	BIOS, diagnostics	BIOS, util./diagn.	BIOS, util./diagn.
<b>Service/Support</b>				
Distribution Channels	Direct from vendor	Direct from vendor	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor
Parts Warranty	90 days	90 days	1 year	1 year
Labor Warranty	90 days	90 days	1 year	1 year
Service Supported by	Vendor	Vendor	Vendor, authorized dealers	Vendor, authorized dealers
Service Features	On site, toll free	On site, toll free	Toll free	Toll free
<b>Base Price (\$)</b>	6,100	6,100	Vendor did not specify	Vendor did not specify

Vendor	Hewlett-Packard Company	Hewlett-Packard Company	Hewlett-Packard Company	Hewlett-Packard Company
Product	Vectra 486 PC Model 670	Vectra CS 10	Vectra CS 15	Vectra CS 16
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	1486/25	NEC V-30/7.16	NEC V-30/7.16	NEC V-30/7.16
Co-Processor Options	None	8087	8087	8087
Standard RAM (bytes)/Speed (ns)	2.0M	640K	640K	640K
RAM Expansion Capacity (bytes)	2.0M	640K	640K	640K
Maximum System RAM (bytes)	64M	640K	640K	640K
RAM Cache, Size (bytes)/Speed (ns)	Vendor did not specify	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	EISA	XT	XT	XT
Bus Speed (MHz)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Total Expansion Slots	16-bit, 8 32-bit	7 8-bit, 16-bit	7 8-bit, 16-bit	7 8-bit, 16-bit
Available Expansion Slots	16-bit, 7 32-bit	7 8-bit, 16-bit	7 8-bit, 16-bit	6 8-bit, 16-bit
Serial Ports	2 on main board	1 on main board	1 on main board	1 on main board
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on main board
Other I/O Devices Included	None	Vendor did not specify	Vendor did not specify	Vendor did not specify
Other I/O Interfaces	Mouse	HP-HIL	HP-HIL	HP-HIL
<b>Mass Storage</b>				
Internal Drive Bays Available	6 half-height	3 half-height	3 half-height	3 half-height
Diskette Drives Included (bytes)	1 1.2M	1 360K	1 1.44M	2 360K
Diskette Drive Options (bytes)	360K, 1.2M, 1.44M	360K, 1.44M	360K, 1.44M	360K, 1.44M
Hard Disk Interface	Vendor did not specify	None	None	None
Hard Disk Size (bytes)/AAT (ms)	670M/15 ms	None	None	None
Optional Mass Storage	84M, 108M, 152M, 670M, tape drive	20M, tape drive, CD-ROM drive	20M, tape drive, CD-ROM drive	20M, tape drive, CD-ROM drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	Adapter optional	On included adapter/640 x 350
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Starlan	Starlan	Starlan	Starlan
<b>Product Design</b>				
Type of Unit	Floorstanding	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Dimensions (H x W x D, inches)	24 x 8.3 x 20	6.30 x 16.70 x 15.40	6.30 x 16.70 x 15.40	6.30 x 16.70 x 15.40
Weight (pounds)	60.00	29.00	29.00	29.00
AC Power Supply (watts)	260	134	134	134
<b>Software</b>				
Operating System(s) Bundled	None	Vendor did not specify	Vendor did not specify	Vendor did not specify
Operating System(s) Supported	Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2, UNIX	Enhanced MS-DOS	Enhanced MS-DOS	Enhanced MS-DOS
Additional Software Included	BIOS, util./diagn.	Comm., util./diagn.	Comm., util./diagn.	Comm., util./diagn.
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers
Service Features	Toll free	Toll free	Toll free	Toll free
<b>Base Price (\$)</b>	Vendor did not specify	1,195/available for GSA	1,295/available for GSA	1,695/available for GSA

Vendor	Hewlett-Packard Company	Hewlett-Packard Company	Hewlett-Packard Company	Hewlett-Packard Company
Product	Vectra CS 20	Vectra CS 25	Vectra CS 27	Vectra ES 10
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	NEC V-30/7.16	NEC V-30/7.16	NEC V-30/7.16	80286/8
Co-Processor Options	8087	8087	8087	80287
Standard RAM (bytes)/Speed (ns)	640K	640K	640K	640K
RAM Expansion Capacity (bytes)	640K	640K	640K	640K
Maximum System RAM (bytes)	640K	640K	640K	8.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	XT	XT	XT	AT
Bus Speed (MHz)	Vendor did not specify			
Total Expansion Slots	7 8-bit, 16-bit	7 8-bit	7 8-bit	2 8-bit, 5 16-bit
Available Expansion Slots	6 8-bit, 16-bit	5 8-bit	5 8-bit	2 8-bit, 4 16-bit
Serial Ports	1 on main board	1 on main board	1 on main board	1 on adapter
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on adapter
Other I/O Devices Included	Vendor did not specify			
Other I/O Interfaces	HP-HIL	HP-HIL	HP-HIL	HP-HIL
<b>Mass Storage</b>				
Internal Drive Bays Available	3 half-height,	3 half-height	3 half-height	3 half-height
Diskette Drives Included (bytes)	1 360K	1 360K	1 1.44M	1 1.2M
Diskette Drive Options (bytes)	360K, 1.44M	360K, 1.44M	360K, 1.44M	360K, 1.2M, 1.44M
Hard Disk Interface	ST506/412	ST506/412	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	None	None	None	None
Optional Mass Storage	20M, tape drive, CD-ROM	20M, tape drive, CD-ROM	20M, tape drive, CD-ROM	20M, 40M, tape drive, CD-ROM
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	On included adapter/640 x 350	On included adapter/640 x 350	Adapter optional
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Starlan	Starlan	Starlan	Starlan
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify			
Dimensions (H x W x D, inches)	6.30 x 16.70 x 15.40			
Weight (pounds)	29.00	29.00	29.00	30.00
AC Power Supply (watts)	134	134	134	134
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify			
Operating System(s) Supported	Enhanced MS-DOS	Enhanced MS-DOS	Enhanced MS-DOS	Enhanced MS-DOS, Vendor MS-OS/2
Additional Software Included	Comm., util./diagn.	Comm., util./diagn.	Comm., util./diagn.	Comm., util./diagn.
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD, direct from vendor			
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers
Service Features	Toll free	Toll free	Toll free	Toll free
<b>Base Price (\$)</b>	1,895/available for GSA	2,295/available for GSA	2,295/available for GSA	1,995/available for GSA

Vendor	Hewlett-Packard Company	Hewlett-Packard Company	Hewlett-Packard Company	Hewlett-Packard Company
Product	Vectra ES 15	Vectra ES 20	Vectra ES 26	Vectra ES 27
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/8	80286/8	80286/8	80286/8
Co-Processor Options	80287	80287	80287	80287
Standard RAM (bytes)/Speed (ns)	640K	640K	640K	640K
RAM Expansion Capacity (bytes)	640K	640K	640K	640K
Maximum System RAM (bytes)	8.0M	8.0M	8.0M	8.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	Vendor did not specify			
Total Expansion Slots	2 8-bit, 5 16-bit			
Available Expansion Slots	2 8-bit, 4 16-bit	2 8-bit, 4 16-bit	1 8-bit, 4 16-bit	1 8-bit, 4 16-bit
Serial Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
Parallel Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
Other I/O Devices Included	Vendor did not specify			
Other I/O Interfaces	HP-HIL	HP-HIL	HP-HIL	HP-HIL
<b>Mass Storage</b>				
Internal Drive Bays Available	3 half-height	3 half-height	3 half-height	3 half-height
Diskette Drives Included (bytes)	1 1.44M	1 1.2M	1 1.2M	1 1.44M
Diskette Drive Options (bytes)	360K, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M
Hard Disk Interface	ST506/412	ST506/412	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	None	None	None	None
Optional Mass Storage	20M, 40M, tape drive, CD-ROM	20M, tape drive, CD-ROM	20M, tape drive, CD-ROM	20M, tape drive, CD-ROM
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	On included adapter/640 x 350	On included adapter/640 x 350
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Starlan	Starlan	Starlan	Starlan
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify			
Dimensions (H x W x D, inches)	6.30 x 16.70 x 15.40			
Weight (pounds)	30.00	30.00	30.00	30.00
AC Power Supply (watts)	134	134	134	134
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify			
Operating System(s) Supported	Enhanced MS-DOS, Vendor MS-OS/2			
Additional Software Included	Comm., util./diagn.	Comm., util./diagn.	Comm., util./diagn.	Comm., util./diagn.
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD, direct from vendor			
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers
Service Features	Toll free	Toll free	Toll free	Toll free
<b>Base Price (\$)</b>	1,995/available for GSA	2,395/available for GSA	2,795/available for GSA	2,795/available for GSA

Vendor	Hewlett-Packard Company	Hewlett-Packard Company	Hewlett-Packard Company	Hewlett-Packard Company
Product	Vectra ES/12 10	Vectra ES/12 15	Vectra ES/12 20	Vectra ES/12 26
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/12	80286/15	80286/20	80286/26
Co-Processor Options	80287	80287	80287	80287
Standard RAM (bytes)/Speed (ns)	640K	640K	640K	640K
RAM Expansion Capacity (bytes)	640K	640K	640K	640K
Maximum System RAM (bytes)	8.0M	8.0M	8.0M	8.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	Vendor did not specify			
Total Expansion Slots	2 8-bit, 5 16-bit			
Available Expansion Slots	2 8-bit, 4 16-bit			
Serial Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
Parallel Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
Other I/O Devices Included	Vendor did not specify			
Other I/O Interfaces	HP-HIL	HP-HIL	HP-HIL	HP-HIL
<b>Mass Storage</b>				
Internal Drive Bays Available	3 half-height	3 half-height	3 half-height	3 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M
Hard Disk Interface	ST506/412	ST506/412	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	None	None	None	None
Optional Mass Storage	20M, 40M, tape drive, CD-ROM			
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	Adapter optional	Adapter optional
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Starlan	Starlan	Starlan	Starlan
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify			
Dimensions (H x W x D, inches)	6.30 x 16.70 x 15.40			
Weight (pounds)	30.00	30.00	30.00	30.00
AC Power Supply (watts)	134	134	134	134
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify			
Operating System(s) Supported	Enhanced MS-DOS, Vendor MS-OS/2			
Additional Software Included	Comm., util./diagn.	Comm., util./diagn.	Comm., util./diagn.	Comm., util./diagn.
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD, direct from vendor			
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers
Service Features	Toll free	Toll free	Toll free	Toll free
<b>Base Price (\$)</b>	2,495/available for GSA	2,495/available for GSA	2,895/available for GSA	3,195/available for GSA

Vendor	Hewlett-Packard Company	Hewlett-Packard Company	Hewlett-Packard Company	Hewlett-Packard Company
Product	Vectra ES/12 27	Vectra ES/12 40	Vectra ES/12 46	Vectra ES/12 47
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/27	80286/20	80286/26	80286/27
Co-Processor Options	80287	80287	80287	80287
Standard RAM (bytes)/Speed (ns)	640K	640K	640K	640K
RAM Expansion Capacity (bytes)	640K	640K	640K	640K
Maximum System RAM (bytes)	8.0M	8.0M	8.0M	8.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	Vendor did not specify			
Total Expansion Slots	2 8-bit, 5 16-bit,	2 8-bit, 5 16-bit	2 8-bit, 5 16-bit	2 8-bit, 5 16-bit
Available Expansion Slots	2 8-bit, 4 16-bit,	2 8-bit, 4 16-bit	2 8-bit, 4 16-bit	2 8-bit, 4 16-bit
Serial Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
Parallel Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
Other I/O Devices Included	Vendor did not specify			
Other I/O Interfaces	HP-HIL	HP-HIL	HP-HIL	HP-HIL
<b>Mass Storage</b>				
Internal Drive Bays Available	3 half-height	3 half-height	3 half-height	3 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M
Hard Disk Interface	ST506/412	ST506/412	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	None	None	None	None
Optional Mass Storage	20M, 40M, tape drive, CD-ROM	40M, tape drive, CD-ROM	40M, tape drive, CD-ROM	40M, tape drive, CD-ROM
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	Adapter optional	Adapter optional
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Starlan	Starlan	Starlan	Starlan
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify			
Dimensions (H x W x D, inches)	6.30 x 16.70 x 15.40			
Weight (pounds)	30.00	30.00	30.00	30.00
AC Power Supply (watts)	134	134	134	134
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify			
Operating System(s) Supported	Enhanced MS-DOS, Vendor MS-OS/2			
Additional Software Included	Comm., util./diagn.	Comm., util./diagn.	Comm., util./diagn.	Comm., util./diagn.
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD, direct from vendor			
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers
Service Features	Toll free	Toll free	Toll free	Toll free
<b>Base Price (\$)</b>	3,195/available for GSA	3,295/available for GSA	3,595/available for GSA	3,595/available for GSA

Vendor	Hewlett-Packard Company	Hewlett-Packard Company	Hewlett-Packard Company	Hewlett-Packard Company
Product	Vectra QS/16 10	Vectra QS/16 40	Vectra QS/16 46	Vectra QS/16 47
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/16	80386/16	80386/16	80386/16
Co-Processor Options	80387	80387	80387	80387
<b>Standard RAM (bytes)/Speed (ns)</b>				
Standard RAM (bytes)/Speed (ns)	1.0M/100	1.0M/100	1.0M/100	1.0M/100
<b>RAM Expansion Capacity (bytes)</b>				
RAM Expansion Capacity (bytes)	16.0M	16.0M	16.0M	16.0M
<b>Maximum System RAM (bytes)</b>				
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
<b>RAM Cache, Size (bytes)/Speed (ns)</b>				
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
<b>Bus Architecture</b>				
Bus Architecture	AT	AT	AT	AT
<b>Bus Speed (MHz)</b>				
Bus Speed (MHz)	Vendor did not specify			
<b>Total Expansion Slots</b>				
Total Expansion Slots	1 8-bit, 6 16-bit	1 8-bit, 6 16-bit	6 16-bit	6 16-bit
<b>Available Expansion Slots</b>				
Available Expansion Slots	1 8-bit, 5 16-bit	1 8-bit, 5 16-bit	5 16-bit	5 16-bit
<b>Serial Ports</b>				
Serial Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
<b>Parallel Ports</b>				
Parallel Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
<b>Other I/O Devices Included</b>				
Other I/O Devices Included	Vendor did not specify			
<b>Other I/O Interfaces</b>				
Other I/O Interfaces	HP-HIL	HP-HIL	HP-HIL	HP-HIL
<b>Mass Storage</b>				
<b>Internal Drive Bays Available</b>				
Internal Drive Bays Available	3 half-height	3 half-height	3 half-height	3 half-height
<b>Diskette Drives Included (bytes)</b>				
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.44M
<b>Diskette Drive Options (bytes)</b>				
Diskette Drive Options (bytes)	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	360K, 1.44M
<b>Hard Disk Interface</b>				
Hard Disk Interface	ST506/412	ST506/412	ST506/412	ST506/412
<b>Hard Disk Size (bytes)/AAT (ms)</b>				
Hard Disk Size (bytes)/AAT (ms)	None	40M	40M	40M
<b>Optional Mass Storage</b>				
Optional Mass Storage	40M, tape drive, CD-ROM			
<b>Keyboard</b>				
<b>Availability</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
<b>Number of Keys/Function Keys</b>				
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
<b>Video Controller/Resolution (pixels)</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	On included adapter/640 x 480	On included adapter/640 x 480
<b>Display</b>				
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
<b>Vendor LAN Options</b>				
Vendor LAN Options	Starlan	Starlan	Starlan	Starlan
<b>Product Design</b>				
<b>Type of Unit</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
<b>Tempest Version</b>				
Tempest Version	Vendor did not specify			
<b>Dimensions (H x W x D, inches)</b>				
Dimensions (H x W x D, inches)	6.30 x 16.70 x 15.40			
<b>Weight (pounds)</b>				
Weight (pounds)	33.00	33.00	33.00	33.00
<b>AC Power Supply (watts)</b>				
AC Power Supply (watts)	134	134	134	134
<b>Software</b>				
<b>Operating System(s) Bundled</b>				
Operating System(s) Bundled	Vendor did not specify			
<b>Operating System(s) Supported</b>				
Operating System(s) Supported	Enhanced MS-DOS, Vendor MS-OS/2			
<b>Additional Software Included</b>				
Additional Software Included	Comm., util./diagn.	Comm., util./diagn.	Comm., util./diagn.	Comm., util./diagn.
<b>Service/Support</b>				
<b>Distribution Channels</b>				
Distribution Channels	Computer retail, VAR/VAD, direct from vendor			
<b>Parts Warranty</b>				
Parts Warranty	1 year	1 year	1 year	1 year
<b>Labor Warranty</b>				
Labor Warranty	1 year	1 year	1 year	1 year
<b>Service Supported by</b>				
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers
<b>Service Features</b>				
Service Features	Toll free	Toll free	Toll free	Toll free
<b>Base Price (\$)</b>				
Base Price (\$)	3,995/available for GSA	5,095/available for GSA	5,495/available for GSA	5,495/available for GSA

Vendor	Hewlett-Packard Company	Hewlett-Packard Company	Hewlett-Packard Company	Hewlett-Packard Company
Product	Vectra GS/16S 10	Vectra GS/16S 47	Vectra GS/20 100e	Vectra GS/20 10e
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386x/16	80386x/16	80386/20	80386/20
Co-Processor Options	80387SX	80387SX	80387	80387
<b>Standard RAM (bytes)/Speed (ns)</b>				
Standard RAM (bytes)/Speed (ns)	1.0M/100	1.0M/100	1.0M/100	1.0M/100
<b>RAM Expansion Capacity (bytes)</b>				
RAM Expansion Capacity (bytes)	8.0M	8.0M	16.0M	16.0M
<b>Maximum System RAM (bytes)</b>				
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
<b>RAM Cache, Size (bytes)/Speed (ns)</b>				
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
<b>Bus Architecture</b>				
Bus Architecture	AT	AT	AT	AT
<b>Bus Speed (MHz)</b>				
Bus Speed (MHz)	Vendor did not specify			
<b>Total Expansion Slots</b>				
Total Expansion Slots	1 8-bit, 6 16-bit	6 16-bit	1 8-bit, 6 16-bit	1 8-bit, 6 16-bit
<b>Available Expansion Slots</b>				
Available Expansion Slots	1 8-bit, 5 16-bit	5 16-bit	1 8-bit, 5 16-bit	1 8-bit, 5 16-bit
<b>Serial Ports</b>				
Serial Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
<b>Parallel Ports</b>				
Parallel Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
<b>Other I/O Devices Included</b>				
Other I/O Devices Included	Vendor did not specify			
<b>Other I/O Interfaces</b>				
Other I/O Interfaces	HP-HIL	HP-HIL	HP-HIL	HP-HIL
<b>Mass Storage</b>				
<b>Internal Drive Bays Available</b>				
Internal Drive Bays Available	3 half-height	3 half-height	3 half-height	3 half-height
<b>Diskette Drives Included (bytes)</b>				
Diskette Drives Included (bytes)	1 1.2M	1 1.44M	1 1.2M	1 1.2M
<b>Diskette Drive Options (bytes)</b>				
Diskette Drive Options (bytes)	360K, 1.2M, 1.44M	360K, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M
<b>Hard Disk Interface</b>				
Hard Disk Interface	ST506/412	ST506/412	ESDI	ESDI
<b>Hard Disk Size (bytes)/AAT (ms)</b>				
Hard Disk Size (bytes)/AAT (ms)	None	None	None/80	None/80
<b>Optional Mass Storage</b>				
Optional Mass Storage	20M, 40M, tape drive, CD-ROM	40M, tape drive, CD-ROM	108M, tape drive, CD-ROM	108M, 152M, tape drive, CD-ROM
<b>Keyboard</b>				
<b>Availability</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
<b>Number of Keys/Function Keys</b>				
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
<b>Video Controller/Resolution (pixels)</b>				
Video Controller/Resolution (pixels)	Adapter optional	On included adapter/640 x 480	On included adapter	On included adapter
<b>Display</b>				
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
<b>Vendor LAN Options</b>				
Vendor LAN Options	Starlan	Starlan	Starlan	Starlan
<b>Product Design</b>				
<b>Type of Unit</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
<b>Tempest Version</b>				
Tempest Version	Vendor did not specify			
<b>Dimensions (H x W x D, inches)</b>				
Dimensions (H x W x D, inches)	6.30 x 16.70 x 15.40			
<b>Weight (pounds)</b>				
Weight (pounds)	33.00	33.00	33.00	33.00
<b>AC Power Supply (watts)</b>				
AC Power Supply (watts)	134	134	134	134
<b>Software</b>				
<b>Operating System(s) Bundled</b>				
Operating System(s) Bundled	Vendor did not specify			
<b>Operating System(s) Supported</b>				
Operating System(s) Supported	Enhanced MS-DOS, Vendor MS-OS/2			
<b>Additional Software Included</b>				
Additional Software Included	Comm., util./diagn.	Comm., util./diagn.	Comm., util./diagn.	Comm., util./diagn.
<b>Service/Support</b>				
<b>Distribution Channels</b>				
Distribution Channels	Computer retail, VAR/VAD, direct from vendor			
<b>Parts Warranty</b>				
Parts Warranty	1 year	1 year	1 year	1 year
<b>Labor Warranty</b>				
Labor Warranty	1 year	1 year	1 year	1 year
<b>Service Supported by</b>				
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers
<b>Service Features</b>				
Service Features	Toll free	Toll free	Toll free	Toll free
<b>Base Price (\$)</b>				
Base Price (\$)	4,495/available for GSA	5,995/available for GSA	Vendor did not specify	4,495/available for GSA

Vendor	Hewlett-Packard Company	Hewlett-Packard Company	Hewlett-Packard Company	Hewlett-Packard Company
Product	Vectra QS/20 15e	Vectra QS/20 4e	Vectra QS/20 47	Vectra RS/20C 100e
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/20	80386/20	80386/20	80386/20
Co-Processor Options	80387	80387	80387	80387, Weitek 3167
<b>Standard RAM (bytes)/Speed (ns)</b>				
Standard RAM (bytes)/Speed (ns)	1.0M/100	1.0M/100	1.0M/100	1.0M/100
<b>RAM Expansion Capacity (bytes)</b>				
RAM Expansion Capacity (bytes)	16.0M	16.0M	16.0M	16.0M
<b>Maximum System RAM (bytes)</b>				
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
<b>RAM Cache, Size (bytes)/Speed (ns)</b>				
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not Supported	Not supported	Intel, 32K
<b>Input/Output</b>				
<b>Bus Architecture</b>				
Bus Architecture	AT	AT	AT	AT
<b>Bus Speed (MHz)</b>				
Bus Speed (MHz)	Vendor did not specify			
<b>Total Expansion Slots</b>				
Total Expansion Slots	1 8-bit, 6 16-bit	6 16-bit	6 16-bit	2 8-bit, 6 16-bit
<b>Available Expansion Slots</b>				
Available Expansion Slots	1 8-bit, 5 16-bit	5 16-bit	5 16-bit	2 8-bit, 5 16-bit
<b>Serial Ports</b>				
Serial Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
<b>Parallel Ports</b>				
Parallel Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
<b>Other I/O Devices Included</b>				
Other I/O Devices Included	Vendor did not specify			
<b>Other I/O Interfaces</b>				
Other I/O Interfaces	HP-HIL	HP-HIL	HP-HIL	HP-HIL
<b>Mass Storage</b>				
<b>Internal Drive Bays Available</b>				
Internal Drive Bays Available	3 half-height	3 half-height	3 half-height	6 half-height
<b>Diskette Drives Included (bytes)</b>				
Diskette Drives Included (bytes)	1 1.44M	1 1.2M	1 1.44M	1 1.2M
<b>Diskette Drive Options (bytes)</b>				
Diskette Drive Options (bytes)	360K, 1.44M	360K, 1.2M, 1.44M	360K, 1.44M	360K, 1.2M, 1.44M
<b>Hard Disk Interface</b>				
Hard Disk Interface	ESDI	ST506/412	ST506/412	ESDI
<b>Hard Disk Size (bytes)/AAT (ms)</b>				
Hard Disk Size (bytes)/AAT (ms)	None/80	40M/, 80	40M/80	103
<b>Optional Mass Storage</b>				
Optional Mass Storage	108M, 152M, tape drive, CD-ROM	40M, tape drive, CD-ROM	40M, tape drive, CD-ROM	Tape drive, CD-ROM
<b>Keyboard</b>				
<b>Availability</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
<b>Number of Keys/Function Keys</b>				
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
<b>Video Controller/Resolution (pixels)</b>				
Video Controller/Resolution (pixels)	On included adapter	On included adapter/640 x 480	On included adapter/640 x 480	Adapter optional
<b>Display</b>				
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
<b>Vendor LAN Options</b>				
Vendor LAN Options	Starlan	Starlan	Starlan	Starlan
<b>Product Design</b>				
<b>Type of Unit</b>				
Type of Unit	Desktop	Desktop	Desktop	Floorstanding
<b>Tempest Version</b>				
Tempest Version	Vendor did not specify			
<b>Dimensions (H x W x D, inches)</b>				
Dimensions (H x W x D, inches)	6.30 x 16.70 x 15.40	6.30 x 16.70 x 15.40	6.30 x 16.70 x 15.40	24.00 x 8.30 x 20.00
<b>Weight (pounds)</b>				
Weight (pounds)	33.00	33.00	33.00	60.00
<b>AC Power Supply (watts)</b>				
AC Power Supply (watts)	134	134	134	200
<b>Software</b>				
<b>Operating System(s) Bundled</b>				
Operating System(s) Bundled	Vendor did not specify			
<b>Operating System(s) Supported</b>				
Operating System(s) Supported	Enhanced MS-DOS, Vendor MS-OS/2			
<b>Additional Software Included</b>				
Additional Software Included	Comm., util./diagn.	Comm., util./diagn.	Comm., util./diagn.	Comm., util./diagn.
<b>Service/Support</b>				
<b>Distribution Channels</b>				
Distribution Channels	Computer retail, VAR/VAD, direct from vendor			
<b>Parts Warranty</b>				
Parts Warranty	1 year	1 year	1 year	1 year
<b>Labor Warranty</b>				
Labor Warranty	1 year	1 year	1 year	1 year
<b>Service Supported by</b>				
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers
<b>Service Features</b>				
Service Features	Toll free	Toll free	Toll free	Toll free
<b>Base Price (\$)</b>				
Base Price (\$)	4,495/available for GSA	5,995/available for GSA	5,995/available for GSA	7,595

Vendor	Hewlett-Packard Company	Hewlett-Packard Company	Hewlett-Packard Company	Hewlett-Packard Company
Product	Vectra RS/20C 150e	Vectra RS/20C 154e	Vectra RS/25C 100e	Vectra RS/25C 150e
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/20	80386/20	80386/25	80386/25
Co-Processor Options	80387, Weitek 3167	80387, Weitek 3167	80387, Weitek 3167	80387, Weitek 3167
Standard RAM (bytes)/Speed (ns)	1.0M/100	4.0M/100	1.0M/80	4.0M/80
RAM Expansion Capacity (bytes)	16.0M	16.0M	16.0M	16.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Intel, 32K	Intel, 32K	Intel, 32K	Intel, 32K
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	Vendor did not specify			
Total Expansion Slots	2 8-bit, 6 16-bit			
Available Expansion Slots	2 8-bit, 5 16-bit			
Serial Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
Parallel Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
Other I/O Devices Included	Vendor did not specify			
Other I/O Interfaces	HP-HIL	HP-HIL	HP-HIL	HP-HIL
<b>Mass Storage</b>				
Internal Drive Bays Available	6 half-height	6 half-height	6 half-height	6 half-height
Diskette Drives Included (bytes)	1 1.44M	1 1.44M	1 1.2M	1 1.44M
Diskette Drive Options (bytes)	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M
Hard Disk Interface	ESDI	ESDI	ESDI	ESDI
Hard Disk Size (bytes)/AAT (ms)	Vendor did not specify	Vendor did not specify	103	Vendor did not specify
Optional Mass Storage	Tape drive, CD-ROM	Tape drive, CD-ROM	Tape drive, CD-ROM	Tape drive, CD-ROM
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	Adapter optional	Adapter optional
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Starlan	Starlan	Starlan	Starlan
<b>Product Design</b>				
Type of Unit	Floorstanding	Floorstanding	Floorstanding	Floorstanding
Tempest Version	Vendor did not specify			
Dimensions (H x W x D, inches)	24.00 x 8.30 x 20.00			
Weight (pounds)	60.00	60.00	60.00	60.00
AC Power Supply (watts)	200	200	200	200
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify			
Operating System(s) Supported	Enhanced MS-DOS, Vendor MS-OS/2			
Additional Software Included	Comm., util./diagn.	Comm., util./diagn.	Comm., util./diagn.	Comm., util./diagn.
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD, direct from vendor			
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers
Service Features	Toll free	Toll free	Toll free	Toll free
<b>Base Price (\$)</b>	8,195	10,145	10,295	10,895

Vendor	Hewlett-Packard Company	Hewlett-Packard Company	Hewlett-Packard Company	IBC/Integrated Business Computers
Product	Vectra RS/25C 154e	Vectra RS/25C 304e	Vectra QS/165 46	XL Series XLM
Processor/Memory CPU/Clock Speed (MHz)	80386/25	80386/25	80386sx/16	25
CPU-Processor Options	80387, Weitek 3167	80387, Weitek 3167	80387SX	
Standard RAM (bytes)/Speed (ns)	4.0M/80	4.0M/80	1.0M/100	1.0M/60
RAM Expansion Capacity (bytes)	16.0M	16.0M	8.0M	96M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	96M
RAM Cache, Size (bytes)/Speed (ns)	Intel, 32K	Intel, 32K	Not supported	Integrated, 8K
Input/Output Bus Architecture	AT	AT	AT	Proprietary
Bus Speed (MHz)	Vendor did not specify	Vendor did not specify	Vendor did not specify	25
Total Expansion Slots	2 8-bit, 6 16-bit	2 8-bit, 6 16-bit	6 16-bit	16-bit, 7 32-bit
Available Expansion Slots	2 8-bit, 5 16-bit	2 8-bit, 5 16-bit	5 16-bit	16-bit, 6 32-bit
Serial Ports	1 on adapter	1 on adapter	1 on adapter	None
Parallel Ports	1 on adapter	1 on adapter	1 on adapter	None
Other I/O Devices Included	Vendor did not specify	Vendor did not specify	Vendor did not specify	None
Other I/O Interfaces	HP-HIL	HP-HIL	HP-HIL	SCSI, network interface (Ethernet)
Mass Storage Internal Drive Bays Available	6 half-height	6 half-height	3 half-height	4 full-height, 1 half-height
Diskette Drives Included (bytes)	1 1.44M	1 1.44M	1	1 1.2M
Diskette Drive Options (bytes)	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	1.44M
Hard Disk Interface	ESDI	ESDI	ST506/412	SCSI
Hard Disk Size (bytes)/AAT (ms)	Vendor did not specify	Vendor did not specify	None	300M/18
Optional Mass Storage	Tape drive, CD-ROM	Tape drive, CD-ROM	40M, tape drive, CD-ROM	760M, tape drive, erasable optical
Keyboard Availability	Included (detachable)	Included (detachable)	Included (detachable)	Vendor did not specify
Number of Keys/Function Keys	101/12	101/12	101/12	Vendor did not specify
Video/Display Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	On included adapter/640 x 480	Vendor did not specify
Display	Optional	Optional	Optional	Vendor did not specify
Local Area Network Support Vendor LAN Options	Starlan	Starlan	Starlan	Vendor did not specify
Product Design Type of Unit	Floorstanding	Floorstanding	Desktop	Floorstanding
Tempest Version	Vendor did not specify	Vendor did not specify	Vendor did not specify	Not available
Dimensions (H x W x D, inches)	24.00 x 8.30 x 20.00	24.00 x 8.30 x 20.00	6.30 x 16.70 x 15.40	24 x 11 x 18
Weight (pounds)	60.00	60.00	33.00	Vendor did not specify
AC Power Supply (watts)	200	200	134	350
Software Operating System(s) Bundled	Vendor did not specify	Vendor did not specify	Vendor did not specify	None
Operating System(s) Supported	Enhanced MS-DOS, Vendor MS-OS/2	Enhanced MS-DOS, Vendor MS-OS/2	Enhanced MS-DOS, Vendor MS-OS/2	UNIX, UNIX derivative, THEOS/PICK
Additional Software Included	Comm., util./diagn.	Comm., util./diagn.	Comm., util./diagn.	None
Service/Support Distribution Channels	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor	VAR/VAD
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers	Third party
Service Features	Toll free	Toll free	Toll free	On site, toll free, 30-day money back
Base Price (\$)	13,295	15,695	5,995/available for GSA	10,000/available for GSA

Vendor	ICL Datachecker	ICL Datachecker	ICL Datachecker	ICL Datachecker
Product	ISP (In Store Processor) Model 30	ISP (In Store Processor) Model 40	ISP (In Store Processor) Model 45	ISP (In Store Processor) Model 80
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	8086/9.54	80286/16	80286/16	80386/20
Co-Processor Options	8087	80287	80287	80387
Standard RAM (bytes)/Speed (ns)	640K/100	1.0M/100	1.0M/100	4.0M/80
RAM Expansion Capacity (bytes)	2.84M	5.0M	5.0 M	16.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	XT	AT	AT	AT
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	2 8-bit	1 8-bit, 1 16-bit	1 8-bit, 3 16-bit	2 8-bit, 6 16-bit, 4 32-bit
Available Expansion Slots	2 8-bit	1 8-bit, 1 16-bit	1 8-bit, 3 16-bit	1 8-bit, 5 16-bit, 4 32-bit
Serial Ports	1 on main board	2 on main board	2 on main board	1 on adapter
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on adapter
Other I/O Devices Included	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Other I/O Interfaces	Mouse, 101-key keyboard port	Mouse, 101-key keyboard port	Mouse, 101-key keyboard port	Mouse, 101-key keyboard port
<b>Mass Storage</b>				
Internal Drive Bays Available	2 third-height	2 third-height	1 half-height, 2 third-height	2 full-height, 3 half-height
Diskette Drives Included (bytes)	1 720K	1 1.44M	1 1.44M	1 1.44M
Diskette Drive Options (bytes)	360K	360K	360K, 1.2M	360K, 1.2M, 720K, 1.44M
Hard Disk Interface	IBM host adapter	IBM host adapter	IBM host adapter	ST506/412
Hard Disk Size (bytes)/AAT (ms)	40M/65	40M/28	40M/28	80M/18
Optional Mass Storage	Tape drive	Tape drive	100M, tape drive	45M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/10	101/10	101/10	101/10
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/640 x 480	Integrated on system board/640 x 480	640 x 480	On included adapter/640 x 480
Display	Optional, analog color	Optional, analog color	Optional, analog color	Optional, analog color
<b>Local Area Network Support</b>				
Vendor LAN Options	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Floorstanding
Tempest Version	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Dimensions (H x W x D, inches)	3.5 x 14.4 x 16.7	3.5 x 14.4 x 16.7	5.2 x 14.4 x 16.7	7 x 23 x 16.8
Weight (pounds)	17.00	17.00	33.00	38.00
AC Power Supply (watts)	72	72	145	192
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	MS-DOS	MS-DOS	MS-DOS
Operating System(s) Supported	IBM PC-DOS, MS-DOS	IBM PC-DOS, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2, UNIX, UNIX deriv.	IBM PC-DOS, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2, UNIX	IBM PC-DOS, MS-DOS, Vendor MS-OS/2, UNIX
Additional Software Included	None	None	Vendor did not specify	Vendor did not specify
<b>Service/Support</b>				
Distribution Channels	Direct from vendor	Direct from vendor	Direct from vendor	Direct from vendor
Parts Warranty	90 days	90 days	90 days	90 days
Labor Warranty	90 days	90 days	90 days	Vendor did not specify
Service Supported by	Vendor	Vendor	Vendor	Vendor
Service Features	On site, toll free	On site, toll free	On site, toll free	On site, toll free
<b>Base Price (\$)</b>	2,890.00	3,795.00	3,995.00	8,700.00

Vendor	International Business Machines Corp. (IBM)			
Product	Personal System/2 Model 30 8530-001	Personal System/2 Model 25 8525-001	Personal System/2 Model 25 8525-004	Personal System/2 Model 25 8525-G01
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	8086/8	8086/8	8086/8	8086/8
Co-Processor Options	8087	8087	8087	8087
Standard RAM (bytes)/Speed (ns)	640K	512K	512K	512K
RAM Expansion Capacity (bytes)	640K	640K	640K	640K
Maximum System RAM (bytes)	640K	640K	640K	640K
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	XT	XT	XT	XT
Bus Speed (MHz)	Vendor did not specify			
Total Expansion Slots	3 8-bit	2 8-bit, 16-bit	2 8-bit	2 8-bit
Available Expansion Slots	3 8-bit	2 8-bit, 16-bit	2 8-bit	2 8-bit
Serial Ports	1 on main board			
Parallel Ports	1 on main board			
Other I/O Devices Included	Vendor did not specify			
Other I/O Interfaces	Mouse, 101-key keyboard port	Mouse, 101-key keyboard port, audio	Mouse, 101-key keyboard port, audio	Mouse, 101-key keyboard port, audio
<b>Mass Storage</b>				
Internal Drive Bays Available	Vendor did not specify	1 third-height	1 third-height	1 third-height
Diskette Drives Included (bytes)	1 720K	1 720K	1 720K	1 720K
Diskette Drive Options (bytes)	360K, 720K	360K, 720K	360K, 720K	360K, 720K
Hard Disk Interface	None	None	None	None
Hard Disk Size (bytes)/AAT (ms)	None	None	None	None
Optional Mass Storage	20M, 30M, tape drive, WORM	20M, tape drive, WORM	20M, tape drive, WORM	20M, tape drive, WORM
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	84/12	84/12	84/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/, 640 x 480	Integrated on system board/, 640 x 480	Integrated on system board/640 x 480	Integrated on system board/640 x 480
Display	Optional	Included, 12-inch, analog monochrome	Included, 12-inch, analog color	Included, 12-inch, analog monochrome
<b>Local Area Network Support</b>				
Vendor LAN Options	Token-ring	Token-ring	Token-ring	Token-ring
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify			
Dimensions (H x W x D, inches)	4.00 x 16.00 x 15.60	15.38 x 12.63 x 14.88	15.38 x 12.63 x 14.88	15.38 x 12.63 x 14.88
Weight (pounds)	17.00	31.00	36.00	31.00
AC Power Supply (watts)	70	90	115	90
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify			
Operating System(s) Supported	IBM PC-DOS	IBM PC-DOS	IBM PC-DOS	IBM PC-DOS
Additional Software Included	Util./diagn.	Util./diagn.	Util./diagn.	Util./diagn.
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD, direct from vendor			
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers
Service Features	On site	On site	On site	On site
<b>Base Price (\$)</b>	1,695/available for GSA	1,350/available for GSA	1,695/available for GSA	1,395/available for GSA

Vendor	International Business Machines Corp. (IBM)	International Business Machines Corp. (IBM)	International Business Machines Corp. (IBM)	International Business Machines Corp. (IBM)
Product	Personal System/2 Model 25 8525-Q04	Personal System/2 Model 25 LS 8525-L01	Personal System/2 Model 25 LS 8525-L04	Personal System/2 Model 30 286 8530-E01
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	8086/8	8086/8	8086/8	80286/10
Co-Processor Options	8087	8087	8087	80287
Standard RAM (bytes)/Speed (ns)	512K	640K	640K	1.0M
RAM Expansion Capacity (bytes)	640K	640K	640K	4.0M
Maximum System RAM (bytes)	640K	640K	640K	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	XT	XT	XT	AT
Bus Speed (MHz)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Total Expansion Slots	2 8-bit	2 8-bit	2 8-bit	3 16-bit
Available Expansion Slots	2 8-bit	1 8-bit	1 8-bit	3 16-bit
Serial Ports	1 on main board	1 on main board	1 on main board	1 on main board
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on main board
Other I/O Devices Included	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Other I/O Interfaces	Mouse, 101-key keyboard port, audio	Mouse, 101-key keyboard port, audio, network interface (Token Ring)	Mouse, 101-key keyboard port, audio, network interface (Token Ring)	Mouse, 101-key keyboard port
<b>Mass Storage</b>				
Internal Drive Bays Available	1 third-height	1 third-height	1 third-height	1 third-height
Diskette Drives Included (bytes)	1 720K	1 720K	1 720K	1 1.44M
Diskette Drive Options (bytes)	360K, 720K	360K, 720K	360K, 720K	360K, 1.2M, 1.44M
Hard Disk Interface	None	None	None	None
Hard Disk Size (bytes)/AAT (ms)	None	None	None	None
Optional Mass Storage	20M, tape drive, WORM	20M, tape drive, WORM	20M, tape drive, WORM	20M, 30M, tape drive, WORM
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	84/12	84/12	84/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/640 x 480	Integrated on system board/640 x 480	Integrated on system board/640 x 480	Integrated on system board/640 x 480
Display	Included, 12-inch, analog color	Included, 12-inch, analog monochrome	Included, 12-inch, analog color	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Token-ring	Token-ring	Token-ring	Token-ring
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Dimensions (H x W x D, inches)	15.38 x 12.63 x 14.88	15.38 x 12.63 x 14.88	15.38 x 12.63 x 14.88	4.00 x 16.00 x 15.60
Weight (pounds)	36.00	31.00	36.00	19.00
AC Power Supply (watts)	115	90	115	90
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Operating System(s) Supported	IBM PC-DOS	IBM PC-DOS	IBM PC-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended
Additional Software Included	Util./diagn.	Util./diagn.	Util./diagn.	Util./diagn.
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers
Service Features	On site	On site	On site	On site
<b>Base Price (\$)</b>	1,740/available for GSA	2,139/available for GSA	2,484/available for GSA	1,995/available for GSA

Vendor	International Business Machines Corp. (IBM)			
Product	Personal System/2 Model 30 286 8530-E21	Personal System/2 Model 30 286 8530-E31	Personal System/2 Model 50 Z 8550-031	Personal System/2 Model 50 Z 8550-061
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/10	80286/10	80286/10	80286/10
Co-Processor Options	80287	80287	80287	80287
Standard RAM (bytes)/Speed (ns)	1.0M	1.0M	1.0M/85	1.0M/85
RAM Expansion Capacity (bytes)	4.0M	4.0M	2.0M	2.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	MCA	MCA
Bus Speed (MHz)	Vendor did not specify	Vendor did not specify	10	10
Total Expansion Slots	3 16-bit	3 16-bit	3 16-bit	3 16-bit
Available Expansion Slots	3 16-bit	3 16-bit	3 16-bit	3 16-bit
Serial Ports	1 on main board			
Parallel Ports	1 on main board			
Other I/O Devices Included	Vendor did not specify			
Other I/O Interfaces	Mouse, 101-key keyboard port			
<b>Mass Storage</b>				
Internal Drive Bays Available	1 third-height	1 third-height	1 third-height	1 third-height
Diskette Drives Included (bytes)	1 1.44M	1 1.44M	1 1.44M	1 1.44M
Diskette Drive Options (bytes)	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M
Hard Disk Interface	ST506/412	ST506/412	ST506/412	ESDI
Hard Disk Size (bytes)/AAT (ms)	20M/80	30M/39	30M/39	60M/27
Optional Mass Storage	20M, 30M, tape drive, WORM	20M, 30M, tape drive, WORM	60M, tape drive, WORM	Tape drive, WORM
<b>Keyboard Availability</b>				
Number of Keys/Function Keys	Included (detachable) 101/12	Included (detachable) 101/12	Included (detachable) 101/12	Included (detachable) 101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/640 x 480			
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Token-ring	Token-ring	Token-ring	Token-ring
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify			
Dimensions (H x W x D, inches)	4.00 x 16.00 x 15.60	4.00 x 16.00 x 15.60	5.50 x 14.20 x 16.50	5.50 x 14.20 x 16.50
Weight (pounds)	19.00	19.00	21.00	21.00
AC Power Supply (watts)	90	90	94	94
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify			
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended
Additional Software Included	Util./diagn.	Util./diagn.	Util./diagn.	Util./diagn.
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD, direct from vendor			
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers
Service Features	On site	On site	On site	On site
<b>Base Price (\$)</b>	2,495/available for GSA	2,595/available for GSA	3,250/available for GSA	3,650/available for GSA

Vendor	International Business Machines Corp. (IBM)	International Business Machines Corp. (IBM)	International Business Machines Corp. (IBM)	International Business Machines Corp. (IBM)
Product	Personal System/2 Model 55 SX 8555-031	Personal System/2 Model 55 SX 8555-061	Personal System/2 Model 60 0560-041	Personal System/2 Model 60 8560-071
Processor/Memory				
CPU/Clock Speed (MHz)	80386sx/16	80386sx/16	80286/10	80286/10
Co-Processor Options	80387SX	80387SX	80287	80287
Standard RAM (bytes)/Speed (ns)	2.0M	2.0M	1.0M	1.0M
RAM Expansion Capacity (bytes)	4.0M	4.0M	1.0M	1.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
Input/Output				
Bus Architecture	MCA	MCA	MCA	MCA
Bus Speed (MHz)	10	10	10	10
Total Expansion Slots	3 16-bit	3 16-bit	7 16-bit	7 16-bit
Available Expansion Slots	3 16-bit	3 16-bit	7 16-bit	7 16-bit
Serial Ports	1 on main board	1 on main board	1 on main board	1 on main board
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on main board
Other I/O Devices Included	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Other I/O Interfaces	Mouse, 101-key keyboard port	Mouse, 101-key keyboard port	Mouse, 101-key keyboard port	Mouse, 101-key keyboard port
Mass Storage				
Internal Drive Bays Available	1 third-height	1 third-height	1 full-height, 1 third-height	1 full-height, 1 third-height
Diskette Drives Included (bytes)	1 1.44M	1 1.44M	1 1.44M	1 1.44M
Diskette Drive Options (bytes)	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M
Hard Disk Interface	ST506/412	ESDI	ST506/412	ESDI
Hard Disk Size (bytes)/AAT (ms)	30M/39	60M/27	44/40	70M/30
Optional Mass Storage	60M, tape drive, WORM	Tape drive, WORM	44, tape drive, WORM	70M, 44M, 115M, tape drive, WORM
Keyboard				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
Video/Display				
Video Controller/Resolution (pixels)	Integrated on system board/640 x 480	Integrated on system board/640 x 480	Integrated on system board/640 x 480	Integrated on system board/640 x 480
Display	Optional	Optional	Optional	Optional
Local Area Network Support				
Vendor LAN Options	Token-ring	Token-ring	Token-ring	Token-ring
Product Design				
Type of Unit	Desktop	Desktop	Floorstanding	Floorstanding
Tempest Version	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Dimensions (H x W x D, inches)	4.00 x 14.00 x 16.50	4.00 x 14.00 x 16.50	23.50 x 6.50 x 19.00	23.50 x 6.50 x 19.00
Weight (pounds)	19.00	19.00	47.00	47.00
AC Power Supply (watts)	90	90	207	225
Software				
Operating System(s) Bundled	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, AIX PS/2	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, AIX PS/2	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended
Additional Software Included	Util./diagn.	Util./diagn.	Util./diagn.	Util./diagn.
Service/Support				
Distribution Channels	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers
Service Features	On site	On site	On site	On site
Base Price (\$)	3,895/available for GSA	4,295/available for GSA	5,295/available for GSA	5,795/available for GSA

Vendor	International Business Machines Corp. (IBM)			
Product	Personal System/2 Model 70 386 8570-061	Personal System/2 Model 70 386 8570-121	Personal System/2 Model 70 386 8570-A21	Personal System/2 Model 70 386 8570-A61
Processor/Memory CPU/Clock Speed (MHz)	80386/20	80386/20	80386/25	80386/25
Co-Processor Options	80387	80387	80387	80387
Standard RAM (bytes)/Speed (ns)	4.0M	4.0M	4.0M	4.0M
RAM Expansion Capacity (bytes)	6M	6M	8.0M	8.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Intel, 64K	Intel, 64K
Input/Output Bus Architecture	MCA	MCA	MCA	MCA
Bus Speed (MHz)	10	10	10	10
Total Expansion Slots	1 16-bit, 2 32-bit			
Available Expansion Slots	1 16-bit, 2 32-bit			
Serial Ports	1 on main board			
Parallel Ports	1 on main board			
Other I/O Devices Included	Vendor did not specify			
Other I/O Interfaces	Mouse, 101-key keyboard port			
Mass Storage Internal Drive Bays Available	1 third-height	1 third-height	1 third-height	1 third-height
Diskette Drives Included (bytes)	1 1.44M	1 1.44M	1 1.44M	1 1.44M
Diskette Drive Options (bytes)	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M
Hard Disk Interface	ESDI	ESDI	ESDI	ESDI
Hard Disk Size (bytes)/AAT (ms)	60M/23	120M/23	120M/23	60M/23
Optional Mass Storage	Tape drive, WORM	Tape drive, WORM	Tape drive, WORM	Tape drive, WORM
Keyboard Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
Video/Display Video Controller/Resolution (pixels)	Integrated on system board/640 x 480			
Display	Optional	Optional	Optional	Optional
Local Area Network Support Vendor LAN Options	Token-ring	Token-ring	Token-ring	Token-ring
Product Design Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify			
Dimensions (H x W x D, inches)	5.50 x 14.20 x 16.50			
Weight (pounds)	21.00	21.00	21.00	21.00
AC Power Supply (watts)	132	132	132	132
Software Operating System(s) Bundled	Vendor did not specify			
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, AIX PS/2 Util./diagn.	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, AIX PS/2 Util./diagn.	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, AIX PS/2 Util./diagn.	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, AIX PS/2 Util./diagn.
Additional Software Included				
Service/Support Distribution Channels	Computer retail, VAR/VAD, direct from vendor			
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers
Service Features	On site	On site	On site	On site
Base Price (\$)	5,795/available for GSA	6,395/available for GSA	8,995/available for GSA	8,395/available for GSA

Vendor	International Business Machines Corp. (IBM)			
Product	Personal System/2 Model 70 386 8570-E81	Personal System/2 Model 70 486	Personal System/2 Model 70 486 (60M hard disk)	Personal System/2 Model 80 386 8580-041
Processor/Memory CPU/Clock Speed (MHz)	80386/16	486/25	486/25	80386/16
Co-Processor Options	80387	80387	80387	80387
Standard RAM (bytes)/Speed (ns)	1.0M	4.0M	4.0M	1.0M
RAM Expansion Capacity (bytes)	6M	8.0M	8.0M	2.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Intel, 64K	Intel, 64K	Not supported
Input/Output Bus Architecture	MCA	MCA	MCA	MCA
Bus Speed (MHz)	10	10	10	10
Total Expansion Slots	1 16-bit, 2 32-bit	1 16-bit, 2 32-bit	1 16-bit, 2 32-bit	4 16-bit, 3 32-bit
Available Expansion Slots	1 16-bit, 2 32-bit	1 16-bit, 2 32-bit	1 16-bit, 2 32-bit	4 16-bit, 3 32-bit
Serial Ports	1 on main board			
Parallel Ports	1 on main board			
Other I/O Devices Included	Vendor did not specify			
Other I/O Interfaces	Mouse, 101-key keyboard port			
Mass Storage Internal Drive Bays Available	1 third-height	1 third-height	1 third-height	1 full-height, 1 third-height
Diskette Drives Included (bytes)	1 1.44M	1 1.44M	1 1.44M	1 1.44M
Diskette Drive Options (bytes)	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M
Hard Disk Interface	ESDI	ESDI	ESDI	ST506/412
Hard Disk Size (bytes)/AAT (ms)	60M/27	120M/, 23	60M/23	44/40
Optional Mass Storage	Tape drive, WORM	Tape drive, WORM	Tape drive, WORM	44, tape drive, WORM
Keyboard Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
Video/Display Video Controller/Resolution (pixels)	Integrated on system board/640 x 480			
Display	Optional	Optional	Optional	Optional
Local Area Network Support Vendor LAN Options	Token-ring	Token-ring	Token-ring	Token-ring
Product Design Type of Unit	Desktop	Desktop	Desktop	Floorstanding
Tempest Version	Vendor did not specify			
Dimensions (H x W x D, inches)	5.50 x 14.20 x 16.50	5.50 x 14.20 x 16.50	5.50 x 14.20 x 16.50	23.50 x 6.50 x 19.00
Weight (pounds)	21.00	21.00	21.00	52.00
AC Power Supply (watts)	132	132	132	207
Software Operating System(s) Bundled	Vendor did not specify			
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, AIX PS/2	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, AIX PS/2	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, AIX PS/2	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, AIX PS/2
Additional Software Included	Util./diagn.	Util./diagn.	Util./diagn.	Util./diagn.
Service/Support Distribution Channels	Computer retail, VAR/VAD, direct from vendor			
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers
Service Features	On site	On site	On site	On site
Base Price (\$)	5,495/available for GSA	12,990/available for GSA	12,390/available for GSA	6,995/available for GSA

Vendor	International Business Machines Corp. (IBM)	International Business Machines Corp. (IBM)	International Business Machines Corp. (IBM)	Isotropic Computer Inc.
Product	Personal System/2 Model 80386 8580-071	Personal System/2 Model 80386 8580-111	Personal System/2 Model 80386 8580-311	ISO BT 286 BT1641-10
Processor/Memory CPU/Clock Speed (MHz)	80386/16	80386/20	80386/20	80286/10
Co-Processor Options	80387	80387	80387	80287
Standard RAM (bytes)/Speed (ns)	2.0M	2.0M	2.0M	1.0M/100
RAM Expansion Capacity (bytes)	4.0M	4.0M	4.0M	1.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
Input/Output Bus Architecture	MCA	MCA	MCA	AT
Bus Speed (MHz)	10	10	10	10
Total Expansion Slots	4 16-bit, 3 32-bit	4 16-bit, 3 32-bit	4 16-bit, 3 32-bit	2 8-bit, 6 16-bit
Available Expansion Slots	4 16-bit, 3 32-bit	4 16-bit, 3 32-bit	4 16-bit, 3 32-bit	1 8-bit, 4 16-bit
Serial Ports	1 on main board	1 on main board	1 on main board	1 on adapter
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on adapter
Other I/O Devices Included	Vendor did not specify	Vendor did not specify	Vendor did not specify	None
Other I/O Interfaces	Mouse, 101-key keyboard port	Mouse, 101-key keyboard port	Mouse, 101-key keyboard port	101-key keyboard port, ext. video
Mass Storage Internal Drive Bays Available	1 full-height, 1 third-height	1 full-height, 1 third-height	1 full-height, 1 third-height	1 full-height, 3 half-height
Diskette Drives Included (bytes)	1 1.44M	1 1.44M	1 1.44M	1 1.2M
Diskette Drive Options (bytes)	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 720K, 1.44M
Hard Disk Interface	ESDI	ESDI	ESDI	ST506/412
Hard Disk Size (bytes)/AAT (ms)	70M/, 30	115M/28	314M/, 23	40M/28
Optional Mass Storage	70M, 44M, 115M, 314M, tape drive, WORM	70M, 44M, 115M, 314M, tape drive, WORM	70M, 44M, 115M, 314M, tape drive, WORM	20M, 80M
Keyboard Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
Video/Display Video Controller/Resolution (pixels)	Integrated on system board/640 x 480	Integrated on system board/640 x 480	Integrated on system board/640 x 480	On included adapter/800 x 600
Display	Optional	Optional	Optional	Optional
Local Area Network Support Vendor LAN Options	Token-ring	Token-ring	Token-ring	None
Product Design Type of Unit	Floorstanding	Floorstanding	Floorstanding	Desktop
Tempest Version	Vendor did not specify	Vendor did not specify	Vendor did not specify	Not available
Dimensions (H x W x D, inches)	23.50 x 6.50 x 19.00	23.50 x 6.50 x 19.00	23.50 x 6.50 x 19.00	6 x 21 x 16
Weight (pounds)	52.00	52.00	52.00	45.00
AC Power Supply (watts)	225	225	225	200
Software Operating System(s) Bundled	Vendor did not specify	Vendor did not specify	Vendor did not specify	MS-DOS
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, AIX PS/2 Util./diagn.	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, AIX PS/2 Util./diagn.	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, AIX PS/2 Util./diagn.	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX deriv., Pick BIOS, setup, diagnostics, util./diagn.
Additional Software Included	Util./diagn.	Util./diagn.	Util./diagn.	util./diagn.
Service/Support Distribution Channels	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor	VAR/VAD, direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers	Vendor
Service Features	On site	On site	On site	30-day money back
Base Price (\$)	7,995/available for GSA	8,995/available for GSA	11,295/available for GSA	1,795

Vendor	Isotropic Computer Inc.	Isotropic Computer Inc.	Isotropic Computer Inc.	Isotropic Computer Inc.
Product	ISO BT 286 BT1641-12	ISO BT 286 BT1641-20	ISO BT 386 BT3241-16	ISO BT 386 BT3241-20
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/12	80286/20	80386/16	80386/20
Co-Processor Options	80287	80287	80287	80287
Standard RAM (bytes)/Speed (ns)	1.0M/100	1.0M/100	1.0M/80	1.0M/80
RAM Expansion Capacity (bytes)	1.0M	1.0M	10.0M	10.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT/separate memory bus	AT/separate memory bus
Bus Speed (MHz)	12	8	8	10
Total Expansion Slots	2 8-bit, 6 16-bit	2 8-bit, 6 16-bit	2 8-bit, 5 16-bit, 2 32-bit	2 8-bit, 5 16-bit, 2 32-bit
Available Expansion Slots	1 8-bit, 4 16-bit	1 8-bit, 4 16-bit	1 8-bit, 3 16-bit, 1 32-bit	1 8-bit, 3 16-bit, 1 32-bit
Serial Ports	1 on adapter	2 on main board	1 on adapter	1 on adapter
Parallel Ports	1 on adapter	1 on main board	1 on adapter	1 on adapter
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	101-key keyboard port, ext. video	101-key keyboard port, ext. video	101-key keyboard port, ext. video	Ext. video, numeric keypad port
<b>Mass Storage</b>				
Internal Drive Bays Available	1 full-height, 3 half-height	1 full-height, 3 half-height	1 full-height, 3 half-height	1 full-height, 3 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M
Hard Disk Interface	ST506/412	ST506/412	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	40M/28	40M/28	40M/28	40M/28
Optional Mass Storage	20M, 80M	20M, 80M	80M	80M
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/800 x 600	On included adapter/800 x 600	On included adapter/800 x 600	On included adapter/800 x 600
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	None	None	None	None
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	Not available
Dimensions (H x W x D, inches)	6 x 21 x 16	6 x 21 x 16	6 x 21 x 16	6 x 21 x 16
Weight (pounds)	45.00	45.00	45.00	45.00
AC Power Supply (watts)	200	200	Vendor did not specify	200
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	MS-DOS	MS-DOS	MS-DOS
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX deriv., Pick BIOS, setup, diagnostics, util./diagn.	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX deriv., Pick BIOS, setup, diagnostics, util./diagn.	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS BIOS, setup, diagnostics, util./diagn.	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS BIOS, setup, diagnostics, util./diagn.
Additional Software Included				
<b>Service/Support</b>				
Distribution Channels	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor	Vendor	Vendor	Vendor
Service Features	30-day money back	30-day money back	30-day money back	30-day money back
<b>Base Price (\$)</b>	1,825	1,995	2,095	2,395

Vendor	Kaypro, Inc.	Leading Edge Products, Inc.	Leading Edge Products, Inc.	Leading Edge Products, Inc.
Product	KC-1	D/3S	D3/MC	D4
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	NEC V-20/8	80386sx/16	80386sx/16	I486/33
Co-Processor Options	None	80387SX	80387SX	None
Standard RAM (bytes)/Speed (ns)	640K/150	1.0M	1.0M	4.0M
RAM Expansion Capacity (bytes)	640K	4.0M	4.0M	8.0M
Maximum System RAM (bytes)	1.0M	4.0M	4.0M	8.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Vendor did not specify	Proprietary, 32K
<b>Input/Output</b>				
Bus Architecture	XT	Vendor did not specify	MCA	EISA
Bus Speed (MHz)	10	Vendor did not specify	10	Vendor did not specify
Total Expansion Slots	8 8-bit	2 8-bit, 4 16-bit	4 16-bit	2 16-bit, 6 32-bit
Available Expansion Slots	5 8-bit	1 8-bit, 4 16-bit	4 16-bit	Vendor did not specify
Serial Ports	1 on main board	2 on main board	1 on main board	2 on main board
Parallel Ports	1 on main board			
Other I/O Devices Included	Vendor did not specify	None	None	None
Other I/O Interfaces	Joystick port	Mouse	Mouse	Mouse
<b>Mass Storage</b>				
Internal Drive Bays Available	2 half-height	3 half-height	3 third-height	3 half-height, 2 third-height
Diskette Drives Included (bytes)	1 360K	1 1.2M	1 1.44M	1 1.2M
Diskette Drive Options (bytes)	None	360K, 720K, 1.44M	None	360K, 720K, 1.44M
Hard Disk Interface	None	Vendor did not specify	None	None
Hard Disk Size (bytes)/AAT (ms)	None	65M/28	None	None
Optional Mass Storage	None	None	None	60M, 80M, 100M, 300M, 220M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	On included adapter/640 x 480	Integrated on system board/640 x 480	On included adapter/text mode only
Display	Included, 12-inch digital monochrome	Included, 14-inch, analog monochrome	Included, 14-inch, analog monochrome	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Vendor did not specify	None	None	None
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Vendor did not specify	Vendor did not specify	Vendor did not specify
Dimensions (H x W x D, inches)	5.50 x 19.50 x 16.00	6 x 15.5 x 15.75	4 x 14 x 15	6.25 x 22 x 16.5
Weight (pounds)	Vendor did not specify			
AC Power Supply (watts)	150	200	100	200
<b>Software</b>				
Operating System(s) Bundled	DR DOS	MS-DOS	MS-DOS	MS-DOS
Operating System(s) Supported	DR DOS	MS-DOS	MS-DOS, Vendor MS-OS/2	MS-DOS, Vendor MS-OS/2
Additional Software Included	None	BIOS, Basic	BIOS	BIOS, util./diagn.
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD
Parts Warranty	1 year	20 months	20 months	20 months
Labor Warranty	1 year	20 months	20 months	20 months
Service Supported by	Authorized dealers, third party	Authorized dealers	Authorized dealers	Authorized dealers
Service Features	On site	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Base Price (\$)</b>	895	1,895	2,295	Vendor did not specify

Vendor	Lee Data Corp.	Lee Data Corp.	Logix Microcomputer	Mark Computer Products Corp.
Product	Series 90 Personal Computer Model 95	Series 90 Personal Computer Model 96	LGX388 -20	Mark 286
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/12	80386sx/16	80386/20	80286/12
Co-Processor Options	80287	80287	80387, 80287	80287
Standard RAM (bytes)/Speed (ns)	1.0M/120	2.0M/100	2.0M/80	2.0M/100
RAM Expansion Capacity (bytes)	2.0M	4.0M	16.0M	12.0M
Maximum System RAM (bytes)	10.0M	16.0M	16.0M	12.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	Vendor did not specify	Vendor did not specify	8	12.5
Total Expansion Slots	3 16-bit	1 8-bit, 5 16-bit	1 32-bit	2 8-bit, 6 16-bit
Available Expansion Slots	2 16-bit	1 8-bit, 2 16-bit	Vendor did not specify	2 8-bit, 6 16-bit
Serial Ports	1 on main board	1 on adapter	1 on adapter	2 on main board
Parallel Ports	1 on main board	1 on adapter	1 on adapter	1 on main board
Other I/O Devices Included	None	None	Mouse	Vendor did not specify
Other I/O Interfaces	Mouse, ext. video	Mouse, ext. video	Mouse	Mouse, audio, expansion unit
<b>Mass Storage</b>				
Internal Drive Bays Available	3 third-height	1 full-height, 2 third-height	Vendor did not specify	3 full-height, 4 half-height
Diskette Drives Included (bytes)	1 1.44M	1 1.44M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	1.44M	1.2M, 1.44M	360K, 720K, 1.44M	360K, 720K, 1.44M
Hard Disk Interface	AT/IDE	AT/IDE	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	40M/28	100M/28	70M/28	50M/28
Optional Mass Storage	20M, 40M	20M, 40M, 100M	20M, 40M, 150M, 300M, tape drive, WORM	80M, 120M, 150M, 300M, 675M, tape drive
<b>Keyboard Availability</b>				
Number of Keys/Function Keys	Optional Vendor did not specify	Optional Vendor did not specify	Included (detachable) 101/12	Included (detachable) 101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/640 x 480	On included adapter/640 x 480	On included adapter/1,024 x 768	Integrated on system board/640 x 400
Display	Included, 14-inch, analog color	Included, 14-inch, analog color	Included, 14-inch, multifrequency	Included, 14-inch, analog monochrome
<b>Local Area Network Support</b>				
Vendor LAN Options	None	None	Ethernet, ARCnet	Ethernet, Token-ring, ARCnet
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	From manufacturer	From manufacturer	Vendor did not specify	From manufacturer
Dimensions (H x W x D, inches)	7.3 x 15.4 x 14.2	4.3 x 15.5 x 16.2	Vendor did not specify	5 x 14 x 12
Weight (pounds)	27.00	19.00	48.00	25.00
AC Power Supply (watts)	135	78	220	200
<b>Software</b>				
Operating System(s) Bundled	None	None	Vendor did not specify	MS-DOS
Operating System(s) Supported	MS-DOS	MS-DOS	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, UNIX, UNIX derivative	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS
Additional Software Included	BIOS, setup, diagnostics	BIOS, setup, diagnostics	Comm., util./diagn.	Comm., applications, util./diagn., desk accessory
<b>Service/Support</b>				
Distribution Channels	Direct from vendor	Direct from vendor	Direct from vendor	Direct from vendor
Parts Warranty	1 year	1 year	1 year	2 years
Labor Warranty	1 year	1 year	Vendor	2 years
Service Supported by	Vendor, third party	Vendor, third party	Vendor	Vendor, third party
Service Features	On site, toll free	On site, toll free	30-day money back	On site, toll free, 30-day money back
<b>Base Price (\$)</b>	1,995	3,299	3,695	1,695/available for GSA

Vendor	Mark Computer Products Corp.	Maxar P.C.	Maxar P.C.	Maxar P.C.
Product	Mark 386 386F	Maxar 286/16	Maxar 286L	Maxar 386
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/33	80286/16	80286/12	80386/16
Co-Processor Options	80387, Weitek 3167	80287	80287	80387
Standard RAM (bytes)/Speed (ns)	4.0M/85	1.0M/120	1.0M/120	4.0M/120
RAM Expansion Capacity (bytes)	16.0M	Vendor did not specify	16.0M	4.0M
Maximum System RAM (bytes)	16.0M	Vendor did not specify	16.0M	8.0M
RAM Cache, Size (bytes)/Speed (ns)	Intel, 64K/30	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	12.5	8	8	Vendor did not specify
Total Expansion Slots	1 8-bit, 5 16-bit, 2 32-bit	2 8-bit, 6 16-bit	6 16-bit	6 16-bit, 2 32-bit
Available Expansion Slots	1 8-bit, 5 16-bit, 2 32-bit	Vendor did not specify	Vendor did not specify	Vendor did not specify
Serial Ports	2 on main board	2 on main board	1 on main board	2 on main board
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on main board
Other I/O Devices Included	Mouse	None	Vendor did not specify	None
Other I/O Interfaces	Mouse, audio, expansion unit	None	Mouse, ext. diskette drive, 101-key keyboard port, joystick	None
<b>Mass Storage</b>				
Internal Drive Bays Available	6 full-height	5 half-height	1 half-height	5 half-height
Diskette Drives Included (bytes)	1 1.2M; 1 1.44M	1 1.2M	None	1 1.2M
Diskette Drive Options (bytes)	360K, 720K	360K, 1.44M	None	360K, 1.44M
Hard Disk Interface	ESDI	ST506/412	None	ST506/412
Hard Disk Size (bytes)/AAT (ms)	120M/16 ms	None	None	None
Optional Mass Storage	80M, 150M, 300M, 67.5M, tape drive, CD-ROM	None	None	None
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/15	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/640 x 400	Adapter optional	Adapter optional	Adapter optional
Display	Included, 14-inch, multifrequency	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, Token-ring, ARCnet	None	Ethernet, Token-ring, ARCnet	None
<b>Product Design</b>				
Type of Unit	Floorstanding	Desktop	Desktop	Desktop
Tempest Version	From manufacturer	Not available	Vendor did not specify	Not available
Dimensions (H x W x D, inches)	23 x 5 x 14	13 x 26 x 22	10.00 x 22.60 x 20.50	13 x 26 x 22
Weight (pounds)	40.00	51.00	55.00	51.00
AC Power Supply (watts)	275	200	150	200
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	MS-DOS	Vendor did not specify	MS-DOS
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX	MS-DOS	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX
Additional Software Included	Comm., applications, util./diagn., desk accessory	Setup, util./diagn.	Util./diagn., Basic	Setup, util./diagn.
<b>Service/Support</b>				
Distribution Channels	VAR/VAD, direct from vendor	Vendor did not specify	Direct from vendor	Vendor did not specify
Parts Warranty	2 years	1 year	1 year	1 year
Labor Warranty	2 years	1 year	1 year	1 year
Service Supported by	Vendor, third party	Third party	Vendor, authorized dealers	Third party
Service Features	On site, toll free, 30-day money back	On site	On site	On site
<b>Base Price (\$)</b>	4,945/available for GSA	Vendor did not specify	1,768	Vendor did not specify

Vendor	Maxar P.C.	Maxar P.C.	Maxar P.C.	Maxar P.C.
Product	Maxar 386 SXL	Maxar 386/20	Maxar 386/25	Maxar 386/33
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386sx/16	80386/20	80386/25	80386/33
Co-Processor Options	80387Weitek 3167	80387, Weitek 1167	80387, Weitek 3167	80387, Weitek 3167
Standard RAM (bytes)/Speed (ns)	2.0M	1.0M/100	1.0M/80	1.0M/80
RAM Expansion Capacity (bytes)	Vendor did not specify	1.0M	5.0M	5.0M
Maximum System RAM (bytes)	8.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	64K/30	64K/30
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	8	8	Vendor did not specify
Total Expansion Slots	2 8-bit, 3 16-bit	1 8-bit, 5 16-bit, 2 32-bit	7 16-bit, 1 32-bit	7 16-bit, 1 32-bit
Available Expansion Slots	Vendor did not specify	1 8-bit, 4 16-bit, 2 32-bit	Vendor did not specify	Vendor did not specify
Serial Ports	2 on main board	2 on main board	2 on main board	2 on main board
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on main board
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	None	None	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	2 half-height, 1 third-height	1 full-height, 2 half-height	5 half-height	5 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	1.2M	1.2M	360K, 1.44M	360K, 1.44M
Hard Disk Interface	ST506/412	ST506/412	ST506/412	ESDI
Hard Disk Size (bytes)/AAT (ms)	None	Vendor did not specify	None	None
Optional Mass Storage	None	70M	None	None
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	On included adapter/640 x 480	Adapter optional	On included adapter
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	None	Vendor did not specify	None	None
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Termpest Version	Not available	Vendor did not specify	Not available	Not available
Dimensions (H x W x D, inches)	10 x 22.6 x 20.5	13.00 x 26.00 x 22.00	13 x 26 x 22	13 x 26 x 27
Weight (pounds)	35.20	50.00	51.00	51.00
AC Power Supply (watts)	150	200	200	200
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	MS-DOS	MS-DOS	MS-DOS
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX	IBM PC-DOS, MS-DOS	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX
Additional Software Included	Setup	Util./diagn.	Setup, util./diagn.	Setup, util./diagn.
<b>Service/Support</b>				
Distribution Channels	Vendor did not specify	VAR/VAD	Vendor did not specify	Vendor did not specify
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Third party	Vendor, authorized dealers	Third party	Third party
Service Features	On site	On site	On site	On site
<b>Base Price (\$)</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify

Vendor	Maxar P.C.	Memorex Telex	Memorex Telex	Memorex Telex
Product	Maxar 88L	7006	7025	7040
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	8088-2/9.54	8086/10	80286/12.56.25	80286/12
Co-Processor Options	80287, 8087	8087	80287	80287
Standard RAM (bytes)/Speed (ns)	640K/120	640K/100	1.0M/120	640K/100
RAM Expansion Capacity (bytes)	640K	4.0M	8.0M	640K
Maximum System RAM (bytes)	640K	8.0M	8.0M	2.6M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Vendor did not specify	Not supported	Vendor did not specify
<b>Input/Output</b>				
Bus Architecture	XT	XT	AT	AT
Bus Speed (MHz)	9.54	10	12.5	12
Total Expansion Slots	4 8-bit	5 8-bit	1 8-bit, 1 16-bit	1 8-bit, 2 16-bit
Available Expansion Slots	Vendor did not specify	5 8-bit	1 8-bit, 1 16-bit	1 8-bit, 2 16-bit
Serial Ports	1 on main board	1 on main board	2 on main board	2 on main board
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on main board
Other I/O Devices Included	Vendor did not specify	Vendor did not specify	None	Vendor did not specify
Other I/O Interfaces	Vendor did not specify	Mouse, network interface	Mouse, 101-key keyboard port, ext. video	Mouse, ext. hard disk port, ext. video
<b>Mass Storage</b>				
Internal Drive Bays Available	1 full-height, 1 half-height	2 half-height	1 third-height	2 half-height
Diskette Drives Included (bytes)	2 1.2M	1 1.44M	1 1.44M	1 1.44M
Diskette Drive Options (bytes)	360K	None	None	None
Hard Disk Interface	None	ST506/412	AT/IDE	SCSI
Hard Disk Size (bytes)/AAT (ms)	None	None	None	Vendor did not specify
Optional Mass Storage	None	20M, 40M	20M, 40M, tape drive	40M, 80M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Optional	Included (detachable)	Optional
Number of Keys/Function Keys	101/12	Vendor did not specify	84/10	Vendor did not specify
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Integrated on system board/640 x 480	Integrated on system board/640 x 480	Integrated on system board/640 x 480
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, Token-ring, ARCnet	Ethernet, Token-ring, ARCnet	Token-ring	Ethernet, Token-ring, ARCnet
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Dimensions (H x W x D, inches)	10.00 x 22.60 x 20.50	Vendor did not specify	3.8 x 12.0 x 15.3	4.00 x 16.00 x 15.25
Weight (pounds)	Vendor did not specify	Vendor did not specify	15.50	25.00
AC Power Supply (watts)	150	100	55	75
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify	MS-DOS	None	MS-DOS
Operating System(s) Supported	MS-DOS	Vendor did not specify	MS-DOS, Vendor MS-OS/2	MS-DOS
Additional Software Included	Vendor did not specify	None	Util./diagn.	Vendor did not specify
<b>Service/Support</b>				
Distribution Channels	Vendor did not specify	Direct from vendor	Direct from vendor	Direct from vendor
Parts Warranty	1 year	Vendor did not specify	1 year	Vendor did not specify
Labor Warranty	1 year	Vendor	Vendor	Vendor
Service Supported by	Vendor, authorized dealers	Vendor	Vendor	Vendor
Service Features	Vendor did not specify	Vendor did not specify	On site, toll free	Vendor did not specify
Base Price (\$)	1,093	1,495	1,995/available for GSA	2,095

Vendor	Memorex Telex	Memorex Telex	Memorex Telex	Memorex Telex
Product	7045	7065	7070	7255
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/1612	80386/20	80386/20	80386x/16
Co-Processor Options	80287	80387	80387	80387SX
Standard RAM (bytes)/Speed (ns)	1.0M/100	2.0M/80	2.0M/80	1M/100
RAM Expansion Capacity (bytes)	8.0M	8.0M	8.0M	8.0M
Maximum System RAM (bytes)	8.0M	8.0M	20M	8.0M
RAM Cache, Size (bytes)/Speed (ns)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	MCA
Bus Speed (MHz)	12.5	8 and 10	8	10
Total Expansion Slots	1 8-bit, 5 16-bit	1 8-bit, 4 16-bit	2 8-bit, 5 16-bit, 1 32-bit	6 32-bit
Available Expansion Slots	1 8-bit, 5 16-bit	1 8-bit, 4 16-bit	2 8-bit, 5 16-bit, 1 32-bit	6 32-bit
Serial Ports	2 on main board	2 on main board	2 on main board	1 on main board
Parallel Ports	1 on main board	1 on main board	2 on main board	1 on main board
Other I/O Devices Included	Vendor did not specify	Vendor did not specify	Vendor did not specify	None
Other I/O Interfaces	Mouse, 101-key keyboard port	Mouse, 101-key keyboard port	Mouse, 101-key keyboard port	Mouse, 101-key keyboard port, ext. video
<b>Mass Storage</b>				
Internal Drive Bays Available	4 half-height	4 half-height	5 half-height	2 half-height, 1 third-height
Diskette Drives Included (bytes)	1 1.44M	1 1.44M	1 1.44M	1 1.44M
Diskette Drive Options (bytes)	360K, 1.2M	360K, 1.2M	360K, 1.44M	1.2M, 1.44M
Hard Disk Interface	Vendor did not specify	ST506/412	ESDI	Vendor did not specify
Hard Disk Size (bytes)/AAT (ms)	None	None	None	None
Optional Mass Storage	20M, 40M, 80M	20M, 40M, 80M	150M, 94M, 338M, tape drive	20M, 40M
<b>Keyboard</b>				
Availability	Optional	Optional	Optional	Included (detachable)
Number of Keys/Function Keys	Vendor did not specify	Vendor did not specify	Vendor did not specify	101/10
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/640 x 480	Adapter optional/640 x 480	Integrated on system board/720 x 348	Integrated on system board/800 x 600
Display	Optional	Optional	Included, 14-inch, analog color	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, Token-ring, ARCnet	Ethernet, Token-ring, ARCnet	Ethernet, Token-ring, ARCnet	Token-ring
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Dimensions (H x W x D, inches)	6.20 x 18.70 x 16.40	6.20 x 18.70 x 16.40	6.30 x 20.90 x 16.50	6 x 14.84 x 16.46
Weight (pounds)	Vendor did not specify	25.00	40.00	25.30
AC Power Supply (watts)	150	145	200	145
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	MS-DOS	MS-DOS	None
Operating System(s) Supported	MS-DOS	MS-DOS	MS-DOS	MS-DOS, Vendor MS-OS/2
Additional Software Included	Vendor did not specify	Vendor did not specify	Vendor did not specify	Util./diagn.
<b>Service/Support</b>				
Distribution Channels	Direct from vendor	Direct from vendor	Direct from vendor	Direct from vendor
Parts Warranty	Vendor did not specify	Vendor did not specify	Vendor did not specify	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor	Vendor	Vendor	Vendor
Service Features	Vendor did not specify	Vendor did not specify	Vendor did not specify	On site, toll free
Base Price (\$)	2,595	4,195	5,060	2,695/available for GSA

Vendor	Micro Express	Micro Express	Micro Express	Micro Express
Product	ME 286-16SL	ME 386-25	ME 386-25LC	ME 386-33LC
Processor/Memory CPU/Clock Speed (MHz)	80286/16	80386/25	80386/25	80386/33
Co-Processor Options	80287	80387	80387	80387
Standard RAM (bytes)/Speed (ns)	640K/100	1.0M/80	1.0M/80	1.0M/80
RAM Expansion Capacity (bytes)	4.0M	16.0M	16.0M	16.0M
Maximum System RAM (bytes)	4.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Chips & Tech., 64K/25	Chips & Tech., 32K/25	Chips & Tech., 32K/25
Input/Output Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	2 8-bit, 3 16-bit	2 8-bit, 5 16-bit, 1 32-bit	2 8-bit, 5 16-bit, 1 32-bit	2 8-bit, 5 16-bit, 1 32-bit
Available Expansion Slots	2 8-bit, 2 16-bit	2 8-bit, 5 16-bit, 1 32-bit	2 8-bit, 5 16-bit, 1 32-bit	2 8-bit, 5 16-bit, 1 32-bit
Serial Ports	2 on adapter	1 on adapter	2 on adapter	2 on adapter
Parallel Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
Other I/O Devices Included	Vendor did not specify			
Other I/O Interfaces	101-key keyboard port, ext. video			
Mass Storage				
Internal Drive Bays Available	1 full-height, 3 half-height			
Diskette Drives Included (bytes)	1 1.2M; 1 1.44M			
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M			
Hard Disk Interface	ST506/412	ESDI	ESDI	ESDI
Hard Disk Size (bytes)/AAT (ms)	None	None	None	None
Optional Mass Storage	20M, 30M, 40M, 70M, 80M, 100M, 150M, tape drive, CD-ROM, WORM	40M, 70M, 80M, 100M, 150M, 300M, 630, tape drive, CD-ROM, WORM, erasable optical	40M, 70M, 80M, 100M, 150M, 300M, 630, tape drive, CD-ROM, WORM, erasable optical	40M, 70M, 80M, 100M, 150M, 300M, 630, tape drive, CD-ROM, WORM, erasable optical
Keyboard Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
Video/Display Video Controller/Resolution (pixels)	On included adapter/720 x 350	Adapter optional	Adapter optional	Adapter optional
Display	Included, 14-inch digital monochrome	Optional	Optional	Optional
Local Area Network Support Vendor LAN Options	Vendor did not specify			
Product Design Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	Not available
Dimensions (H x W x D, inches)	4 x 16.5 x 15.25	5.50 x 21.00 x 16.50	6.5 x 14.5 x 16.5	6.5 x 14.5 x 16.5
Weight (pounds)	Vendor did not specify	50.00	Vendor did not specify	Vendor did not specify
AC Power Supply (watts)	200	200	200	200
Software Operating System(s) Bundled	Vendor did not specify			
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2 Util./diag.	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2 Util./diag.	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2 Util./diag.	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2 Util./diag.
Additional Software Included				
Service/Support Distribution Channels	Direct from vendor	Direct from vendor	Direct from vendor	Direct from vendor
Parts Warranty	15 months	15 months	15 months	15 months
Labor Warranty	15 months	15 months	15 months	15 months
Service Supported by	Vendor, third party	Vendor, third party	Vendor, third party	Vendor, third party
Service Features	On site, toll free, 30-day money back			
Base Price (\$)	1,199	1,999	1,999	2,749

Vendor	Micro Express	Mission Cyrus Corp.	Mission Cyrus Corp.	Mission Cyrus Corp.
Product	ME 386-SX	Darius CentralIntelligence - AT AT Version 33 MHz	Darius CentralIntelligence - MCA MCA Version 25 MHz	Darius Professional - AT AT Version 16 MHz
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386sx/16	80386/33	80386/25	80386/16
Co-Processor Options	80387	80387	80387, Weitek 3167	80387SX
Standard RAM (bytes)/Speed (ns)	1.0M/80	4.0M/80	4.0M/80	1.0M/100
RAM Expansion Capacity (bytes)	16.0M	8.0M	16.0M	8.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Chips & Tech., 32K/25	Intel, 32K/25	Intel, 32K/25	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	MCA	AT
Bus Speed (MHz)	8	8	10	8
Total Expansion Slots	1 8-bit, 6 16-bit, 1 32-bit	10 16-bit	8 32-bit	2 16-bit
Available Expansion Slots	1 8-bit, 6 16-bit, 1 32-bit	7 16-bit	7 32-bit	2 16-bit
Serial Ports	2 on adapter	2 on main board	2 on main board	1 on main board
Parallel Ports	1 on adapter	1 on main board	1 on main board	1 on main board
Other I/O Devices Included	Vendor did not specify	Mouse	Mouse, int. modem	Mouse, int. modem
Other I/O Interfaces	101-key keyboard port, ext. video	Mouse, SCSI, 101-key keyboard port, ext. video, network interface	Mouse, SCSI, 101-key keyboard port, ext. video, network interface, Ethernet	Mouse, 101-key keyboard port, ext. video
<b>Mass Storage</b>				
Internal Drive Bays Available	1 full-height, 3 half-height	4 full-height, 3 third-height	4 full-height, 2 third-height	3 third-height
Diskette Drives Included (bytes)	1 1.2M; 1 1.44M	1 1.44M	1 1.44M	1 1.44M
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M	1.2M	1.2M	None
Hard Disk Interface	ESDI	ESDI	SCSI	AT/IDE
Hard Disk Size (bytes)/AAT (ms)	None	200M/18	200M/18	50M/23
Optional Mass Storage	40M, 70M, 80M, 100M, 150M, 300M, 630, tape drive, CD- ROM,WORM, erasable optical	760M, tape drive, CD-ROM, WORM, erasable optical	760M, tape drive, CD-ROM, WORM, erasable optical	100M, 200M, tape drive, CD-ROM
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	On included adapter/640 x 480	Integrated on system board/640 x 480	Integrated on system board/800 x 600
Display	Optional	Optional	Optional	Included, 14-inch, analog color
<b>Local Area Network Support</b>				
Vendor LAN Options	Vendor did not specify	Ethernet, Token-ring, ARCnet	Ethernet, Token-ring, ARCnet	Ethernet, Token-ring, ARCnet
<b>Product Design</b>				
Type of Unit	Desktop	Floorstanding	Floorstanding	Desktop
Tempest Version	Not available	From manufacturer	From manufacturer	Vendor did not specify
Dimensions (H x W x D, inches)	6.5 x 14.5 x 16.5	Vendor did not specify	Vendor did not specify	4.25 x 17.25 x 12.25
Weight (pounds)	Vendor did not specify	Vendor did not specify	100.00	20.00
AC Power Supply (watts)	200	400 UPS	400 UPS	220
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify	MS-DOS	MS-DOS	MS-DOS
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX, UNIX deriv. Util./diagn.	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX, UNIX deriv. Util./diagn.	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX, UNIX deriv. Util./diagn.
Additional Software Included	Util./diagn.	Util./diagn.	Util./diagn.	Util./diagn.
<b>Service/Support</b>				
Distribution Channels	Direct from vendor	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD
Parts Warranty	15 months	120 days	120 days	120 days
Labor Warranty	15 months	120 days	120 days	120 days
Service Supported by	Vendor, third party	Authorized dealers	Authorized dealers	Authorized dealers
Service Features	On site, toll free, 30-day money back	Toll free	Toll free	Toll free
<b>Base Price (\$)</b>	999	14,999	14,999	3,699

Vendor	Mission Cyrus Corp.	Mission Cyrus Corp.	Mission Cyrus Corp.	Mitsuba Corp.
Product	Darius ProFessional - AT AT Version 16 MHz (hard disk)	Darius ProFessional - MCA MCA Version	Darius ProPortable - ISA ISA Version 33 MHz	Mitsuba 286 MIT-WSN
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386x/16	80386/25	80386/33	80286/12
Co-Processor Options	80387SX	80387, Weitek 1167	80387, Weitek 3167	80287
Standard RAM (bytes)/Speed (ns)	1.0M/100	4.0M/100	1.0M/80	512K/100
RAM Expansion Capacity (bytes)	8.0M	16.0M	32M	Vendor did not specify
Maximum System RAM (bytes)	16.0M	16.0M	32M	4.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Intel, 32K/30	Intel, 64K/25	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	MCA	AT, AT passive backplane	AT
Bus Speed (MHz)	8	10	8	8
Total Expansion Slots	Vendor did not specify	2 32-bit	2 16-bit	2 8-bit, 3 16-bit,
Available Expansion Slots	Vendor did not specify	2 32-bit	2 16-bit	Vendor did not specify
Serial Ports	1 on main board	2 on main board	1 on main board	2 on main board
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on main board
Other I/O Devices Included	Mouse, int. modem	Mouse, int. modem	Mouse, int. modem	None
Other I/O Interfaces	Mouse	Mouse, SCSI, 101-key keyboard port, ext. video, network interface	Mouse, SCSI	Mouse, ext. diskette drive, ext. video
<b>Mass Storage</b>				
Internal Drive Bays Available	3 third-height	3 third-height	3 third-height	2 half-height, 2 third-height
Diskette Drives Included (bytes)	1 1.44M	1 1.44M	1 1.44M	1 1.2M
Diskette Drive Options (bytes)	None	1.44M	None	360K, 1.2M, 720K, 1.44M
Hard Disk Interface	AT/IDE	AT/IDE	AT/IDE	ST506/412
Hard Disk Size (bytes)/AAT (ms)	None	50M/23	100M/10ms	None
Optional Mass Storage	40M, 200M, tape drive, CD-ROM	100M, 200M, tape drive, CD-ROM, WORM, erasable optical	40M, 200M, tape drive, CD-ROM	20M, 30M, 40M, 50M, 60M, 70M, 80M, 90M, 100M, 120M, 150M, none
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/800 x 600	Integrated on system board/640 x 480	Integrated on system board	Integrated on system board/, 720 x 348
Display	Included, 14-inch, optional analog color	Included, 14-inch, analog color	Included, 14-inch, optional analog color	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, Token-ring, ARCnet	Ethernet, Token-ring, ARCnet	Ethernet, Token-ring, ARCnet	None
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Vendor did not specify	Vendor did not specify	Vendor did not specify
Dimensions (H x W x D, inches)	Vendor did not specify	4.25 x 17.25 x 12.25	4.25 x 17.25 x 12.25	4 x 15.25 x 16.25
Weight (pounds)	12.25	Vendor did not specify	17.00	Vendor did not specify
AC Power Supply (watts)	220	220	220	150
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	MS-DOS	MS-DOS	None
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS BIOS, setup	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX, UNIX deriv. Util./diagn.	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS DesqView	IBM PC-DOS, MS-DOS, UNIX derivative
Additional Software Included				None
<b>Service/Support</b>				
Distribution Channels	Computer retail	Computer retail	Computer retail	Computer retail, VAR/VAD
Parts Warranty	1 year	120 days	1 year	1 year
Labor Warranty	1 year	Vendor did not specify	1 year	1 year
Service Supported by	Authorized dealers	Authorized dealers	Authorized dealers	Authorized dealers
Service Features	Toll free	Toll free	Toll free	Vendor did not specify
<b>Base Price (\$)</b>	2,499	6,499	7,999	Vendor did not specify

Vendor	Mitsuba Corp.	Mitsuba Corp.	Mitsuba Corp.	Mitsuba Corp.
<b>Product</b>	Mitsuba 286-10 MIT286-10	Mitsuba 286-20 MIT286-20	Ninja 286-12	Professional XT MIT-XT8408
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/10	80286/20	80286/12	8088/10
Co-Processor Options	80287	80287	80287	8087
Standard RAM (bytes)/Speed (ns)	1.0M	1.0M/80	512K/100	640K/120
RAM Expansion Capacity (bytes)	Vendor did not specify	4.0M	640K	640K
Maximum System RAM (bytes)	Vendor did not specify	8.0M	640K	640K
RAM Cache, Size (bytes)/Speed (ns)	Vendor did not specify	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	XT
Bus Speed (MHz)	8	8	8	4.77
Total Expansion Slots	2 8-bit, 6 16-bit,	2 8-bit, 6 16-bit,	4 8-bit, 4 16-bit	8 8-bit
Available Expansion Slots	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Serial Ports	None; 0 on adapter	None	2 on main board	None
Parallel Ports	None; 0 on adapter	None	1 on main board	None
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	None	Vendor did not specify	Mouse	None
<b>Mass Storage</b>				
Internal Drive Bays Available	Vendor did not specify	2 full-height	3 half-height	2 full-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 360K
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	720K
Hard Disk Interface	ST506/412	ST506/412	ST506/412	None
Hard Disk Size (bytes)/AAT (ms)	None	None	None	Vendor did not specify
Optional Mass Storage	20M, 30M, 40M, 50M, 60M, 70M, 80M, 90M, 100M, 120M, 150M	20M, 30M, 40M, 50M, 60M, 70M, 80M, 90M, 100M, 120M, 150M	20M, 30M, 40M, 50M, 60M, 70M, 80M, 90M, 100M, 120M, 150M	20M, 30M, 40M
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	Adapter optional	Adapter optional
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	None	None	None	None
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Dimensions (H x W x D, inches)	Vendor did not specify	Vendor did not specify	6 x 17 x 18.5	Vendor did not specify
Weight (pounds)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
AC Power Supply (watts)	200	200	200	150
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Operating System(s) Supported	IBM PC-DOS, MS-DOS, UNIX derivative	IBM PC-DOS, MS-DOS, UNIX derivative	IBM PC-DOS, MS-DOS, UNIX derivative	IBM PC-DOS, MS-DOS
Additional Software Included	None	BIOS, setup, util./diagn.	BIOS	BIOS
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Authorized dealers	Authorized dealers	Authorized dealers	Authorized dealers
Service Features	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Base Price (\$)</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify

Vendor	Mitsubishi Electronics America, Inc.			
<b>Product</b>	mp386/25 103	mp386/25 105	mp386/25 13	mp386/25 15
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/25	80386/25	80386/25	80386/25
Co-Processor Options	80387	80387	80387, Weitek 3167	80387, Weitek 3167
Standard RAM (bytes)/Speed (ns)	2.0M	2.0M	2.0M/80	2.0M/80
RAM Expansion Capacity (bytes)	2.0M	18M	18M	18M
Maximum System RAM (bytes)	16.0M	18M	18M	18M
RAM Cache, Size (bytes)/Speed (ns)	Intel, 32K/25	Intel, 32K/25	Intel, 32K/25	Intel, 32K/25
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	12.5	12.5	12.5	12.5
Total Expansion Slots	2 8-bit, 7 16-bit			
Available Expansion Slots	2 8-bit, 7 16-bit			
Serial Ports	2 on main board			
Parallel Ports	1 on main board			
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	None	None	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	3 half-height	3 half-height	5 full-height	5 full-height
Diskette Drives Included (bytes)	1 1.44M	1 1.2M	1 1.44M	1 1.2M
Diskette Drive Options (bytes)	1.2M, 1.44M	1.2M, 1.44M	Vendor did not specify	1.2M, 1.44M
Hard Disk Interface	ESDI	AT/IDE	Vendor did not specify	None
Hard Disk Size (bytes)/AAT (ms)	100M/29	100M/29	Vendor did not specify	Vendor did not specify
Optional Mass Storage	100M, 300M	100M, 300M	100M, 300M	100M, 300M
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional/640 x 480	Adapter optional	Adapter optional	Adapter optional
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	None	None	None	None
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify	Vendor did not specify	Not available	Not available
Dimensions (H x W x D, inches)	6.38 x 22.83 x 16.77			
Weight (pounds)	Vendor did not specify			
AC Power Supply (watts)	230	230	230	230
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	MS-DOS	MS-DOS	MS-DOS
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS
Additional Software Included	BIOS, setup, diagnostics, GW Basic 3.2, Super Disk Caching	BIOS, setup, diagnostics, GW Basic, Super Disk Caching	BIOS, setup, diagnostics, GW Basic, Super Disk Caching	BIOS, setup, diagnostics, GW Basic, Super Disk Caching
<b>Service/Support</b>				
Distribution Channels	Computer retail, general retail, VAR/VAD			
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	Vendor did not specify	Vendor did not specify
Service Supported by	Authorized dealers, third party			
Service Features	Vendor did not specify			
<b>Base Price (\$)</b>	6,195	6,195	4,495	4,495

Vendor	Mitsubishi Electronics America, Inc.	Mitsubishi Electronics America, Inc.	NCR Corp.	NEC Information Systems, Inc.
<b>Product</b>	mp386/25 333	mp386/25 335	PC486/MC	PowerMate 286 Plus
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/25	80386/25	1486/25	80286/12
Co-Processor Options	80387	None	None	80287
Standard RAM (bytes)/Speed (ns)	2.0M/80	2.0M	2.0M/80	1.0M/80
RAM Expansion Capacity (bytes)	16.0M	Vendor did not specify	16.0M	4.0M
Maximum System RAM (bytes)	16.0M	Vendor did not specify	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported, 32K/25	Not supported	Intel	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	MCA	AT
Bus Speed (MHz)	12.5	12.5	10	8
Total Expansion Slots	2 8-bit, 7 16-bit,	2 8-bit, 7 16-bit,	4 16-bit, 3 32-bit	4 16-bit
Available Expansion Slots	2 8-bit, 6 16-bit,	2 8-bit, 6 16-bit,	2 16-bit, 2 32-bit	Vendor did not specify
Serial Ports	2 on main board	2 on main board	1 on main board	1 on main board
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on main board
Other I/O Devices Included	Mouse	None	None	None
Other I/O Interfaces	None	None	Mouse, SCSI, 101-key keyboard port, ext. video	Mouse
<b>Mass Storage</b>				
Internal Drive Bays Available	3 half-height	3 half-height	Vendor did not specify	2 half-height, 1 third-height
Diskette Drives Included (bytes)	1 1.44M	1 1.2M	1 1.44M	1 1.2M
Diskette Drive Options (bytes)	Vendor did not specify	1.2M, 1.44M	1.44M	1.2M, 1.44M
Hard Disk Interface	Vendor did not specify	AT/IDE	SCSI	ST506/412
Hard Disk Size (bytes)/AAT (ms)	330M/18	330M/29	200M/15	42M/28
Optional Mass Storage	100M, 330M, 160M	100M, 300M	100M, 200M	100M, 140M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/15	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional/800 x 600	Adapter optional	On included adapter/800 x 600	Integrated on system board/640 x 400
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	None	None	None	None
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify	Vendor did not specify	Not available	Vendor did not specify
Dimensions (H x W x D, inches)	6.38 x 22.83 x 16.77	6.38 x 22.83 x 16.77	5.2 x 15 x 16.6	4.8 x 17.0 x 16.0
Weight (pounds)	Vendor did not specify	Vendor did not specify	24.00	22.00
AC Power Supply (watts)	Vendor did not specify	230	175	110
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify	MS-DOS	None	Enhanced MS-DOS
Operating System(s) Supported	MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	Vendor MS-OS/2, UNIX derivative
Additional Software Included	BIOS, setup, diagnostics, Disk Caching SW	BIOS, setup, diagnostics, GW Basic 3.2, Super Disk Caching	BIOS, setup, none	None
<b>Service/Support</b>				
Distribution Channels	Computer retail, general retail, VAR/VAD	Computer retail, general retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD, direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Authorized dealers, third party	Authorized dealers, third party	Vendor, authorized dealers	Authorized dealers
Service Features	Vendor did not specify	Vendor did not specify	On site, toll free, 30-day money back	Vendor did not specify
<b>Base Price (\$)</b>	7,995	7,995	9,995/available for GSA	2,899

Vendor	NEC Information Systems, Inc.	NEC Information Systems, Inc.	NEC Information Systems, Inc.	NEC Information Systems, Inc.
Product	PowerMate 286	PowerMate 286 ZPlus	PowerMate 386/20 APC-H601E-xB	PowerMate 386/20 APC-H603E-xB
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/10	80286/12	80386/20	80386/20
Co-Processor Options	80287	80287	80387	80387
Standard RAM (bytes)/Speed (ns)	512K/-	1.0M/80	2.0M/80	2.0M/80
RAM Expansion Capacity (bytes)	1.0M	4.0M	8.0M	8.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	Split AT	Split AT
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	4 16-bit	4 16-bit	2 8-bit, 5 16-bit, 1 32-bit	2 8-bit, 5 16-bit, 1 32-bit
Available Expansion Slots	4 16-bit	Vendor did not specify	2 8-bit, 4 16-bit, 1 32-bit	2 8-bit, 4 16-bit, 1 32-bit
Serial Ports	1 on main board	1 on main board	1 on main board	1 on main board
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on main board
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	None	Mouse	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	2 half-height, 1 third-height	2 half-height, 1 third-height	5 half-height	5 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.44M	1 1.44M
Diskette Drive Options (bytes)	360K, 1.2M, 1.44M	1.2M, 720K	360K, 1.2M, 720K	360K, 1.2M, 720K
Hard Disk Interface	Vendor did not specify	None	ST506/412	ESDI
Hard Disk Size (bytes)/AAT (ms)	Vendor did not specify	None	42M/28	130M/28
Optional Mass Storage	100M, 42M, 140, tape drive	100M, 42M, 140M, tape drive	20M, 80M, tape drive	20M, 80M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/640 x 480	Integrated on system board/640 x 480	Adapter optional	Adapter optional
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	None	None	None	None
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Dimensions (H x W x D, inches)	5.0 x 14.2 x 16.2	4.8 x 17.0 x 16.0	6.30 x 21.20 x 16.50	6.30 x 21.20 x 16.50
Weight (pounds)	1.00	22.00	41.00	41.00
AC Power Supply (watts)	85	110	237	237
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	Enhanced MS-DOS	MS-DOS	MS-DOS
Operating System(s) Supported	UNIX derivative	Vendor MS-OS/2, UNIX derivative	MS-DOS, Vendor MS-OS/2, UNIX derivative	MS-DOS, Vendor MS-OS/2, UNIX derivative
Additional Software Included	None	None	Windows	Windows
<b>Service/Support</b>				
Distribution Channels	Computer retail	Vendor did not specify	Vendor did not specify	Vendor did not specify
Parts Warranty	1 year	Vendor did not specify	Vendor did not specify	Vendor did not specify
Labor Warranty	1 year	Vendor did not specify	Vendor did not specify	Vendor did not specify
Service Supported by	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Service Features	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Base Price (\$)</b>	Vendor did not specify	1,999	Vendor did not specify	Vendor did not specify

Vendor	NEC Information Systems, Inc.	NEC Information Systems, Inc.	NEC Information Systems, Inc.	Octave Systems, Inc.
<b>Product</b>	<b>PowerMate 386/20 APC-H605E-xB</b>	<b>PowerMate SX APC-H801-1B</b>	<b>PowerMate SX APC-H804-1B</b>	<b>PC/386 DO</b>
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/20	80386sx/16	80386sx/16	80386/20
Co-Processor Options	80387	80387SX	80387SX	80387
Standard RAM (bytes)/Speed (ns)	2.0M/80	2.0M/80	2.0M/80	1.0M/120
RAM Expansion Capacity (bytes)	8.0M	2.0M	2.0M	8.0M
Maximum System RAM (bytes)	16.0M	10.0M	10.0M	8.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Intel/25
<b>Input/Output</b>				
Bus Architecture	Split AT	AT	AT	Vendor did not specify
Bus Speed (MHz)	8	8	8	12.5
Total Expansion Slots	2 8-bit, 5 16-bit, 1 32-bit	1 8-bit, 4 16-bit,	1 8-bit, 4 16-bit,	Vendor did not specify
Available Expansion Slots	2 8-bit, 4 16-bit, 1 32-bit	1 8-bit, 3 16-bit,	1 8-bit, 3 16-bit,	Vendor did not specify
Serial Ports	1 on main board	1 on main board	1 on main board	On main board
Parallel Ports	1 on main board	11 on main board	11 on main board	On main board
Other I/O Devices Included	None	Vendor did not specify	Vendor did not specify	None
Other I/O Interfaces	None	None	None	Mouse, ext. diskette drive, ext. hard disk, numeric keypad port, expansion unit, propr. modem slot
<b>Mass Storage</b>				
Internal Drive Bays Available	5 half-height	3 half-height	3 half-height	Vendor did not specify
Diskette Drives Included (bytes)	1 1.44M	1 1.2M	1 1.2M	Vendor did not specify
Diskette Drive Options (bytes)	360K, 1.2M, 720K	360K, 720K, 1.44M	360K, 720K, 1.44M	1.2M, 720K, 1.44M
Hard Disk Interface	ESDI	ST506/412	ESDI	ESDI
Hard Disk Size (bytes)/AAT (ms)	300M/28	42M/28	140M	70M/28
Optional Mass Storage	20M, 80M, tape drive	140M, tape drive	42M, tape drive	150M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Vendor did not specify
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	Adapter optional	On included adapter/800 x 600
Display	Optional	Optional	Optional	Included, 14-inch digital color
<b>Local Area Network Support</b>				
Vendor LAN Options	None	Vendor did not specify	Vendor did not specify	Ethernet, ARCnet, Tiara
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify	Vendor did not specify	Vendor did not specify	Not available
Dimensions (H x W x D, inches)	6.30 x 21.20 x 16.50	6.40 x 16.50 x 19.80	6.40 x 16.50 x 19.80	Vendor did not specify
Weight (pounds)	41.00	43.00	43.00	Vendor did not specify
AC Power Supply (watts)	237	193	193	Vendor did not specify
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	MS-DOS	MS-DOS	IBM PC-DOS, MS-DOS
Operating System(s) Supported	MS-DOS, Vendor MS-OS/2, UNIX derivative	MS-DOS, Vendor MS-OS/2, UNIX derivative	MS-DOS, Vendor MS-OS/2, UNIX derivative	IBM PC-DOS, MS-DOS
Additional Software Included	Windows	Windows	Windows	BIOS, setup, diagnostics, operating system
<b>Service/Support</b>				
Distribution Channels	Vendor did not specify	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, general retail
Parts Warranty	Vendor did not specify	1 year	1 year	1 year
Labor Warranty	Vendor did not specify	1 year	1 year	1 year
Service Supported by	Vendor did not specify	Vendor, authorized dealers	Vendor, authorized dealers	Vendor
Service Features	Vendor did not specify	Vendor did not specify	Vendor did not specify	On site
<b>Base Price (\$)</b>	Vendor did not specify	4,495	5,995	1,425

Vendor	Otec Technologies, Inc.	Otec Technologies, Inc.	Otec Technologies, Inc.	Otec Technologies, Inc.
Product	OPC 188-10	OPC 286-10	OPC 286-12	OPC 286-8
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	8088/10	80286/10	80286/12	80286/8
Co-Processor Options	8087	80287	80287	80287
Standard RAM (bytes)/Speed (ns)	640K/120	512K/120	512K/100	512K/120/150
RAM Expansion Capacity (bytes)	640K	1.0M	1.0M	1.0M
Maximum System RAM (bytes)	640K	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	XT	AT	AT	AT
Bus Speed (MHz)	4.77	Vendor did not specify	Vendor did not specify	Vendor did not specify
Total Expansion Slots	8 8-bit, 16-bit	2 8-bit, 6 16-bit	2 8-bit, 6 16-bit	6 8-bit, 6 16-bit
Available Expansion Slots	8 8-bit, 16-bit	2 8-bit, 6 16-bit	2 8-bit, 6 16-bit	6 8-bit, 6 16-bit
Serial Ports	None; 0 on adapter	None; 0 on adapter	None; 0 on adapter	None; 0 on adapter
Parallel Ports	None; 0 on adapter	None; 0 on adapter	None; 0 on adapter	None; 0 on adapter
Other I/O Devices Included	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Other I/O Interfaces	None	None	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	2 full-height, 4 half-height	5 half-height	5 half-height	5 half-height
Diskette Drives Included (bytes)	1 360K	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	360K	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M
Hard Disk Interface	ST506/412	ST506/412	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	None	None	None	None
Optional Mass Storage	20M, 30M, 40M, 50M, 60M, 70, 80M	20M, 40M, 70M	20M, 40M, 70M	20M, 40M, 70M
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	84/10
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional/640 x 350	Adapter optional/640 x 480, 640 x 350, 320 x 200	Adapter optional/640 x 480, 640 x 350, 320 x 200	Adapter optional/640 x 480, 640 x 350, 320 x 200
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Vendor did not specify	Vendor did not specify	Vendor did not specify	Novell
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	Not available
Dimensions (H x W x D, inches)	5 x 19 x 16.5	5.5 x 21 x 16.5	5.5 x 21 x 16.5	6.125 x 21.125 x 16.56
Weight (pounds)	25.00	38.00	38.00	38.00
AC Power Supply (watts)	120	200	200	238
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	Vendor did not specify	Vendor did not specify	MS-DOS
Operating System(s) Supported	MS-DOS, CPM/86, CCP/M	IBM OS/2 Standard, MS-DOS, UNIX derivative	IBM OS/2 Standard, MS-DOS, UNIX derivative	IBM OS/2 Standard, MS-DOS, UNIX derivative
Additional Software Included	Util./diagn.	Util./diagn., low-level disk formatting utility	Util./diagn.	Util./diagn., GW-Basic
<b>Service/Support</b>				
Distribution Channels	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers, third party	Vendor, authorized dealers, third party	Vendor, authorized dealers, third party	Vendor, authorized dealers, third party
Service Features	Toll free	Toll free	Toll free	Toll free
<b>Base Price (\$)</b>	525	736	752	719

Vendor	Otec Technologies, Inc.	Otec Technologies, Inc.	Otec Technologies, Inc.	Packard Bell
Product	OPC 386-20	OPC 386-25	OPC 386-33	Force 386/25
<b>Processor/Memory</b> CPU/Clock Speed (MHz)	80386/20	80386/25	80386/33	80386/25
Co-Processor Options	80387, Weitek 1167, Weitek 3167	80387, Weitek 1167, Weitek 3167	80387, Weitek 1167, Weitek 3167	80387, Weitek 3167
Standard RAM (bytes)/Speed (ns)	1.0M/100	1.0M/80	4.0M/60	2.0M/80
RAM Expansion Capacity (bytes)	8.0M	8.0M	8.0M	8.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Proprietary, 64K/15 SRAM	Intel, 64K/35
<b>Input/Output</b> Bus Architecture	AT	AT	AT	ISA
Bus Speed (MHz)	Vendor did not specify	Vendor did not specify	Vendor did not specify	8
Total Expansion Slots	2 8-bit, 5 16-bit, 1 32-bit	2 8-bit, 5 16-bit, 1 32-bit	1 8-bit, 6 16-bit, 1 32-bit	1 8-bit, 5 16-bit, 2 32-bit
Available Expansion Slots	2 8-bit, 5 16-bit, 1 32-bit	2 8-bit, 5 16-bit, 1 32-bit	1 8-bit, 6 16-bit, 1 32-bit	Vendor did not specify
Serial Ports	None; 0 on adapter	None; 0 on adapter	None; 0 on adapter	2 on main board
Parallel Ports	None; 0 on adapter	None; 0 on adapter	None; 0 on adapter	1 on main board
Other I/O Devices Included	Vendor did not specify	Vendor did not specify	Vendor did not specify	None
Other I/O Interfaces	Vendor did not specify	None	None	None
<b>Mass Storage</b> Internal Drive Bays Available	5 half-height	5 half-height	5 half-height	5 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.44M
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	1.44M
Hard Disk Interface	ST506/412	ST506/412	ST506/412	None
Hard Disk Size (bytes)/AAT (ms)	None	None	None	None
Optional Mass Storage	20M, 40M, 70M	20M, 40M, 70M	20M, 40M, 70M	60M
<b>Keyboard</b> Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b> Video Controller/Resolution (pixels)	Adapter optional/640 x 480, 640 x 350, 320 x 200	Adapter optional/640 x 480, 640 x 350, 320 x 200	Adapter optional/640 x 480, 640 x 350, 320 x 200	Adapter optional/-
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b> Vendor LAN Options	Vendor did not specify	Vendor did not specify	Vendor did not specify	None
<b>Product Design</b> Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	Not available
Dimensions (H x W x D, inches)	5.5 x 21 x 16.5	5.5 x 21 x 16.5	5.5 x 21 x 16.5	6.5 x 21.25 x 17.0
Weight (pounds)	39.00	38.00	38.00	45.00
AC Power Supply (watts)	220, 110/220	220, 110/220	200	200
<b>Software</b> Operating System(s) Bundled	Vendor did not specify	Vendor did not specify	Vendor did not specify	MS-DOS
Operating System(s) Supported	IBM OS/2 Standard, MS-DOS, UNIX derivative	IBM OS/2 Standard, MS-DOS, UNIX derivative	IBM OS/2 Standard, MS-DOS, UNIX derivative	MS-DOS
Additional Software Included	Util./diagn.	Util./diagn.	Util./diagn.	BIOS, setup, GW Basic
<b>Service/Support</b> Distribution Channels	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor	Computer retail, VAR/VAD
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers, third party	Vendor, authorized dealers, third party	Vendor, authorized dealers, third party	Third party
Service Features	Toll free	Toll free	Toll free	On site, toll free
<b>Base Price (\$)</b>	1,461	1,673	Vendor did not specify	5,595

Vendor	Packard Bell	Packard Bell	Packard Bell	Packard Bell
Product	Force 386SX	PB 1000/12X	PB 686	PB 800/16
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386sx/16	80286/12	80286/12	80286/16
Co-Processor Options	80387SX	80287	80287	80287
Standard RAM (bytes)/Speed (ns)	1.0M/80	640K/80	640K/100	1.0M/80
RAM Expansion Capacity (bytes)	4.0M	640K	1.0M	1.0M
Maximum System RAM (bytes)	16.0M	8.0M	Vendor did not specify	8.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	1 8-bit, 4 16-bit,	2 8-bit, 4 16-bit,	5 16-bit	2 8-bit, 6 16-bit
Available Expansion Slots	1 8-bit, 4 16-bit,	2 8-bit, 4 16-bit,	5 16-bit	6 16-bit
Serial Ports	2 on main board	2 on main board	2 on main board	2 on adapter
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on adapter
Other I/O Devices Included	None	None	None	Vendor did not specify
Other I/O Interfaces	Mouse	None	Vendor did not specify	None
<b>Mass Storage</b>				
Internal Drive Bays Available	4 half-height	3 half-height, 1 third-height	3 half-height	3 half-height
Diskette Drives Included (bytes)	1 1.2M; 1 1.44M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	None	1.44M	None	1.44M
Hard Disk Interface	AT/IDE	None	None	None
Hard Disk Size (bytes)/AAT (ms)	None	None	None	None
Optional Mass Storage	40M	40M, 60M, 100M	40M	40M, 60M
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Optional
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/640 x 480	Adapter optional	Adapter optional/-	Adapter optional
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	None	None	None	None
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify	Vendor did not specify	Not available	Vendor did not specify
Dimensions (H x W x D, inches)	6.3 x 17.7 x 16.3	Vendor did not specify	5.5 x 15.2 x 15.5	Vendor did not specify
Weight (pounds)	32.00	Vendor did not specify	24.20	Vendor did not specify
AC Power Supply (watts)	145	145	135	145
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	MS-DOS	MS-DOS	MS-DOS
Operating System(s) Supported	MS-DOS	MS-DOS	MS-DOS	MS-DOS, Vendor MS-OS/2
Additional Software Included	BIOS, setup, GW Basic	GW-Basic	BIOS, setup, applications	GW-Basic
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD	Computer retail, general retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, general retail, VAR/VAD
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Third party	Authorized dealers, third party	Authorized dealers	Authorized dealers
Service Features	On site, toll free	Toll free	On site, toll free	Toll free
<b>Base Price (\$)</b>	2,795	2,099	1,495	2,249

Vendor	Packard Bell	Panasonic Industrial Company	Panasonic Industrial Company	Panasonic Industrial Company
<b>Product</b>	<b>VX588</b>	<b>Business Partner FX-1650</b>	<b>Business Partner FX-1750</b>	<b>Business Partner FX-1850</b>
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	NEC V-40	8086/8	80286/8	80286/12
Co-Processor Options	8087	8087	80287	80287
Standard RAM (bytes)/Speed (ns)	640K/120	640K/120	640K/120	640K/100
RAM Expansion Capacity (bytes)	640K	640K	788K	8.0M
Maximum System RAM (bytes)	640K	640K	Vendor did not specify	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Vendor did not specify	Vendor did not specify
<b>Input/Output</b>				
Bus Architecture	XT	XT	XT	AT
Bus Speed (MHz)	8	8	8	10
Total Expansion Slots	4 8-bit, 16-bit	5 8-bit	5 8-bit	3 8-bit, 4 16-bit
Available Expansion Slots	4 8-bit, 16-bit	5 8-bit	Vendor did not specify	Vendor did not specify
Serial Ports	1 on main board	1 on main board	1 on main board	1 on main board
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on main board
Other I/O Devices Included	None	Vendor did not specify	Vendor did not specify	Vendor did not specify
Other I/O Interfaces	None	101-key keyboard port, ext. video	101-key keyboard port, ext. video	101-key keyboard port
<b>Mass Storage</b>				
Internal Drive Bays Available	2 half-height	1 half-height, 2 third-height	1 half-height, 2 third-height	2 half-height, 2 third-height
Diskette Drives Included (bytes)	1 360K	1 760K	1 720K	1 1.44M
Diskette Drive Options (bytes)	360K, 720K	360K, 720K	360K, 720K	360K, 1.2M, 1.44M
Hard Disk Interface	None	ST506/412	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	None	None	None	None
Optional Mass Storage	30M	20M	20M	40M, WORM
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	84/10	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/320 x 200	Integrated on system board/320 x 200	Integrated on system board/320 x 200	Adapter optional
Display	Optional	Optional	Inch	Vendor did not specify
<b>Local Area Network Support</b>				
Vendor LAN Options	None	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify	Not available	Not available	Not available
Dimensions (H x W x D, inches)	Vendor did not specify	5.10 x 15.50 x 13.10	5.10 x 15.50 x 13.10	6.25 x 15.75 x 17.00
Weight (pounds)	Vendor did not specify	33.00	33.00	33.00
AC Power Supply (watts)	135	67	67	135
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	MS-DOS	MS-DOS	MS-DOS
Operating System(s) Supported	MS-DOS	MS-DOS	MS-DOS	MS-DOS
Additional Software Included	GW-Basic	None	None	Vendor did not specify
<b>Service/Support</b>				
Distribution Channels	Computer retail, general retail, VAR/VAD	Computer retail, VAR/VAD	Vendor did not specify	Computer retail, VAR/VAD
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Authorized dealers	Authorized dealers	Authorized dealers	Authorized dealers
Service Features	Toll free	Toll free	Toll free	Toll free
<b>Base Price (\$)</b>	<b>1,299</b>	<b>999</b>	<b>1,299</b>	<b>1,799</b>

Vendor	Panasonic Industrial Company	PC Pro	Phillips Information Systems	Phillips Information Systems
Product	Business Partner FX-1950	Touche 5550T/5500T/5000T	P3120	P3230
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/20	80386/3325, 20	8088/10	80286/12.5
Co-Processor Options	80387	80387, Weitek 3167	8087	80287
Standard RAM (bytes)/Speed (ns)	2.0M/80	4.0M/70	640K/120	1.0M/120
RAM Expansion Capacity (bytes)	16.0M	8.0M	768K	4.0M
Maximum System RAM (bytes)	16.0M	16.0M	768K	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Vendor did not specify	AMI, 64K/25	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	XT	AT
Bus Speed (MHz)	10	8	Vendor did not specify	Vendor did not specify
Total Expansion Slots	2 8-bit, 6 16-bit	1 8-bit, 6 16-bit, 1 32-bit	5 8-bit	1 8-bit, 4 16-bit
Available Expansion Slots	Vendor did not specify	1 8-bit, 4 16-bit, 1 32-bit	4 8-bit	0 8-bit, 4 16-bit
Serial Ports	1 on main board	2 on adapter	2 on main board	2 on main board
Parallel Ports	1 on main board	1 on adapter	1 on main board	1 on main board
Other I/O Devices Included	Vendor did not specify	None	Vendor did not specify	Vendor did not specify
Other I/O Interfaces	101-key keyboard port	None	101-key keyboard port	101-key keyboard port
<b>Mass Storage</b>				
Internal Drive Bays Available	3 half-height	6 half-height	2 half-height	2 half-height
Diskette Drives Included (bytes)	1 1.44M	1 1.2M, 1 1.44M	1 1.44M	1 1.44M
Diskette Drive Options (bytes)	360K, 1.2M, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M
Hard Disk Interface	ST506/412	ESDI	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	None	150M/16	None	40M/28
Optional Mass Storage	40M, WORM	80M, 120M, 150M, 300M, tape drive, WORM	20M, 30M	20M, CD-ROM
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional/640 x 400	On included adapter/800 x 600	On included adapter/320 x 200	Adapter optional
Display	Vendor did not specify	Included, 14-inch, analog color	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Vendor did not specify	None	Vendor did not specify	Vendor did not specify
<b>Product Design</b>				
Type of Unit	Desktop	Floorstanding	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	Not available
Dimensions (H x W x D, inches)	6.50 x 19.00 x 18.00	28 x 7 x 18	5.47 x 15.25 x 14.25	5.47 x 15.25 x 14.25
Weight (pounds)	47.00	Vendor did not specify	17.00	Vendor did not specify
AC Power Supply (watts)	200	230	100	100
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify	None	Vendor did not specify	Enhanced MS-DOS, MS-DOS
Operating System(s) Supported	MS-DOS, UNIX derivative	MS-DOS, Vendor MS-OS/2, UNIX	MS-DOS	MS-DOS
Additional Software Included	None	None	Vendor did not specify	Vendor did not specify
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD	Direct from vendor	Direct from vendor	Direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	Vendor did not specify	1 year	1 year
Service Supported by	Authorized dealers	Vendor	Vendor	Vendor
Service Features	Toll free	Toll free	Vendor did not specify	Vendor did not specify
<b>Base Price (\$)</b>	3,799	3,799	950	1,435

Vendor	Phillips Information Systems	Phillips Information Systems	Phillips Information Systems	Polywell Computers Inc.
Product	P3345	P3360 High Performance	P3370 Base Tower	Poly 386-20/Cache M1386-20-1-40-M
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386ex/16	80386/25	80386/33	80386/20
Co-Processor Options	80387SX	80387	80387	80387
Standard RAM (bytes)/Speed (ns)	1.0M/100	1.0M/100	4.0M/100	1.0M/100
RAM Expansion Capacity (bytes)	Vendor did not specify	Vendor did not specify	Vendor did not specify	8.0M
Maximum System RAM (bytes)	5.0M	24K	Vendor did not specify	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Intel	Intel, 64K	Intel, 64K/100	Dir wri mem cache, 64K/25
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	Vendor did not specify	8	10	8
Total Expansion Slots	1 8-bit, 4 16-bit	1 8-bit, 7 16-bit	1 8-bit, 7 16-bit, 2 32-bit	1 8-bit, 6 16-bit, 1 32-bit
Available Expansion Slots	1 8-bit, 3 16-bit	1 8-bit, 6 16-bit	Vendor did not specify	0 8-bit, 4 16-bit, 1 32-bit
Serial Ports	On main board	2 on main board	2 on main board	2 on adapter
Parallel Ports	On main board	1 on main board	1 on main board	1 on adapter
Other I/O Devices Included	Vendor did not specify			
Other I/O Interfaces	101-key keyboard port	101-key keyboard port	101-key keyboard port	101-key keyboard port
<b>Mass Storage</b>				
Internal Drive Bays Available	2 half-height	2 half-height	3 half-height	5 half-height
Diskette Drives Included (bytes)	1 1.44M	1 1.44M	1 1.44M	1 1.2M
Diskette Drive Options (bytes)	1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 720K, 1.44M
Hard Disk Interface	ST506/412	ESDI	ESDI	ST506/412
Hard Disk Size (bytes)/AAT (ms)	40M/28	150M/28	180M	40M/28
Optional Mass Storage	100M, CD-ROM	None, CD-ROM	300M	60M, 80M, 90M, 120M, 150M, 300M, 760M, CD-ROM
<b>Keyboard</b>				
Availability	Vendor did not specify	Included (detachable)	Optional	Included (detachable)
Number of Keys/Function Keys	Vendor did not specify	101/12	Vendor did not specify	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	Adapter optional	On included adapter/720 x 348(MGA)
Display	Optional	Optional	Optional	Included, 14-inch digital monochrome
<b>Local Area Network Support</b>				
Vendor LAN Options	Vendor did not specify	Vendor did not specify	Vendor did not specify	Ethernet, ARCnet, polynet
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Floorstanding	Desktop
Tempest Version	Not available	Not available	Vendor did not specify	From manufacturer
Dimensions (H x W x D, inches)	5.50 x 15.20 x 14.30	6.22 x 19.70 x 16.60	23.70 x 8.27 x 23.70	5.75 x 21.00 x 16.50
Weight (pounds)	19.00	24.00	Vendor did not specify	60.00
AC Power Supply (watts)	100	230	330	220
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	MS-DOS	MS-DOS	MS-DOS
Operating System(s) Supported	MS-DOS	MS-DOS	MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, MS-DOS
Additional Software Included	Vendor did not specify	Vendor did not specify	Util./diagn.	Util./diagn.
<b>Service/Support</b>				
Distribution Channels	Direct from vendor	Direct from vendor	Direct from vendor	Computer retail, general retail
Parts Warranty	1 year	1 year	1 year	1 year, M 2-yrs
Labor Warranty	1 year	1 year	1 year	5-years
Service Supported by	Vendor	Vendor	Vendor	Vendor, authorized dealers
Service Features	On site	On site	On site	Toll free, 30-day money back
<b>Base Price (\$)</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	2,280.00/available for GSA

Vendor	Polywell Computers Inc.	Polywell Computers Inc.	Polywell Computers Inc.	Polywell Computers Inc.
Product	Poly 386-33/Cache 386-33-1	Poly 386/486-25 Cache P1386-25-1	Poly 386SX-20 386SX-1-40-M	Poly286-16FB 140MGP
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/33	80386/25	80386sx/20	80286/16
Co-Processor Options	80387	80387	80387SX	80287
Standard RAM (bytes)/Speed (ns)	1.0M/80	1.0M/80	1.0M/80	1.0M/80
RAM Expansion Capacity (bytes)	16.0M	16.0M	8.0M	4.0M
Maximum System RAM (bytes)	16.0M	16.0M	8.0M	4.0M
RAM Cache, Size (bytes)/Speed (ns)	Intel, 32K/20	Intel, 32K/25	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	8, 6	8, 10	12
Total Expansion Slots	2 8-bit, 5 16-bit, 1 32-bit	2 8-bit, 5 16-bit, 0 32-bit	2 8-bit, 5 16-bit, 0 32-bit	2 8-bit, 6 16-bit
Available Expansion Slots	1 8-bit, 3 16-bit, 0 32-bit	1 8-bit, 3 16-bit, 0 32-bit	0 8-bit, 4 16-bit, 0 32-bit	1 8-bit, 4 16-bit
Serial Ports	2 on adapter	2 on adapter	2 on adapter	2 on adapter
Parallel Ports	1 on adapter	1 on adapter	1 on adapter	2 on adapter
Other I/O Devices Included	Gameport	Vendor did not specify	Vendor did not specify	None
Other I/O Interfaces	101-key keyboard port	101-key keyboard port	101-key keyboard port	Gameport
<b>Mass Storage</b>				
Internal Drive Bays Available	5 half-height	5 half-height	5 half-height	3 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	360K, 720K, 1.44M	360K, 720K, 1.44M	360K, 720K, 1.44M	360K, 720K, 1.44M
Hard Disk Interface	ST506/412	ST506/412	ST506/412	AT/IDE
Hard Disk Size (bytes)/AAT (ms)	40M/28	40M/28	40M/28	40M/28
Optional Mass Storage	60M, 70M, 80M, 90M, 120M, 150M, 300M, 760M, CD-ROM	60M, 70M, 80M, 90M, 120M, 150M, 300M, 760M, CD-ROM	70M, 80M, 90M, 120M, 150M, 300M, 760M, CD-ROM	100M, 150M, 760M
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/10
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/1,024 x 768	On included adapter/1,024 x 768	On included adapter/720 x 348(MGA)	On included adapter/1,024 x 768
Display	Included, 14-inch, analog color	Included, 14-inch, analog color	Included, 14-inch digital monochrome	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, ARCnet, polynet	Ethernet, ARCnet, polynet	Ethernet, ARCnet	Ethernet, ARCnet
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify	Vendor did not specify	From manufacturer	Vendor did not specify
Dimensions (H x W x D, inches)	5.75 x 21.00 x 16.50	5.75 x 21.00 x 16.50	5.3 x 21 x 16.5	14.2 x 6.75 x 16.2
Weight (pounds)	58.00	58.00	60.00	30.00
AC Power Supply (watts)	220	220	220	200
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	MS-DOS	MS-DOS	MS-DOS
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, MS-DOS, UNIX Util./diagn.	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, MS-DOS, UNIX Util./diagn.	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, MS-DOS, UNIX Util./diagn.	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, Vendor MS-OS/2, UNIX, UNIX deriv. BIOS, setup, diagnostics, util./diagn.
Additional Software Included				
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD
Parts Warranty	1 year, M 2-years	1 year, M 2-yrs.	1 year, M 2-year	1 year
Labor Warranty	5-yrs.	5-yrs.	5-years	5 years
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers
Service Features	Toll free, 30-day money back	Toll free, 30-day money back	Toll free, 30-day money back	Toll free
<b>Base Price (\$)</b>	4,400.00	3,600.00	1,685.00/available for GSA	1,220

Vendor	Polywell Computers Inc.	Polywell Computers Inc.	Polywell Computers Inc.	Polywell Computers Inc.
Product	Poly386-25VD 2401024	Poly386-33HD 1401024	Poly386/20 Cache Poly386-20MD	Poly386/486-25 Cache Poly386-25CD
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/25	80386/33	80386/20	80386/25
Co-Processor Options	80387	80387	80387	80387
Standard RAM (bytes)/Speed (ns)	2.0M/80	80	1.0M/80	1.0M/80
RAM Expansion Capacity (bytes)	8.0M	16.0M	8.0M	16.0M
Maximum System RAM (bytes)	8.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Intel, 32K/25	Proprietary, 64K/30	Intel, 32K/25
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	2 8-bit, 5 16-bit, 0 32-bit	2 8-bit, 5 16-bit, 1 32-bit	1 8-bit, 6 16-bit, 1 32-bit	2 8-bit, 5 16-bit, 0 32-bit
Available Expansion Slots	1 8-bit, 3 16-bit, 0 32-bit	1 8-bit, 3 16-bit, 0 32-bit	0 8-bit, 4 16-bit, 1 32-bit	1 8-bit, 3 16-bit, 0 32-bit
Serial Ports	2 on adapter	2 on adapter	2 on adapter	2 on adapter
Parallel Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	Game port	Gameport	Vendor did not specify	None
<b>Mass Storage</b>				
Internal Drive Bays Available	5 half-height	5 half-height	5 half-height	5 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	360K, 720K, 1.44M	360K, 720K, 1.44M	360K, 720K, 1.44M	360K, 720K, 1.44M
Hard Disk Interface	AT/IDE	AT/IDE	AT/IDE	AT/IDE
Hard Disk Size (bytes)/AAT (ms)	40M/28	28	40M/28	40M/28
Optional Mass Storage	60M, 80M, 100M, 150M, 760M, CD-ROM	60M, 70M, 80M, 90M, 100M, 120M, 150M, 300M, 760M, CD-ROM	60M, 80M, 90M, 120M, 150M, 300M, 760M, CD-ROM	60M, 70M, 80M, 90M, 120M, 150M, 300M, 760M, CD-ROM
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/10	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/1,024 x 768	On included adapter/1,024 x 768	On included adapter/720 x 348	On included adapter/1,024 x 768
Display	Optional	Included, 14-inch, analog color	Included, 14-inch digital monochrome	Included, 14-inch, analog color
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, ARCnet	Ethernet, ARCnet, Polynet	Ethernet, ARCnet, Polynet	ARCnet, Polynet
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify	Vendor did not specify	From manufacturer	Vendor did not specify
Dimensions (H x W x D, inches)	21 x 6.75 x 16.5	5.75 x 21 x 16.5	5.75 x 21 x 16.5	5.75 x 21 x 16.5
Weight (pounds)	30.00	58.00	60.00	58.00
AC Power Supply (watts)	220	Vendor did not specify	220	220
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	MS-DOS, Pick	MS-DOS, Pick	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, vendor MS-OS/2, UNIX, UNIX deriv.
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, Vendor MS-OS/2, UNIX, UNIX deriv.	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, Vendor MS-OS/2, UNIX, UNIX deriv.	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, Vendor MS-OS/2, UNIX, UNIX deriv.	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, Vendor MS-OS/2, UNIX, UNIX deriv.
Additional Software Included	BIOS, setup, util./diagn.	BIOS, setup, util./diagn.	BIOS, setup, util./diagn.	BIOS, setup, util./diagn.
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	5 years	5 yrs.	5 years	5 years
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers
Service Features	Toll free	Toll free, 30-day money back	Toll free	Toll free
<b>Base Price (\$)</b>	2,525	3,200	2,220	2,900

Vendor	Polywell Computers Inc.	Precision Systems Group	Precision Systems Group	Precision Systems Group
Product	Poly386SX-20D 140MGP	Power Tower PSG 486254	PSG 386-16 186162	PSG 386-20 386202
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386sx/20	1486/25	80386/16	80386/20
Cu-Processor Options	80387SX	Weitek 4167, i860	80387	80387
Standard RAM (bytes)/Speed (ns)	1.0M/80	4.0M/80	1.0M/100	2.0M/80
RAM Expansion Capacity (bytes)	8.0M	8.0M	Vendor did not specify	4.0M
Maximum System RAM (bytes)	8.0M	300M	16.0M	20M
RAM Cache, Size (bytes)/Speed (ns)	Vendor did not specify	Intel, 256K/25	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	10	8.33	8	10
Total Expansion Slots	2 8-bit, 5 16-bit, 0 32-bit	1 8-bit, 6 16-bit	3 8-bit, 4 16-bit, 1 32-bit	1 8-bit, 6 16-bit, 1 32-bit
Available Expansion Slots	0 8-bit, 4 16-bit	Vendor did not specify	2 8-bit, 3 16-bit, 1 32-bit	0 8-bit, 5 16-bit, 1 32-bit
Serial Ports	2 on adapter	2 on main board	2 on adapter	2 on adapter
Parallel Ports	1 on adapter	1 on main board	1 on adapter	1 on adapter
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	Vendor did not specify	None	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	5 half-height	6 full-height, 5 half-height, 1 third-height	1 full-height, 3 half-height	1 full-height, 3 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	360K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M
Hard Disk Interface	AT/IDE	Vendor did not specify	AT/IDE	AT/IDE
Hard Disk Size (bytes)/AAT (ms)	40M/28	150M/, 5	Vendor did not specify	Vendor did not specify
Optional Mass Storage	60M, 80M, 120M, 150M, 300M, 760M, CD-ROM	20M, 30M, 40M, 50M, 60M, 70M, 80M, 90M, 100M, 120M, 150M, 300M, 4G, tape drive, CD-ROM, WORM, erasable	20M, 30M, 40M, 50M, 60M, 70M, 80M, 90M, 100M, 120M, 150M, 300M, tape drive, CD-ROM, WORM, erasable	40M, 50M, 60M, 70M, 80M, 90M, 100M, 120M, 150M, 300M, tape drive, CD-ROM, WORM, erasable optical
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101	101/12	101
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/720 x 348	On included adapter/1,024 x 768	Adapter optional	Adapter optional
Display	Included, 14-inch digital monochrome	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, ARCnet	Ethernet, Token-ring, ARCnet	Ethernet, Token-ring, ARCnet	Ethernet, Token-ring, ARCnet
<b>Product Design</b>				
Type of Unit	Desktop	Floorstanding	Desktop	Desktop
Tempest Version	From manufacturer	From manufacturer	Not available	Not available
Dimensions (H x W x D, inches)	5.75 x 21 x 16.5	Vendor did not specify	6 x 21 x 16	6 x 21 x 16
Weight (pounds)	60.00	Vendor did not specify	41.00	41.00
AC Power Supply (watts)	220	275	220	200
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	MS-DOS	MS-DOS	MS-DOS
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, Vendor MS-OS/2, UNIX, UNIX deriv.	IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS, MS-DOS, UNIX, UNIX deriv.	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS
Additional Software Included	BIOS, setup, util./diagn.	BIOS, setup	None	None
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD	VAR/VAD, direct from vendor	Computer retail, general retail, VAR/VAD, direct	Computer retail, general retail, VAR/VAD, direct
Parts Warranty	1 year	2 years	1 year	1 year
Labor Warranty	5 years	2 years	Vendor did not specify	Vendor did not specify
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers, third party	Vendor, authorized dealers, third party
Service Features	Toll free, 30-day money back	Toll free	On site, toll free, 30-day money back	On site, toll free, 30-day money back
<b>Base Price (\$)</b>	1,560	6,900/available for GSA	4,595	3,179

Vendor	Precision Systems Group	Precision Systems Group	QIC Research	QIC Research
<b>Product</b>	<b>PSG 386-25 386252</b>	<b>PSG 386-33 386332</b>	<b>286-12 MHz 1700C</b>	<b>286-8 MHz 1800-8</b>
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/25	80386/33	80286/12	80286/8mhz
Co-Processor Options	80387	80387	80287	80287
Standard RAM (bytes)/Speed (ns)	4.0M/80	4.0M/70	1.0M/100	512K/150
RAM Expansion Capacity (bytes)	4.0M	4.0M	1.0M	1.0M
Maximum System RAM (bytes)	64M	64M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Intel, 64K/80ns	Intel, 64K/20	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	6	8	12mhz	8
Total Expansion Slots	1 8-bit, 6 16-bit, 1 32-bit	1 8-bit, 6 16-bit, 7 32-bit	4 8-bit, 4 16-bit	2 8-bit, 6 16-bit
Available Expansion Slots	0 8-bit, 5 16-bit, 1 32-bit	0 8-bit, 5 16-bit, 1 32-bit	Vendor did not specify	Vendor did not specify
Serial Ports	2 on adapter	2 on adapter	1 on main board	None
Parallel Ports	1 on adapter	1 on adapter	1 on main board	None
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	None	None	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	1 full-height, 3 half-height	1 full-height, 3 half-height	3 half-height	5 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M
Hard Disk Interface	AT/IDE	AT/IDE	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	Vendor did not specify	Vendor did not specify	None	None
Optional Mass Storage	40M, 50M, 60M, 70M, 80M, 90M, 100M, 120M, 150M, 300M, tape drive, CD-ROM, WORM, erasable optical	40M, 50M, 60M, 70M, 80M, 90M, 100M, 120M, 150M, 300M, tape drive, CD-ROM, WORM	20M, 30M, 40M, 70M, 80M, 120M, 150M, 300M, tape drive	20M, 30M, 40M, 70M, 80M, 120M, 150M, 300M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	Adapter optional	Adapter optional
Display	Optional	Optional	Vendor did not specify	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, Token-ring, ARCnet	Ethernet, Token-ring, ARCnet	Ethernet, ARCnet	Ethernet, ARCnet
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	Not available
Dimensions (H x W x D, inches)	6 x 21 x 16	6 x 21 x 16	6.2 x 17.2 x 16.4	6.5 x 21.2 x 16.5
Weight (pounds)	41.00	41.00	48.00	50.00
AC Power Supply (watts)	220	220	200	200
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	MS-DOS	None	None
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, Vendor MS-OS/2	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, Vendor MS-OS/2, UNIX
Additional Software Included	None	None	None	None
<b>Service/Support</b>				
Distribution Channels	Computer retail, general retail, VAR/VAD, direct	Computer retail, general retail, VAR/VAD, direct	VAR/VAD	VAR/VAD
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	Vendor did not specify	Vendor did not specify	Vendor	Vendor
Service Supported by	Vendor, authorized dealers, third party	Vendor, authorized dealers, third party	Vendor	Vendor
Service Features	On site, toll free, 30-day money back	On site, toll free, 30-day money back	30-day money back	30-day money back
<b>Base Price (\$)</b>	<b>2,945</b>	<b>6,355</b>	<b>1,000.00</b>	<b>829.00</b>

Vendor	QIC Research	QIC Research	QIC Research	QIC Research
Product	286/10-0 10-B	286/10-1 17-A	386-16SX 30-G	386-20 MHz 30 D
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/10	80286/10	80386sx/16	80386/20
Co-Processor Options	80287	80287	80387SX, 80387SX	80387, Weltek 1167, Weltek 3167
Standard RAM (bytes)/Speed (ns)	512K/120	512K/150	1.0M/80	1.0M/80
RAM Expansion Capacity (bytes)	1.0M	1.0M	2.0M	1.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	10	10	8	8
Total Expansion Slots	2 8-bit, 6 16-bit	2 8-bit, 6 16-bit	2 8-bit, 6 16-bit	6 16-bit, 2 32-bit
Available Expansion Slots	Vendor did not specify			
Serial Ports	2 on main board	1 on main board	On main board	2 on main board
Parallel Ports	1 on main board	1 on main board	On main board	1 on main board
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	None	None	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	5 half-height	3 half-height	3 half-height	5 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M			
Hard Disk Interface	ST506/412	ST506/412	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	None	None	None	None
Optional Mass Storage	20M, 30M, 40M, 70M, 80M, 102M, 150M, 300M, tape drive	20M, 30M, 40M, 70M, 80M, 120M, 150M, 300M, tape drive	20M, 30M, 40M, 70M, 80M, 120M, 150M, 300M, tape drive	20M, 30M, 40M, 70M, 80M, 120M, 150M, 300M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	Adapter optional	Adapter optional
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, ARCnet	Ethernet, ARCnet	Ethernet, ARCnet	Ethernet, ARCnet
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	Not available
Dimensions (H x W x D, inches)	6.5 x 21.2 x 16.5	6.2 x 17.2 x 16.4	6.2 x 17.2 x 16.4	6.2 x 21.1 x 17.9
Weight (pounds)	50.00	48.00	48.00	40.00
AC Power Supply (watts)	200	200	200	200
<b>Software</b>				
Operating System(s) Bundled	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, vendor MS-OS/2	None	None	None
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, Vendor MS-OS/2	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, Vendor MS-OS/2	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, Vendor MS-OS/2	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, Vendor MS-OS/2
Additional Software Included	None	None	None	None
<b>Service/Support</b>				
Distribution Channels	VAR/VAD	VAR/VAD	VAR/VAD	VAR/VAD
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor	Vendor	Vendor	Vendor
Service Features	30-day money back	30-day money back	30-day money back	30-day money back
<b>Base Price (\$)</b>	1,088	765.00	1325.00	1753.00

Vendor	QIC Research	Rexon Business Machines Corp.	Rexon Business Machines Corp.	Sanyo Business Systems Corp.
<b>Product</b>	8088 XT	RBM 1388	RBM 2388	MBC-18LX Small Footprint XT MBC-18LX
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	8088/10	80386sx/16	80386/25	8088/8
Co-Processor Options	8087	80387SX	80387	8087
Standard RAM (bytes)/Speed (ns)	256k/120	1.0M/100	1.0M/80	640K
RAM Expansion Capacity (bytes)	640K	2.0M	8.0M	640K
Maximum System RAM (bytes)	640K	8.0M	24M	2.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Intel, 64K/35	Not supported
<b>Input/Output</b>				
Bus Architecture	XT	AT	AT	XT
Bus Speed (MHz)	10	Vendor did not specify	Vendor did not specify	Vendor did not specify
Total Expansion Slots	8 8-bit	2 8-bit, 5 16-bit, 1 32-bit	1 8-bit, 5 16-bit, 2 32-bit	3 8-bit, 16-bit
Available Expansion Slots	Vendor did not specify	0 8-bit, 3 16-bit, 1 32-bit	0 8-bit, 2 16-bit, 2 32-bit	3 8-bit, 16-bit
Serial Ports	On main board	None; 2 on adapter	2 on main board	1 on main board
Parallel Ports	On main board	None; 1 on adapter	1 on main board	1 on main board
Other I/O Devices Included	None	1/4" tape drive	1/4" tape drive	Vendor did not specify
Other I/O Interfaces	None	101-key keyboard port	101-key keyboard port	101-key keyboard port
<b>Mass Storage</b>				
Internal Drive Bays Available	2 full-height, 4 half-height	5 half-height	5 half-height	2 half-height
Diskette Drives Included (bytes)	1 360K	1 1.2M	1 1.2M	1 360K
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M	None	None	360K, 720K
Hard Disk Interface	None	Vendor did not specify	ST506/412	Vendor did not specify
Hard Disk Size (bytes)/AAT (ms)	None	None	None	Vendor did not specify
Optional Mass Storage	20M, 30M, 40M, 70M, 80M, 120M, 150M, 300M, tape drive	50M, 80M, 150M, 300M	50M, 80M, 150M, 300M	None
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	84/10	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	Adapter optional	Adapter optional
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	None	None	None	Vendor did not specify
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	Not available
Dimensions (H x W x D, inches)	6.2 x 21.1 x 17.9	6.2 x 21.1 x 16.5	6.2 x 21.1 x 16.5	6.13 x 13.38 x 13.38
Weight (pounds)	42.00	85.00	85.00	Vendor did not specify
AC Power Supply (watts)	150 watts	200	200	85
<b>Software</b>				
Operating System(s) Bundled	IBM PC-DOS, MS-DOS	MS-DOS	MS-DOS	Vendor did not specify
Operating System(s) Supported	IBM PC-DOS, MS-DOS	IBM PC-DOS, Enhanced MS-DOS, MS-DOS, UNIX, UNIX derivative, PICK, RECAP	IBM PC-DOS, Enhanced MS-DOS, MS-DOS, UNIX, UNIX derivative, PICK, RECAP	MS-DOS
Additional Software Included	None	BIOS, setup, diagnostics, util./diagn.	BIOS, setup, diagnostics, util./diagn.	Basic
<b>Service/Support</b>				
Distribution Channels	VAR/VAD	VAR/VAD	VAR/VAD	Computer retail, VAR/VAD
Parts Warranty	180 days	1 year	1 year	1 year
Labor Warranty	180 days	1 year	1 year	1 year
Service Supported by	Vendor	Vendor, authorized dealers, third party	Vendor, authorized dealers, third party	Authorized dealers
Service Features	30-day money back	On site	On site	On site, toll free
<b>Base Price (\$)</b>	329.00	4,455	6,455	869

Vendor	Sanyo Business Systems Corp.	Sanyo Business Systems Corp.	Sanyo Business Systems Corp.	Sanyo Business Systems Corp.
Product	MBC-18LX5	MBC-17LX	MBC-17Plus Small Footprint 286 AT MC-17Plus	MBC-18Plus
Processor/Memory CPU/Clock Speed (MHz)	8088/10	80286/12	80286/10	80386/16
Co-Processor Options	8087	80287	80287	80387
Standard RAM (bytes)/Speed (ns)	640K/120	1.0M/85	1.0M	1.0M/85
RAM Expansion Capacity (bytes)	640K	1.0M	1.0M	1.0M
Maximum System RAM (bytes)	640K	15.0M	15M	15.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
Input/Output				
Bus Architecture	XT	AT passive backplane	AT	AT passive backplane
Bus Speed (MHz)	4.77	10	Vendor did not specify	8
Total Expansion Slots	3 8-bit	2 8-bit, 4 16-bit	2 8-bit, 4 16-bit	2 8-bit, 4 16-bit, 1 32-bit
Available Expansion Slots	3 8-bit	2 8-bit, 3 16-bit	Vendor did not specify	2 8-bit, 3 16-bit, 1 32-bit
Serial Ports	1 on main board	1 on main board	1 on main board	1 on main board
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on main board
Other I/O Devices Included	None	None	Vendor did not specify	None
Other I/O Interfaces	None	None	101-key keyboard port	None
Mass Storage				
Internal Drive Bays Available	1 half-height	2 half-height	3 half-height	2 half-height
Diskette Drives Included (bytes)	1 360K	1 1.2M	Vendor did not specify	1 1.2M
Diskette Drive Options (bytes)	360K, 720K	360K, 720K	360K, 1.2M, 720K, 1.44M	360K, 720K
Hard Disk Interface	Vendor did not specify	None	None	None
Hard Disk Size (bytes)/AAT (ms)	None/28	None/28	None	None
Optional Mass Storage	20M, 40M, 80M, tape drive, CD-ROM	20M, 40M, 80M, tape drive, CD-ROM	20M, 30M, 40M, 50M, 60M, 70M, 80M, 90M, 100M, 120M	20M, 40M, 80M, tape drive, CD-ROM
Keyboard				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
Video/Display				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	Adapter optional	Adapter optional
Display	Optional	Optional	Optional	Optional
Local Area Network Support				
Vendor LAN Options	None	None	Vendor did not specify	None
Product Design				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	From manufacturer	From manufacturer	Vendor did not specify	From manufacturer
Dimensions (H x W x D, inches)	6.4 x 13.4 x 13.4	6.81 x 13.27 x 16.14	6.80 x 13.30 x 16.10	6.8 x 13.0 x 16.6
Weight (pounds)	22.00	23.81	Vendor did not specify	30.00
AC Power Supply (watts)	Vendor did not specify	135	183	135
Software				
Operating System(s) Bundled	MS-DOS	MS-DOS	Vendor did not specify	MS-DOS
Operating System(s) Supported	IBM PC-DOS, MS-DOS	IBM PC-DOS, MS-DOS	MS-DOS	IBM PC-DOS, MS-DOS
Additional Software Included	BIOS	BIOS, setup	Basic	BIOS
Service/Support				
Distribution Channels	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Authorized dealers	Vendor, authorized dealers	Authorized dealers	Authorized dealers
Service Features	Toll free	Toll free	On site, toll free	Toll free
Base Price (\$)	905	1,689	1,689	3,199

Vendor	S.F. Micro, Inc.	S.F. Micro, Inc.	S.F. Micro, Inc.	S.F. Micro, Inc.
Product	386/25 3000L	386/25 Tower 3900A	386/33 3000K	386/33 Tower 3900B
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/25	80386/25	80386/33	80386/33
Co-Processor Options	80387	80387	80387	80387
Standard RAM (bytes)/Speed (ns)	1.0M/100	4.0M/100	4.0M/100	4.0M/100
RAM Expansion Capacity (bytes)	8.0M	8.0M	8.0M	8.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	64K/30	Proprietary, 64K/30	64K/30	Proprietary, 64K/30
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	12.5	12.5, 8	12.5, 8	12.5
Total Expansion Slots	1 8-bit, 6 16-bit, 1 32-bit			
Available Expansion Slots	0 8-bit, 5 16-bit, 1 32-bit			
Serial Ports	None; 1 on adapter			
Parallel Ports	None; 1 on adapter			
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	None	Vendor did not specify	101-key keyboard port	None
<b>Mass Storage</b>				
Internal Drive Bays Available	5 half-height	2 full-height, 4 half-height	5 half-height	2 full-height, 4 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M			
Hard Disk Interface	ST506/412	ST506/412	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	None	None	None	None
Optional Mass Storage	20M, 30M, 40M, 80M, 120M, 150M, 300M, tape drive	20M, 30M, 40M, 80M, 120M, 150M, 300M, tape drive	20M, 30M, 40M, 80M, 120M, 150M, 300M, tape drive	20M, 30M, 40M, 80M, 120M, 150M, 300M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	Adapter optional	Adapter optional
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	None	None	None	None
<b>Product Design</b>				
Type of Unit	Desktop	Floorstanding	Desktop	Floorstanding
Tempest Version	Vendor did not specify			
Dimensions (H x W x D, inches)	6.5 x 21.2 x 16.5	25.5 x 7 x 18	6.5 x 21.2 x 16.5	25.5 x 7 x 18
Weight (pounds)	50.00	58.00	50.00	58.00
AC Power Supply (watts)	200	200	200	200
<b>Software</b>				
Operating System(s) Bundled	None	Optional	None	Optional
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, MS-DOS			
Additional Software Included	BIOS, setup	BIOS, setup	BIOS, setup	BIOS, setup
<b>Service/Support</b>				
Distribution Channels	Direct from vendor	Direct from vendor	Direct from vendor	Direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, third party	Vendor, third party	Vendor, third party	Vendor, third party
Service Features	On site, 30-day money back			
<b>Base Price (\$)</b>	2,549	3,250	3,250	3,595

Vendor	S.F. Micro, Inc.	S.F. Micro, Inc.	S.F. Micro, Inc.	S.F. Micro, Inc.
Product	AGI 1700A	AGI 1700C	AGI 1800A	AGI 1800C
Processor/Memory CPU/Clock Speed (MHz)	80286/10	80286/12	80286/10	80286/12
Co-Processor Options	None	80287	None	80287
Standard RAM (bytes)/Speed (ns)	512K/120	1.0M/100	512K/120	1.0M/100
RAM Expansion Capacity (bytes)	1.0M	1.0M	1.0M	1.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
Input/Output Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	2 8-bit, 6 16-bit	4 8-bit, 4 16-bit	2 8-bit, 6 16-bit	4 8-bit, 4 16-bit
Available Expansion Slots	1 8-bit, 5 16-bit	3 8-bit, 3 16-bit	1 8-bit, 5 16-bit	3 8-bit, 3 16-bit
Serial Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
Parallel Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
Other I/O Devices Included	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Other I/O Interfaces	None	None	None	None
Mass Storage				
Internal Drive Bays Available	3 half-height	3 half-height	5 half-height	5 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M
Hard Disk Interface	ST506/412	ST506/412	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	None	None	None	None
Optional Mass Storage	20M, 30M, 40M, 80M, 120M, 150M, tape drive	20M, 30M, 40M, 80M, 120M, 150M, tape drive	20M, 30M, 40M, 80M, 120M, 150M, tape drive	20M, 30M, 40M, 80M, 120M, 150M, tape drive
Keyboard Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
Video/Display Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	Adapter optional	Adapter optional
Display	Optional	Optional	Optional	Optional
Local Area Network Support Vendor LAN Options	Ethernet, ARCnet	Ethernet, ARCnet	Ethernet, ARCnet	Ethernet, ARCnet
Product Design				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	Not available
Dimensions (H x W x D, inches)	6.20 x 17.20 x 16.40	6.20 x 17.20 x 16.40	6.50 x 21.20 x 16.50	6.50 x 21.20 x 16.50
Weight (pounds)	48.00	48.00	50.00	50.00
AC Power Supply (watts)	200	200	200	200
Software				
Operating System(s) Bundled	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2,	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2
Additional Software Included	None	None	None	None
Service/Support				
Distribution Channels	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor	Vendor	Vendor	Vendor
Service Features	On site, 30-day money back	On site, 30-day money back	On site, 30-day money back	On site, 30-day money back
Base Price (\$)	799	1,049	829	1,099

Vendor	S.F. Micro, Inc.	S.F. Micro, Inc.	S.F. Micro, Inc.	Silver Dollars International, Inc.
Product	AGI 3000D	AGI 3000G	XT-12 1600D	PC-88
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/20	80386sx/16	NEC V-20/12	8088/10
Co-Processor Options	80387	80387SX	8087	None
Standard RAM (bytes)/Speed (ns)	1.0M/80	1.0M/80	256K/100	1.0M/100
RAM Expansion Capacity (bytes)	1.0M	2.0M	1.0M	1.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Vendor did not specify	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	XT	XT
Bus Speed (MHz)	8	8	4.77	8.33
Total Expansion Slots	6 16-bit, 2 32-bit	2 8-bit, 6 16-bit	8 8-bit, 0 16-bit, 0 32-bit	2 8-bit, 6 16-bit
Available Expansion Slots	Vendor did not specify	1 8-bit, 5 16-bit	8 8-bit, 0 16-bit, 0 32-bit	Vendor did not specify
Serial Ports	1 on adapter	None; 1 on adapter	None; 0 on adapter	1 on adapter
Parallel Ports	1 on adapter	None; 1 on adapter	None; 0 on adapter	1 on adapter
Other I/O Devices Included	Vendor did not specify	Vendor did not specify	None	Game
Other I/O Interfaces	None	None	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	5 half-height	3 half-height	3 half-height, 1 third-height	Vendor did not specify
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 360K	1 360K
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	Any
Hard Disk Interface	ST506/412	ST506/412	None	ST506/412
Hard Disk Size (bytes)/AAT (ms)	None	None	None	None
Optional Mass Storage	20M, 30M, 40M, 80M, 120M, 150M, tape drive	20M, 30M, 40M, 80M, 120M, 150M, tape drive	20M, 30M, 40M, tape drive	20M, 30M, 40M, 80M, 120M
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	Adapter optional	On included adapter/, Vendor did not specify
Display	Optional	Optional	Optional	Included, 14-inch
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, ARCnet	Ethernet, ARCnet	None	Ethernet, ARCnet
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	Not available
Dimensions (H x W x D, inches)	6.50 x 21.20 x 16.50	6.20 x 17.20 x 16.40	6.25 x 17 x 15	5 x 15 x 15
Weight (pounds)	50.00	48.00	38.00	26.00
AC Power Supply (watts)	200	200	200	150
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify	None	Optional	Vendor did not specify
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2	IBM PC-DOS, IBM OS/2 Standard, MS-DOS	IBM PC-DOS, Enhanced MS-DOS, MS-DOS, UNIX, UNIX derivative, Pick
Additional Software Included	None	None	BIOS, EMS Manager	BIOS, setup
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor	Direct from vendor	VAR/VAD, direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor	Vendor	Vendor	Vendor, third party
Service Features	On site	On site, 30-day money back	30-day money back	On site, 30-day money back
<b>Base Price (\$)</b>	1,749	1,349	459	550

Vendor	Silver Dollars International, Inc.	Silver Dollars International, Inc.	Sirex USA, Inc.	Sirex USA, Inc.
Product	SD-286	SD-386	SpeedMaster SP386-25	StationMaster SM286-12
Processor/Memory CPU/Clock Speed (MHz)	80286/16	80386/16	80386/25	80286/12.5
Co-Processor Options	None	None	80387	80287
Standard RAM (bytes)/Speed (ns)	640K	640K/100	1.0M/80	640K/100
RAM Expansion Capacity (bytes)	4.0M	4.0M	16.0M	1.0M
Maximum System RAM (bytes)	4.0M	4.0M	16.0M	1.0M
RAM Cache, Size (bytes)/Speed (ns)	Vendor did not specify	Chips & Tech., 64K/30	Intel, 32K/20	Not supported
Input/Output Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	10	10	10	8
Total Expansion Slots	2 8-bit, 6 16-bit	2 8-bit, 6 16-bit	1 8-bit, 5 16-bit, 1 32-bit	1 8-bit, 1 16-bit
Available Expansion Slots	Vendor did not specify	Vendor did not specify	1 8-bit, 4 16-bit, 1 32-bit	1 8-bit, 1 16-bit
Serial Ports	2 on adapter	2 on adapter	1 on adapter	2 on main board
Parallel Ports	1 on adapter	1 on adapter	1 on adapter	1 on main board
Other I/O Devices Included	Vendor did not specify	Vendor did not specify	None	None
Other I/O Interfaces	101-key keyboard port, ext. video	101-key keyboard port, ext. video	Vendor did not specify	Vendor did not specify
Mass Storage				
Internal Drive Bays Available	2 half-height	2 half-height	6 half-height	half-height, 2 third-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.44M
Diskette Drive Options (bytes)	360K, 720K, 1.44M	360K, 720K, 1.44M	1.44M	Vendor did not specify
Hard Disk Interface	ST506/412	ST506/412	AT/IDE	None
Hard Disk Size (bytes)/AAT (ms)	40M/28	40M/28	None	None
Optional Mass Storage	80M, 120M, tape drive, WORM	80M, 120M, tape drive, WORM	40M, 80M, 150M, 300M, tape drive, CD-ROM	20M, 40M, 80M
Keyboard Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
Video/Display Video Controller/Resolution (pixels)	On included adapter/640 x 350	On included adapter/640 x 350	On included adapter/1,024 x 768	Integrated on system board/720 x 350
Display	Included, 12-inch digital monochrome	Included, 12-inch digital monochrome	Optional	Optional
Local Area Network Support Vendor LAN Options	Ethernet	Ethernet	Ethernet, ARCnet	Ethernet, ARCnet
Product Design Type of Unit	Desktop	Desktop	Floorstanding	Desktop
Tempest Version	Not available	Not available	From manufacturer	From manufacturer
Dimensions (H x W x D, inches)	5.00 x 25.00 x 18.00	5.00 x 25.00 x 18.00	Vendor did not specify	3 x 11 x 14
Weight (pounds)	31.00	31.00	Vendor did not specify	12.00
AC Power Supply (watts)	220	220	200	60
Software Operating System(s) Bundled	Enhanced MS-DOS, MS-DOS, Phoenix DOS/BIOS	Enhanced MS-DOS, MS-DOS, Phoenix DOS/BIOS	None	None
Operating System(s) Supported	Enhanced MS-DOS, MS-DOS, Phoenix DOS/BIOS	Enhanced MS-DOS, MS-DOS, Phoenix DOS/BIOS	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2 BIOS, setup, util./diagn.	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2 BIOS, setup, util./diagn.
Additional Software Included	Vendor did not specify	Vendor did not specify		
Service/Support Distribution Channels	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers, third party	Vendor, authorized dealers, third party	Vendor, third party	Vendor, third party
Service Features	On site, 30-day money back	On site, 30-day money back	On site, toll free	On site, toll free
Base Price (\$)	1,475	2,095	1,495	659

Vendor	Sirex USA, Inc.	Sirex USA, Inc.	Sirex USA, Inc.	Sun Moon Star
<b>Product</b>	<b>TaskMaster TM286-12</b>	<b>WorkMaster SX WM386SX-16</b>	<b>WorkMaster WM386-20</b>	<b>System 386SX</b>
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/12.5	80386/16	80386/20	80386sx/16
Co-Processor Options	None	80387SX	80387	80387SX
Standard RAM (bytes)/Speed (ns)	640K/100	1.0M/80	1.0M/80	1.0M/80
RAM Expansion Capacity (bytes)	4.0M	8.0M	8.0M	8.0M
Maximum System RAM (bytes)	4.0M	8.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	2 8-bit, 5 16-bit	2 8-bit, 5 16-bit	2 8-bit, 4 16-bit, 1 32-bit	2 8-bit, 3 16-bit
Available Expansion Slots	1 8-bit, 5 16-bit	1 8-bit, 5 16-bit	1 8-bit, 4 16-bit, 1 32-bit	2 8-bit, 3 16-bit
Serial Ports	1 on adapter	1 on adapter	1 on adapter	2 on main board
Parallel Ports	1 on adapter	1 on adapter	1 on adapter	1 on main board
Other I/O Devices Included	None	None	None	Mouse
Other I/O Interfaces	Vendor did not specify	Vendor did not specify	Vendor did not specify	101-key keyboard port
<b>Mass Storage</b>				
Internal Drive Bays Available	2 half-height, 2 third-height	2 half-height, 2 third-height	3 half-height, 1 third-height	3 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	1.44M	1.44M	1.44M	1.2M
Hard Disk Interface	AT/IDE	AT/IDE	AT/IDE	AT/IDE
Hard Disk Size (bytes)/AAT (ms)	None	None	None	40M/28
Optional Mass Storage	20M, 40M, 80M, 150M, 300M, tape drive	40M, 80M, tape drive, CD-ROM	40M, 80M, 150M, 300M, tape drive, CD-ROM	20M, 100M, 200M
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	Adapter optional	On included adapter/640 x 480
Display	Optional	Optional	Optional	Included, 14-inch digital monochrome
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, ARCnet	Ethernet, ARCnet	Ethernet, ARCnet	None
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Floorstanding	Desktop
Tempest Version	From manufacturer	From manufacturer	From manufacturer	Not available
Dimensions (H x W x D, inches)	6 x 15 x 16	6 x 15 x 16	18 x 6 x 15	Vendor did not specify
Weight (pounds)	35.00	35.00	40.00	Vendor did not specify
AC Power Supply (watts)	200	200	200	145
<b>Software</b>				
Operating System(s) Bundled	None	None	None	DB-DOS
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2	IBM PC-DOS, MS-DOS
Additional Software Included	BIOS, setup, util./diagn.	BIOS, setup, util./diagn.	BIOS, setup, util./diagn.	BIOS, comm., applications, util./diagn., desk accessory
<b>Service/Support</b>				
Distribution Channels	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor	Computer retail, VAR/VAD
Parts Warranty	1 year	1 year	1 year	3 yrs.
Labor Warranty	1 year	1 year	1 year	3 yrs.
Service Supported by	Vendor, third party	Vendor, third party	Vendor, third party	Authorized dealers
Service Features	On site, toll free	On site, toll free	On site, toll free	On site, toll free
<b>Base Price (\$)</b>	<b>699</b>	<b>795</b>	<b>1,295</b>	<b>2,995</b>

Vendor	Suntronics Co., Inc.	Swan Technologies	Swan Technologies	Swan Technologies
<b>Product</b>	Computer System SYN-386	Swan 386/33	Swan 286/12	Swan 386/20
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/20	80386/33	80286/12.5	80386/20
Co-Processor Options	80387	80387	80287	80387
Standard RAM (bytes)/Speed (ns)	1.0M/80	1.0M/80	512K/100	1.0M/85
RAM Expansion Capacity (bytes)	Vendor did not specify	8.0M	5M	16.0M
Maximum System RAM (bytes)	8.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Intel/25	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT/separate memory bus	AT	AT
Bus Speed (MHz)	8	8.25	6.25	8
Total Expansion Slots	2 8-bit, 5 16-bit, 1 32-bit	2 8-bit, 5 16-bit, 1 32-bit	2 8-bit, 6 16-bit	3 8-bit, 4 16-bit, 1 32-bit
Available Expansion Slots	1 8-bit, 3 16-bit, 1 32-bit	1 8-bit, 3 16-bit	5 16-bit	1 8-bit, 3 16-bit
Serial Ports	1 on adapter	2 on main board	1 on main board	2 on adapter
Parallel Ports	1 on adapter	1 on main board	1 on main board	1 on adapter
Other I/O Devices Included	Mouse	Vendor did not specify	Vendor did not specify	Vendor did not specify
Other I/O Interfaces	101-key keyboard port	Mouse, ext. video	101-key keyboard port	101-key keyboard port
<b>Mass Storage</b>				
Internal Drive Bays Available	Vendor did not specify	6 half-height	1 full-height	1 full-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M; 1 1.44M	1 1.2M, 1 1.44M	1 1.2M, 1 1.44M
Diskette Drive Options (bytes)	380K, 1.2M, 720K, 1.44M	Vendor did not specify	380K, 1.2M, 720K, 1.44M	380K
Hard Disk Interface	ST506/412	SCSI	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	40M/28	None	50M	50M
Optional Mass Storage	40M, 60M, 70M, 80M, 120M, 300M, tape drive	600M, tape drive, CD-ROM	30M, 40M, 80M, 150M, tape drive, CD-ROM	40M, 80M, 150M, tape drive, CD-ROM
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/640 x 480	Adapter optional	Adapter optional	Adapter optional
Display	Included, 14-inch, analog color	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Vendor did not specify	Tops	TOPS	TOPS
<b>Product Design</b>				
Type of Unit	Desktop	Floorstanding	Desktop	Desktop
Tempest Version	From manufacturer	Not available	Vendor did not specify	Not available
Dimensions (H x W x D, inches)	6.5 x 21.5 x 16.5	24.5 x 7.5 x 17.5	7.00 x 21.00 x 17.00	7.00 x 21.00 x 17.00
Weight (pounds)	30.00	50.00	Vendor did not specify	Vendor did not specify
AC Power Supply (watts)	200	230	200	200
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify	MS-DOS	Vendor did not specify	Vendor did not specify
Operating System(s) Supported	IBM PC-DOS, MS-DOS, Vendor MS-OS/2	IBM OS/2 Standard, MS-DOS, UNIX, UNIX derivative	IBM OS/2 Standard, MS-DOS, UNIX, UNIX derivative	IBM OS/2 Standard, MS-DOS, UNIX, UNIX derivative
Additional Software Included	Vendor did not specify	BIOS, setup, hard drive utilities, util./diagn., desk accessory	Vendor did not specify	Util./diagn.
<b>Service/Support</b>				
Distribution Channels	Direct from vendor	Direct from vendor	Direct from vendor	Direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor	Vendor, third party	Third party	Third party
Service Features	Toll free	On site, toll free, 30-day money back	On site, toll free, 30-day money back	On site, toll free, 30-day money back
<b>Base Price (\$)</b>	2585	2,999	849	1,599

Vendor	Swan Technologies	Swan Technologies	Systems Integration Associates	Systems Integration Associates
<b>Product</b>	Swan 386SX	Swan XT/10	SIA 386/20	SIA 386/25
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386sx/16	8088/10	80386/20	80386/25
Co-Processor Options	80387SX	8087	80387	80387
Standard RAM (bytes)/Speed (ns)	1.0M/100	640K/120	1.0M/100	4.0M/80
RAM Expansion Capacity (bytes)	8.0M	640K	24M	24M
Maximum System RAM (bytes)	16.0M	8.0M	24M	24M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Proprietary, 64K/20	Proprietary, 64K/20
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	Vendor did not specify	8	8
Total Expansion Slots	2 8-bit, 6 16-bit	8 8-bit	2 8-bit, 6 16-bit, 1 32-bit	2 8-bit, 6 16-bit, 1 32-bit
Available Expansion Slots	5 16-bit	6 8-bit	Vendor did not specify	Vendor did not specify
Serial Ports	1 on main board	1 on main board	1 on adapter	1 on adapter
Parallel Ports	1 on main board	1 on main board	1 on adapter	1 on adapter
Other I/O Devices Included	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Other I/O Interfaces	101-key keyboard port	101-key keyboard port	101-key keyboard port	101-key keyboard port
<b>Mass Storage</b>				
Internal Drive Bays Available	1 third-height	1 full-height	5 half-height	5 half-height
Diskette Drives Included (bytes)	1 1.2M; 1 1.44M	1 1.2M; 1 1.44M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	1.2M, 1.44M	360K, 720K	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M
Hard Disk Interface	ST506/412	ST506/412	ESDI	ESDI
Hard Disk Size (bytes)/AAT (ms)	50M	None	None	None
Optional Mass Storage	30M, 40M, 50M, 80M, 90M, 150M, tape drive, CD-ROM	20M, 30M, 40M, tape drive	40M, 90M, 150M, 65M, 340M, 680M, tape drive	40M, 90M, 150M, 65M, 340M, 680M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	On included adapter/640 x 480	On included adapter/640 x 480
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	TOPS	TOPS	Vendor did not specify	Ethernet, Token-ring, ARCnet
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	Not available
Dimensions (H x W x D, inches)	6.0 x 17.0 x 16.0	6.00 x 20.00 x 17.00	5.50 x 21.00 x 16.00	5.50 x 21.00 x 16.00
Weight (pounds)	Vendor did not specify	Vendor did not specify	55.00	55.00
AC Power Supply (watts)	200	150	200	200
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Operating System(s) Supported	IBM OS/2 Standard, MS-DOS, UNIX, UNIX derivative	MS-DOS	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX, UNIX deriv.	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX, UNIX deriv.
Additional Software Included	Vendor did not specify	Vendor did not specify	Util./diagn.	Util./diagn., LIM
<b>Service/Support</b>				
Distribution Channels	Direct from vendor	Direct from vendor	Computer retail, VAR/VAD	Computer retail, VAR/VAD
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor did not specify	Third party	Authorized dealers, third party	Authorized dealers, third party
Service Features	Toll free, 30-day money back	On site, toll free, 30-day money back	On site, 30-day money back	On site, 30-day money back
<b>Base Price (\$)</b>	1,199	499	3,245	4,585

Vendor	Systems Integration Associates	Systems Integration Associates	Systems Integration Associates	Systex & Associates
Product	SIA 386/33	SIA 486/25	SIA 486/33C	Systex 286-12
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/33	I486/25	80386/486 optional/33	80286/12
Co-Processor Options	80387	4167	80387	80287
Standard RAM (bytes)/Speed (ns)	4.0M/70	4.0M/80	4.0M/60	512K/100
RAM Expansion Capacity (bytes)	24M	8.0M	4.0M	4.0M
Maximum System RAM (bytes)	24M	32M	32M	4.0M
RAM Cache, Size (bytes)/Speed (ns)	Proprietary, 64K/20	Proprietary, 128K/25	Proprietary, 64K/25	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	8-16MHz	8	8
Total Expansion Slots	2 8-bit, 6 16-bit, 1 32-bit	1 8-bit, 6 16-bit, 1 32-bit	1 8-bit, 6 16-bit, 1 32-bit	2 8-bit, 6 16-bit
Available Expansion Slots	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Serial Ports	1 on adapter	1 on adapter	On main board	1 on adapter
Parallel Ports	1 on adapter	1 on adapter	On main board	1 on adapter
Other I/O Devices Included	Vendor did not specify	None	Vendor did not specify	Vendor did not specify
Other I/O Interfaces	101-key keyboard port	None	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	10 half-height	10 half-height	10 half-height	1 full-height, 3 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 720K, 1.44M
Hard Disk Interface	ESDI	ESDI	ESDI	ST506/412
Hard Disk Size (bytes)/AAT (ms)	None	90M/16.5 ms	90M/, 16.5 ms	None
Optional Mass Storage	90M, 150M, 340M, 680M, tape drive	90M, 150M, 340, 680, tape drive	90M, 150M, 340, 680, tape drive	20M, 40M, 60M, 80M, 120M, 150M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/640 x 480	Adapter optional/800 x 600	Adapter optional/800 x 600	On included adapter/320 x 200
Display	Optional	Included, 14-inch, optional analog color	Included, 14-inch, analog color	Included, 12-inch digital monochrome
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, Token-ring, ARCnet	None	Vendor did not specify	Vendor did not specify
<b>Product Design</b>				
Type of Unit	Floorstanding	Floorstanding	Floorstanding	Desktop
Tempest Version	Not available	Not available	Not available	Not available
Dimensions (H x W x D, inches)	24.00 x 9.00 x 23.00	24.5 x 9 x 23.5	24.5 x 9 x 23.5	Vendor did not specify
Weight (pounds)	70.00	70.00	70.00	Vendor did not specify
AC Power Supply (watts)	350	350	350	200, 220
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, UNIX, UNIX deriv.	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	MS-DOS, Vendor MS-OS/2, UNIX, UNIX derivative
Additional Software Included	Util./diagn.	BIOS, setup, diagnostics, util./diagn.	Util./diagn.	None
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD	VAR/VAD	VAR/VAD	Computer retail, VAR/VAD
Parts Warranty	1 year	1 year	1 year	2 years
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Authorized dealers, third party	Authorized dealers	Authorized dealers	Third party
Service Features	On site, 30-day money back	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Base Price (\$)</b>	7,410	7,870	6,578	999

Vendor	Systex & Associates	Systex & Associates	Tandon Computer Corp.	Tandon Computer Corp.
Product	Systex 386-20	Systex 386-25	Tandon 386/25	Tandon 386/33
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/20	80386/25	80386/25	80386/33
Co-Processor Options	80387	80387, Weitek 3167	80387	80387
Standard RAM (bytes)/Speed (ns)	1.0M/80	1.0M/80	1.0M/100	1.0M
RAM Expansion Capacity (bytes)	16.0M	16.0M	16.0M	16.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Proprietary, 64K/25	Proprietary, 64K/25	Proprietary, 64K/25
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	6	8	8
Total Expansion Slots	1 8-bit, 5 16-bit, 2 32-bit	2 8-bit, 3 16-bit, 1 32-bit	2 8-bit, 5 16-bit, 1 32-bit	2 8-bit, 5 16-bit, 1 32-bit
Available Expansion Slots	0 8-bit, 4 16-bit, 2 32-bit	1 8-bit, 4 16-bit, 1 32-bit	Vendor did not specify	1 8-bit, 5 16-bit, 1 32-bit
Serial Ports	2 on main board	1 on adapter	1 on adapter	1 on adapter
Parallel Ports	1 on main board	1 on adapter	1 on adapter	1 on adapter
Other I/O Devices Included	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Other I/O Interfaces	Vendor did not specify	None	101-key keyboard port	101-key keyboard port
<b>Mass Storage</b>				
Internal Drive Bays Available	1 full-height, 3 half-height	1 full-height, 3 half-height	5 half-height	5 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	1.44M	1.44M
Hard Disk Interface	ST506/412	ST506/412	Vendor did not specify	Vendor did not specify
Hard Disk Size (bytes)/AAT (ms)	40M/28	40M/28	None	None
Optional Mass Storage	40M, 60M, 80M, 120M, tape drive	60M, 80M, 120M, 150M	110M, 330M, Personal Data Pac rem. drive	110M, 330M, 660M, Personal Data Pac rem. drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/320 x 200	On included adapter/320 x 200	Adapter optional	Adapter optional
Display	Included, 14-inch digital color	Included, 14-inch digital color	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Vendor did not specify	Vendor did not specify	Vendor did not specify
Dimensions (H x W x D, inches)	Vendor did not specify	Vendor did not specify	6.30 x 21.00 x 16.30	6.30 x 21.00 x 16.30
Weight (pounds)	Vendor did not specify	Vendor did not specify	40.00	40.00
AC Power Supply (watts)	220	220	190	190
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify	Vendor did not specify	Enhanced MS-DOS	Enhanced MS-DOS
Operating System(s) Supported	MS-DOS, Vendor MS-OS/2, UNIX, UNIX derivative	MS-DOS, Vendor MS-OS/2, UNIX, UNIX derivative	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2
Additional Software Included	None	None	Windows, GW Basic	Windows, GW Basic
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Vendor did not specify	Computer retail, general retail, VAR/VAD
Parts Warranty	2 years	2 years	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Third party	Third party	Vendor, authorized dealers, third party	Vendor, authorized dealers, third party
Service Features	Vendor did not specify	Vendor did not specify	On site	On site
<b>Base Price (\$)</b>	1,999	2,699	Vendor did not specify	4,899

Vendor	Tandon Computer Corp.	Tandon Computer Corp.	Tandon Computer Corp.	Tandy Corp./Radio Shack
Product	Tandon PCA/12	Tandon 486/25	Tandon PCA/12 SL	Tandy 1000 HX 25-1053
Processor/Memory CPU/Clock Speed (MHz)	80286/12	80486/25	80286/12	8088/7.16
Co-Processor Options	80287	4187 Weitek	80287	None
Standard RAM (bytes)/Speed (ns)	1.0M/100	2.0M	640K	256K/150
RAM Expansion Capacity (bytes)	5M	2.0M	1.0M	640K
Maximum System RAM (bytes)	16.0M	64M	Vendor did not specify	640K
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
Input/Output Bus Architecture	AT	EISA	Vendor did not specify	XT
Bus Speed (MHz)	8	Vendor did not specify	Vendor did not specify	4.77, 7.16
Total Expansion Slots	2 8-bit, 6 16-bit	2 16-bit, 6 32-bit	Vendor did not specify	Vendor did not specify
Available Expansion Slots	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Serial Ports	1 on main board	2 on main board	2 on main board	On main board
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on main board
Other I/O Devices Included	Vendor did not specify	None	None	Vendor did not specify
Other I/O Interfaces	101-key keyboard port	None	None	Ext. diskette drive, ext. video, audio, 2 joystick ports
Mass Storage				
Internal Drive Bays Available	5 half-height	Vendor did not specify	Vendor did not specify	2 third-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 720K
Diskette Drive Options (bytes)	1.44M	None	None	720K
Hard Disk Interface	None	SCSI	None	None
Hard Disk Size (bytes)/AAT (ms)	None	Vendor did not specify	Vendor did not specify	None
Optional Mass Storage	40M	100M, 300M, 600	20M, 40M	None
Keyboard Availability	Included (detachable)	Vendor did not specify	Included (detachable)	Included (fixed position)
Number of Keys/Function Keys	101/12	101/12	101/12	90/12
Video/Display Video Controller/Resolution (pixels)	640 x 480	Vendor did not specify	Vendor did not specify	Integrated on system board/640 X 200
Display	Optional	Vendor did not specify	Optional	Optional
Local Area Network Support Vendor LAN Options	Vendor did not specify	None	Vendor did not specify	Tandylink
Product Design Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Vendor did not specify	Not available
Dimensions (H x W x D, inches)	6.30 x 21.10 x 16.30	6.3 x 21.1 x 16.3	5 x 18.3 x 16	3.25 x 17.00 x 14.50
Weight (pounds)	Vendor did not specify	39.90	Vendor did not specify	19.00
AC Power Supply (watts)	190	230	130	25
Software Operating System(s) Bundled	Enhanced MS-DOS	Vendor did not specify	MS-DOS	Enhanced MS-DOS
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2	Vendor did not specify	MS-DOS	Enhanced MS-DOS, MS-DOS
Additional Software Included	Windows, GW Basic	Windows	Windows	Applications
Service/Support Distribution Channels	Computer retail, general retail, VAR/VAD	Computer retail, general retail, VAR/VAD	Computer retail, general retail, VAR/VAD	Direct from vendor
Parts Warranty	1 year	1 year	1 year	90 days
Labor Warranty	1 year	1 year	1 year	90 days
Service Supported by	Vendor, authorized dealers, third party	Authorized dealers	Authorized dealers	Vendor, authorized dealers
Service Features	On site	Vendor did not specify	Vendor did not specify	On site
Base Price (\$)	1,682/available for GSA	9,000	1,409	699

Vendor	Tandy Corp./Radio Shack	Tandy Corp./Radio Shack	Tandy Corp./Radio Shack	Tandy Corp./Radio Shack
Product	Tandy 1000 SL 25-1401	Tandy 1000 TL/2 25-1602	Tandy 3000 NL 25-4072/4043	Tandy 4000 25-5000/4043
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	8086	80286/84 (selectable)	80286/10	80386/16
Co-Processor Options	8087	80287	80287	80387
Standard RAM (bytes)/Speed (ns)	384K/150	640K/150	512K/150	1.0M/100
RAM Expansion Capacity (bytes)	640K	768K	640K	8.0M
Maximum System RAM (bytes)	640K	768K	18.0M	18.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	XT	XT, PC	AT	AT
Bus Speed (MHz)	8, 4	8	10, 8	8, 6
Total Expansion Slots	5 8-bit	4 8-bit	3 8-bit, 5 16-bit	2 8-bit, 6 16-bit, 1 32-bit
Available Expansion Slots	5 8-bit	4 8-bit	3 8-bit, 5 16-bit	6 16-bit, 1 32-bit
Serial Ports	1 on main board	1 on main board	1 on main board	1 on adapter
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on adapter
Other I/O Devices Included	Vendor did not specify	None	Vendor did not specify	Vendor did not specify
Other I/O Interfaces	101-key keyboard port, audio, 2 joystick ports	101-key keyboard port, 2 joystick ports	101-key keyboard port	101-key keyboard port
<b>Mass Storage</b>				
Internal Drive Bays Available	1 half-height, 1 third-height	1 half-height, 2 third-height	1 full-height, 2 half-height	1 full-height, 1 half-height, 1 third-height
Diskette Drives Included (bytes)	1 360K	1 720K	1 1.44M	1 1.44M
Diskette Drive Options (bytes)	360K, 720K	360K, 720K	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M
Hard Disk Interface	Vendor did not specify	Smart Drive	None	Vendor did not specify
Hard Disk Size (bytes)/AAT (ms)	None	None	None	None
Optional Mass Storage	20M, 40M, CD-ROM	20M, 40M, CD-ROM	20M, 40M, 70M, 80M, 170M 344M, tape drive, CD-ROM	20M, 40M, 70M, 80M, 170M 344M, tape drive, CD-ROM
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/640 X 200	Integrated on system board/320 x 200, 640 x 200	Adapter optional	On included adapter/640 x 480
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	ARCnet, Tandylink	Ethernet, ARCnet, TandyLink	Ethernet, ARCnet, Tandylink	Ethernet, ARCnet, Tandylink
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	Not available
Dimensions (H x W x D, inches)	5.10 x 15.50 x 13.10	5.1 x 15.5 x 13.1	6.25 x 15.75 x 17.00	6.50 x 19.00 x 18.00
Weight (pounds)	33.00	33.00	33.00	47.00
AC Power Supply (watts)	67	67	135	192
<b>Software</b>				
Operating System(s) Bundled	Enhanced MS-DOS	Enhanced MS-DOS	Vendor did not specify	Vendor did not specify
Operating System(s) Supported	Enhanced MS-DOS, MS-DOS	Enhanced MS-DOS, MS-DOS	Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2, UNIX derivative	Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2, UNIX derivative
Additional Software Included	Applications, GW-Basic	Operating system, DeskMate, applications	Util./diagn.	Util./diagn.
<b>Service/Support</b>				
Distribution Channels	Direct from vendor	Direct from vendor	Direct from vendor	Direct from vendor
Parts Warranty	90 days	90 days	1 year	1 year
Labor Warranty	90 days	90 days	1 year	1 year
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers	Vendor, authorized dealers
Service Features	On site	On site	On site	On site
<b>Base Price (\$)</b>	899	1,299	1,999	2,999

Vendor	Tandy Corp./Radio Shack	Tandy Corp./Radio Shack	Tandy Corp./Radio Shack	Tandy Corp./Radio Shack
Product	Tandy 4000 LX 25-5100	Tandy 4000 SX 25-4900	Tandy 4020 LX 25-5120	Tandy 4025 LX 25-5125
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/20	80386sx/16	80386/20	80386/25
Co-Processor Options	80387	80387SX	80387	80387
Standard RAM (bytes)/Speed (ns)	2.0M/80	1.0M/100	1.0M/100	2.0M/100
RAM Expansion Capacity (bytes)	8.0M	5.0M	8.0M	8.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Intel, 32K/35	Intel/25
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT/separate memory bus	AT/separate memory bus
Bus Speed (MHz)	10, 8	8	8	8
Total Expansion Slots	2 8-bit, 6 16-bit, 1 32-bit	1 8-bit, 4 16-bit	6 16-bit, 2 32-bit	6 16-bit, 2 32-bit
Available Expansion Slots	6 16-bit, 1 32-bit	4 16-bit	5 16-bit, 1 32-bit	5 16-bit, 1 32-bit
Serial Ports	1 on adapter	1 on main board	1 on main board	1 on main board
Parallel Ports	1 on adapter	1 on main board	1 on main board	1 on main board
Other I/O Devices Included	Vendor did not specify	Vendor did not specify	None	None
Other I/O Interfaces	101-key keyboard port	101-key keyboard port	Mouse	Mouse, 101-key keyboard port, ext. video
<b>Mass Storage</b>				
Internal Drive Bays Available	1 full-height, 1 half-height, 1 third-height	1 full-height, 2 half-height, 1 third-height	1 full-height, 2 half-height, 2 third-height	1 full-height, 2 half-height, 2 third-height
Diskette Drives Included (bytes)	1 1.44M	1 1.44M	1 1.44M	1 1.44M
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M	360K, 1.2M, 720K, 1.44M
Hard Disk Interface	None	AT/IDE	AT/IDE	AT/IDE
Hard Disk Size (bytes)/AAT (ms)	None	40M/19	None	None
Optional Mass Storage	20M, 40M, 70M, 80M, 170M 344M, tape drive, CD-ROM	20M, 40M, 70M, 80M, 170M 344M, tape drive	40M, 80M, 150M, 170M, 344M, tape drive, CD-ROM	40M, 80M, 150M, 170M, 344M, tape drive, CD-ROM
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/640 x 480	On included adapter/640 x 480	On included adapter/640 x 480	On included adapter/640 x 480
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, ARCnet, Tandylink	Ethernet, ARCnet, Tandylink	Ethernet, ARCnet, TandyLink	Ethernet, ARCnet, TandyLink
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Vendor did not specify	Not available	Not available
Dimensions (H x W x D, inches)	6.50 x 19.00 x 18.00	6.25 x 15.75 x 17.00	6.5 x 15.75 x 17	6.5 x 15.75 x 17
Weight (pounds)	47.00	Vendor did not specify	47.00	47.00
AC Power Supply (watts)	192	200	200	200
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify	Vendor did not specify	None	None
Operating System(s) Supported	Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2, UNIX derivative	Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2, UNIX derivative	MS-DOS, Vendor MS-OS/2, UNIX derivative	MS-DOS, UNIX derivative
Additional Software Included	Util./diagn.	Util./diagn.	Util./diagn.	Util./diagn.
<b>Service/Support</b>				
Distribution Channels	Direct from vendor	Direct from vendor	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers	Vendor	Vendor
Service Features	On site	On site	On site, toll free, 30-day money back	On site, toll free, 30-day money back
<b>Base Price (\$)</b>	<b>4,399</b>	<b>2,599</b>	<b>3,999</b>	<b>4,999</b>

Vendor	Tandy Corp./Radio Shack	Tatung Company of America, Inc.	Tatung Company of America, Inc.	Teconomics, Inc.
<b>Product</b>	<b>Tandy 5000 MC 25-8000</b>	<b>TCS-8600T</b>	<b>TCS-8270</b>	<b>BT 388-25</b>
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/20	80386/33	486/25	80386/25
Co-Processor Options	80387	Integrated on chip	Vendor did not specify	80387
Standard RAM (bytes)/Speed (ns)	2.0M/100	2.0M/80	2.0M	2.0M/80
RAM Expansion Capacity (bytes)	16.0M	16.0M	64M	16.0M
Maximum System RAM (bytes)	16.0M	16.0M	Vendor did not specify	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Intel, 32K/25	64K/20 ns	64K	Intel, 256K/25
<b>Input/Output</b>				
Bus Architecture	MCA	AT	MCA	AT
Bus Speed (MHz)	10	8	25	25 for 32B+ bus
Total Expansion Slots	3 16-bit, 4 32-bit	3 8-bit, 5 16-bit, 1 32-bit	1 16-bit, 3 32-bit	1 8-bit, 5 16-bit, 1 32-bit
Available Expansion Slots	3 16-bit, 4 32-bit	3 8-bit, 5 16-bit, 0 32-bit	1 16-bit, 3 32-bit	2 8-bit, 16-bit
Serial Ports	1 on main board	2 on main board	2 on main board	2 on main board
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on main board
Other I/O Devices Included	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Other I/O Interfaces	Mouse, 101-key keyboard port	Vendor did not specify	Vendor did not specify	101-key keyboard port
<b>Mass Storage</b>				
Internal Drive Bays Available	1 full-height, 2 half-height, 1 third-height	6 half-height	5 half-height	1 full-height, 3 half-height
Diskette Drives Included (bytes)	1 1.44M	1 1.2M	1 1.44M	1 1.2M
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M	1.2M	Vendor did not specify	1.44M
Hard Disk Interface	None	ESDI	ST506/412, ESDI, SCSI	ESDI
Hard Disk Size (bytes)/AAT (ms)	None	Vendor did not specify	Vendor did not specify	80M/28
Optional Mass Storage	20M, 40M, 70M, 80M, 170M 344M, tape drive	106M, 150M, 383M, 760M	Vendor did not specify	40M, 60M, 100M, 120M, 150M, 300M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/640 x 480	Adapter optional	Integrated on system board/640 x 480	Adapter optional/1,024 x 768
Display	Optional	Optional	Optional	Optional, Analog color
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet	None	None	Ethernet, ARCnet
<b>Product Design</b>				
Type of Unit	Desktop	Floorstanding	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	From manufacturer
Dimensions (H x W x D, inches)	6.13 x 17.00 x 15.50	162 mm x 540 mm x 440 mm	6.75 x 17 x 21.25	Vendor did not specify
Weight (pounds)	38.00	Vendor did not specify	Vendor did not specify	Vendor did not specify
AC Power Supply (watts)	192	230	Vendor did not specify	220
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify	MS-DOS	Vendor did not specify	IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS, MS-DOS, UNIX, UNIX deriv.
Operating System(s) Supported	Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2, UNIX derivative	IBM OS/2 Extended	IBM OS/2 Extended	IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS, MS-DOS, UNIX, UNIX deriv.
Additional Software Included	Util./diagn.	BIOS, setup, util./diagn.	BIOS, setup, util./diagn.	Util./diagn.
<b>Service/Support</b>				
Distribution Channels	Direct from vendor	Vendor did not specify	Vendor did not specify	Direct from vendor
Parts Warranty	1 year	1 year	1 year	6 months
Labor Warranty	1 year	1 year	1 year	Vendor did not specify
Service Supported by	Vendor, authorized dealers	Vendor, authorized dealers, third party	Vendor, authorized dealers, third party	Vendor
Service Features	On site	On site, toll free	On site, toll free	On site
<b>Base Price (\$)</b>	<b>4,999</b>	<b>5,895</b>	<b>8,995</b>	<b>Contact vendor</b>

Vendor	TeleVideo Systems Inc.	TeleVideo Systems Inc.	TeleVideo Systems Inc.	Texas Instruments
Product	Tele286SE	Tele386SX	TS2 TeleStation	1000 Series System SP1000 SP1001
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/12	80386sx/16	80286/10	80386/16
Co-Processor Options	None	80387SX	80287	None
Standard RAM (bytes)/Speed (ns)	1.0M/80100	1.0M/80	1.0M/80	1.0M/100
RAM Expansion Capacity (bytes)	1.0M	4.0M	2.5M	Vendor did not specify
Maximum System RAM (bytes)	16.0M	16.0M	2.5M	9M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Proprietary, 8K
<b>Input/Output</b>				
Bus Architecture	AT	AT	XT	AT
Bus Speed (MHz)	8	8	8	Vendor did not specify
Total Expansion Slots	3 16-bit	3 16-bit	Vendor did not specify	2 8-bit, 5 16-bit, 1 32-bit
Available Expansion Slots	3 16-bit	2 16-bit	Vendor did not specify	Vendor did not specify
Serial Ports	2 on main board	2 on main board	2 on main board	2 on adapter
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on adapter
Other I/O Devices Included	None	None	None	Vendor did not specify
Other I/O Interfaces	Ext. video	Ext. video	None	Vendor did not specify
<b>Mass Storage</b>				
Internal Drive Bays Available	2 third-height	2 third-height	Vendor did not specify	2 full-height
Diskette Drives Included (bytes)	Vendor did not specify	1 1.44M	None	2 1.2M
Diskette Drive Options (bytes)	1.44M	1.44M	None	None
Hard Disk Interface	ST506/412	ST506/412	None	ST506/412
Hard Disk Size (bytes)/AAT (ms)	40M/28	40M/28	None	Vendor did not specify
Optional Mass Storage	None	20M, 40M, 100M	None	48M, 87M, 140M, tape drive, standard
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Optional
Number of Keys/Function Keys	101/12	101/12	101/12	Vendor did not specify
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/640 x 480	Integrated on system board/640 x 480	Integrated on system board/720 X 348	Vendor did not specify
Display	Included, 14-inch, analog color	Included, 14-inch, analog color	Included, 14-inch digital monochrome	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet	Ethernet	Ethernet	Ethernet
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Floorstanding
Tempest Version	Vendor did not specify	From third party	From third party	Vendor did not specify
Dimensions (H x W x D, inches)	4.0 x 14.5 x 15.5	4 x 14.5 x 15.5	15.4 x 12.5 x 12.8	21.00 x 6.50 x 17.00
Weight (pounds)	20.00	20.00	25.70	46.00
AC Power Supply (watts)	100	100	50	200
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	MS-DOS	MS-DOS	TI System V
Operating System(s) Supported	IBM PC-DOS, MS-DOS, Vendor MS-OS/2, UNIX, UNIX derivative	IBM PC-DOS, MS-DOS, Vendor MS-OS/2, UNIX, UNIX derivative	MS-DOS	MS-DOS, UNIX, UNIX derivative
Additional Software Included	BIOS, setup, util./diag.	BIOS, setup, util./diag.	BIOS	Vendor did not specify
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Vendor did not specify
Parts Warranty	Vendor did not specify	1 year	1 year	90 days
Labor Warranty	Vendor did not specify	1 year	1 year	90 days
Service Supported by	Vendor, third party	Vendor, third party	Third party	Vendor
Service Features	On site, toll free	On site	On site	On site, toll free
<b>Base Price (\$)</b>	1,495	2,399	1,429	3,495

Vendor	Texas Instruments	Texas Instruments	Texas Instruments	Third Coast Technologies, Inc.
Product	386/33	1000 Series System 1200 S1205NT	1000 Series System 1300 S1325	EL386
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/33	80386/16	80386/20	80386/16
Co-Processor Options	80387	None	None	80387
Standard RAM (bytes)/Speed (ns)	2.0M/80	2.0M	4.0M	1.0M/120
RAM Expansion Capacity (bytes)	4.0M	8.0M	8.0M	16.0M
Maximum System RAM (bytes)	36M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Intel, 32K/25	Proprietary, 8K	Proprietary, 16K	Not supported
<b>Input/Output</b>				
Bus Architecture	AT passive backplane	AT	AT	EISA
Bus Speed (MHz)	8	Vendor did not specify	Vendor did not specify	10
Total Expansion Slots	Vendor did not specify	3 8-bit, 11 16-bit	3 8-bit, 10 16-bit	2 8-bit, 5 16-bit, 1 32-bit
Available Expansion Slots	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Serial Ports	2 on main board	1 on main board	1 on main board	1 on adapter
Parallel Ports	1 on main board	1 on main board	1 on main board	2 on adapter
Other I/O Devices Included	None	Vendor did not specify	Vendor did not specify	Vendor did not specify
Other I/O Interfaces	None	Vendor did not specify	Vendor did not specify	101-key keyboard port
<b>Mass Storage</b>				
Internal Drive Bays Available	Vendor did not specify	2 full-height, 4 half-height	2 full-height, 4 half-height	5 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	1.2M, 1.44M	Vendor did not specify	360K	1.44M
Hard Disk Interface	ESDI	ST506/412	SCSI	ST506/412
Hard Disk Size (bytes)/AAT (ms)	40M/18	48M/18	182M/18	30M/40
Optional Mass Storage	100M, tape drive	87M, 182M	182M, tape drive, standard	50M, 70M, 90M, 120M, 150M, 240, tape drive, CD-ROM, WORM, erasable, optical
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101	101/12	101/12	101/15
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional/640 x 480	On included adapter	On included adapter	On included adapter/320 x 200
Display	Included, 14-inch, optional analog color	Included, 14-inch	Included, 14-inch	Included, 14-inch digital monochrome
<b>Local Area Network Support</b>				
Vendor LAN Options	None	Ethernet	Ethernet	Ethernet, ARCnet
<b>Product Design</b>				
Type of Unit	Floorstanding	Floorstanding	Floorstanding	Desktop
Tempest Version	Not available	Vendor did not specify	Vendor did not specify	Not available
Dimensions (H x W x D, inches)	6.25 x 19.25 x 16.5	18.60 x 7.80 x 18.50	18.60 x 7.80 x 18.50	6.00 x 21.00 x 16.50
Weight (pounds)	Vendor did not specify	58.00	58.00	45.00
AC Power Supply (watts)	220	400	220	220
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	TI System V	TI System V	Vendor did not specify
Operating System(s) Supported	MS-DOS, UNIX, UNIX derivative	MS-DOS, UNIX, UNIX derivative	MS-DOS, UNIX, UNIX derivative	MS-DOS, UNIX, UNIX derivative, Theos, Pick
Additional Software Included	BIOS, util./diagn.	Vendor did not specify	Vendor did not specify	Util./diagn.
<b>Service/Support</b>				
Distribution Channels	VAR/VAD	Vendor did not specify	Vendor did not specify	VAR/VAD, direct from vendor
Part. Warranty	1 year	90 days	90 days	180 days
Labor Warranty	1 year	90 days	90 days	180 days
Service Supported by	Vendor	Vendor	Vendor	Vendor
Service Features	On site	On site, toll free	On site, toll free	On site
<b>Base Price (\$)</b>	6,995	8,995	22,655	2,763

Vendor	Third Coast Technologies, Inc.	Third Coast Technologies, Inc.	Third Coast Technologies, Inc.	Third Coast Technologies, Inc.
Product	EL386 EL386-DR	F8386 F8386 FT	F8386 F8386 HP	Talos Talos-B
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/25	80386/25	80386/20	80386/16
Co-Processor Options	80387, Weitek 1167, Weitek 3167	80387	80387	80387
Standard RAM (bytes)/Speed (ns)	4.0M/100	4.0M/100	4.0M/100	4.0M/120
RAM Expansion Capacity (bytes)	16.0M	16.0M	16.0M	16.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Austek, 32K/20	Austek, 32K/20	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	12.5	8	8	8
Total Expansion Slots	2 8-bit, 6 16-bit	2 8-bit, 6 16-bit	2 8-bit, 5 16-bit	2 8-bit, 5 16-bit, 1 32-bit
Available Expansion Slots	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Serial Ports	1 on adapter	1 on adapter	1 on adapter	8 on adapter
Parallel Ports	2 on adapter	2 on adapter	2 on adapter	1 on adapter
Other I/O Devices Included	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Other I/O Interfaces	101-key keyboard port	101-key keyboard port, network interface (Ethernet)	101-key keyboard port, ext. video, network interface (Ethernet)	SCSI, 101-key keyboard port, ext. video
<b>Mass Storage</b>				
Internal Drive Bays Available	5 half-height	1 full-height, 4 half-height	1 full-height, 4 half-height	1 full-height, 4 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	1.44M	1.2M, 1.44M	1.2M, 1.44M	1.2M
Hard Disk Interface	Vendor did not specify	ESDI	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	240M/18	150 mirrored/0.5	90M/0.5	70M/28
Optional Mass Storage	50M, 70M, 90M, 120M, 150M, tape drive, CD-ROM, WORM, erasable, optical	90M, 120M, 150M, 300M, 765M, tape drive	90M, 120M, 150M, 300M, 240, 765, tape drive	50M, 70M, 90M, 120M, 150M, 300M, 765M, tape drive, CD-ROM, WORM, erasable, optical
<b>Keyboard Availability</b>				
Number of Keys/Function Keys	Included (detachable) 101/15	Included (detachable) 101/15	Included (detachable) 101/15	Optional 101/15
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/320 x 200	On included adapter/320 x 200	On included adapter/320 x 200	On included adapter/320 x 200
Display	Included, 14-inch digital monochrome	Included, 14-inch digital monochrome	Included, 14-inch digital monochrome	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, ARCnet	Ethernet, ARCnet	Ethernet, ARCnet	Ethernet, ARCnet
<b>Product Design</b>				
Type of Unit	Desktop	Floorstanding	Floorstanding	Floorstanding
Tempest Version	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Dimensions (H x W x D, inches)	8.00 x 21.00 x 18.50	22.00 x 7.00 x 24.00	22.00 x 7.00 x 24.00	22.00 x 7.00 x 24.00
Weight (pounds)	45.00	Vendor did not specify	55.00	50.00
AC Power Supply (watts)	220	220	220	220
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Operating System(s) Supported	MS-DOS, UNIX, UNIX derivative, Theos, Pick	UNIX, UNIX derivative	UNIX, UNIX derivative	MS-DOS, UNIX, UNIX derivative, Theos, Pick
Additional Software Included	Util./diagn.	Vendor did not specify	Util./diagn.	Util./diagn.
<b>Service/Support</b>				
Distribution Channels	VAR/VAD	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor
Parts Warranty	180 days	180 days	180 days	180 days
Labor Warranty	180 days	180 days	180 days	180 days
Service Supported by	Vendor	Vendor, authorized dealers	Vendor, authorized dealers	Vendor
Service Features	On site	On site	On site	On site
<b>Base Price (\$)</b>	7,274	9,188	6,043	3,989

Vendor	Third Coast Technologies, Inc.	Third Coast Technologies, Inc.	Third Coast Technologies, Inc.	Third Coast Technologies, Inc.
Product	Talco Talco-T	Talco Talco-U	Talco Talco-U/64	URX URX-25/64
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/20	80386/25	80386/33	80386/25
Co-Processor Options	80387	80387, Weitek 1167, Weitek 3167	80387	80387, Weitek 1167, Weitek 3167
Standard RAM (bytes)/Speed (ns)	4.0M/100	8.0M/100	16M/80	8.0M/100
RAM Expansion Capacity (bytes)	16.0M	16.0M	16.0M	16.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Austek, 32K/20	Austek, 32K/20	Austek, 32K/20
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	8	8	12.5
Total Expansion Slots	2 8-bit, 5 16-bit, 1 32-bit	2 8-bit, 6 16-bit	2 8-bit, 6 16-bit	2 8-bit, 5 16-bit, 1 32-bit
Available Expansion Slots	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Serial Ports	16 on adapter	32 on adapter	64 on adapter	64 on adapter
Parallel Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
Other I/O Devices Included	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Other I/O Interfaces	SCSI, 101-key keyboard port, ext. video	SCSI, 101-key keyboard port, ext. video	SCSI, 101-key keyboard port, ext. video	SCSI, 101-key keyboard port, ext. video
<b>Mass Storage</b>				
Internal Drive Bays Available	1 full-height, 4 half-height	1 full-height, 4 half-height	1 full-height, 4 half-height	16 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	1.2M, 720K	1.2M, 1.44M	1.2M, 1.44M	1.2M, 1.44M
Hard Disk Interface	Vendor did not specify	ESDI	ESDI	Fault tol. ESDI
Hard Disk Size (bytes)/AAT (ms)	120M/, 0.5	300M/0.5	765M/0.5	765 mirrored/0.5
Optional Mass Storage	50M, 70M, 90M, 120M, 150M, 300M, 765M, tape drive, CD-ROM, WORM	70M, 90M, 120M, 150M, 300M, 765M, tape drive, CD-ROM, WORM, erasable, optical	70M, 90M, 120M, 150M, 300M, 765M, tape drive, CD-ROM, WORM, erasable, optical	150M, 300M, 765M, tape drive, CD-ROM, WORM, erasable, optical
<b>Keyboard</b>				
Availability	Optional	Optional	Optional	Included (detachable)
Number of Keys/Function Keys	101/15	101/15	101/15	101/15
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/320 x 200	On included adapter/320 x 200	On included adapter/320 x 200	320 x 200
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, ARCnet	Ethernet, ARCnet	Ethernet, ARCnet	Ethernet, ARCnet
<b>Product Design</b>				
Type of Unit	Floorstanding	Floorstanding	Floorstanding	Floorstanding
Tempest Version	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Dimensions (H x W x D, inches)	22.00 x 7.00 x 24.00	22.00 x 7.00 x 24.00	22.00 x 7.00 x 24.00	33.00 x 10.00 x 28.00
Weight (pounds)	50.00	55.00	58.00	70.00
AC Power Supply (watts)	220	Vendor did not specify	220	250
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Operating System(s) Supported	MS-DOS, UNIX, UNIX derivative, Theos, Pick	MS-DOS, UNIX, UNIX derivative, Theos, Pick	MS-DOS, UNIX, UNIX derivative, Theos, Pick	MS-DOS, UNIX, UNIX derivative, Theos, Pick
Additional Software Included	Util./diagn.	Util./diagn.	Util./diagn.	Util./diagn.
<b>Service/Support</b>				
Distribution Channels	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor	VAR/VAD
Parts Warranty	180 days	180 days	180 days	180 days
Labor Warranty	180 days	180 days	180 days	180 days
Service Supported by	Vendor	Vendor, authorized dealers	Authorized dealers	Vendor, authorized dealers
Service Features	On site	On site	On site	On site
<b>Base Price (\$)</b>	7,343	13,511	Vendor did not specify	25,672

Vendor	Third Coast Technologies, Inc.	Third Coast Technologies, Inc.	Third Coast Technologies, Inc.	Third Coast Technologies, Inc.
<b>Product</b>	URX URX-25/8	URX URX-33/128	V VFR386/20	V VFR386/25
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386	80386/33	80386/20	80386/25
Co-Processor Options	80387, Weitek 1167, Weitek 3167	80387, Weitek 1167, Weitek 3167	80387	80387
Standard RAM (bytes)/Speed (ns)	4.0M/100	16.0M/80	4.0M/100	4.0M/80
RAM Expansion Capacity (bytes)	16.0M	16.0M	16.0M	16.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Austek, 32K	Austek, 32K/20	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	Proprietary	Proprietary
Bus Speed (MHz)	12.5	16.5	10	12.5
Total Expansion Slots	2 8-bit, 5 16-bit, 1 32-bit	2 8-bit, 6 16-bit	12 16-bit	12 16-bit
Available Expansion Slots	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Serial Ports	8 on adapter	128 on adapter	16 on adapter	64 on adapter
Parallel Ports	1 on adapter	1 on adapter	On main board	On main board
Other I/O Devices Included	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Other I/O Interfaces	SCSI, 101-key keyboard port, ext. video	SCSI, 101-key keyboard port, ext. video, network interface	SCSI	SCSI
<b>Mass Storage</b>				
Internal Drive Bays Available	16 half-height	16 half-height	8 half-height	8 half-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	1.2M, 1.44M	1.2M, 1.44M	1.2M	1.2M
Hard Disk Interface	Fault tol. ESDI	Fault tol. ESDI	SCSI	ESDI
Hard Disk Size (bytes)/AAT (ms)	150M mirrored/0.5	765 mirrored/0.5	28	765M/0.5
Optional Mass Storage	150M, 300M, 765M, tape drive, CD-ROM, WORM, erasable optical	765M, tape drive, CD-ROM, WORM, erasable optical	70M, 90M, 120M, 150M, 300M, 765M, 240M, tape drive	150M, 300M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (fixed position)	Vendor did not specify	Vendor did not specify
Number of Keys/Function Keys	101/15	101/15	Vendor did not specify	Vendor did not specify
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/320 x 200	On included adapter/320 x 200	Vendor did not specify	Vendor did not specify
Display	Optional	Optional	Vendor did not specify	Vendor did not specify
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, ARCnet	Ethernet	Vendor did not specify	Vendor did not specify
<b>Product Design</b>				
Type of Unit	Floorstanding	Floorstanding	Floorstanding	Floorstanding
Vendor Version	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Dimensions (H x W x D, inches)	33.00 x 10.00 x 28.00	33.00 x 10.00 x 28.00	28.00 x 9.50 x 25.50	28.00 x 9.50 x 25.50
Weight (pounds)	70.00	70.00	95.00	95.00
AC Power Supply (watts)	250	400	660	660
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Operating System(s) Supported	MS-DOS, UNIX, UNIX derivative, Theos, Pick	MS-DOS, UNIX, UNIX derivative, Theos, Pick	Theos	Theos
Additional Software Included	Util./diagn.	Util./diagn.	Vendor did not specify	Vendor did not specify
<b>Service/Support</b>				
Distribution Channels	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor	VAR/VAD, direct from vendor
Parts Warranty	180 days	180 days	180 days	180 days
Labor Warranty	180 days	180 days	180 days	180 days
Service Supported by	Vendor, authorized dealers	Vendor	Vendor, authorized dealers	Vendor, authorized dealers
Service Features	On site	On site	On site	On site
<b>Base Price (\$)</b>	13,070	Vendor did not specify	6,833	15,994

Vendor	Toshiba America, Inc.	Tri-Star Computers	Tri-Star Computers	Twinhead Corp.
<b>Product</b>	<b>T8500</b>	<b>386 Business Systems</b>	<b>Reliant 386 20</b>	<b>SUPERSET-200</b>
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/25	80386/25	80386/20	8088/9.54
Co-Processor Options	80387, Weitek 3167	80387, 80287, Weitek 1167	80387, 80287	8087
Standard RAM (bytes)/Speed (ns)	2.0M	1.0M/80	1.0M/100	640K/120
RAM Expansion Capacity (bytes)	8.0M	8.0M	8.0M	640K
Maximum System RAM (bytes)	8.0M	16.0M	16.0M	640K
RAM Cache, Size (bytes)/Speed (ns)	Proprietary, 64K/40	Chips & Technologies	Chips & Technologies, 8K/35	Not supported
<b>Input/Output</b>				
Bus Architecture	Split AT	AT	Vendor did not specify	XT
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	1 8-bit, 3 16-bit	2 8-bit, 5 16-bit, 1 32-bit	2 8-bit, 5 16-bit, 1 32-bit	3 8-bit
Available Expansion Slots	1 8-bit, 3 16-bit	Vendor did not specify	1 8-bit, 3 16-bit, 1 32-bit	3 8-bit
Serial Ports	21 on main board	2 on adapter	1 on main board; 1 on adapter	1 on main board
Parallel Ports	1 on main board	1 on adapter	1 on main board	1 on main board
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	SCSI, ext. diskette drive, ext. video	101-key keyboard port	Game port	Mouse
<b>Mass Storage</b>				
Internal Drive Bays Available	3 third-height	1 full-height, 3 half-height	Vendor did not specify	3 third-height
Diskette Drives Included (bytes)	1 360K	1 1.2M; 1 1.44M	1 1.2M; 1 1.44M	1 720K
Diskette Drive Options (bytes)	Vendor did not specify	360K, 1.2M, 720K, 1.44M	Vendor did not specify	360K, 720K
Hard Disk Interface	Vendor did not specify	Vendor did not specify	RLL	None
Hard Disk Size (bytes)/AAT (ms)	100M/25	Vendor did not specify	Vendor did not specify	None
Optional Mass Storage	100M, tape drive	40M, 80M, 100M, 120M, 150M, 300M	40M, 80M, 100M, 150M, 300M, tape drive	40M
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Optional
Number of Keys/Function Keys	101/12	101/12	101/12	84/10
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/640 x 480	On included adapter/1,024 x 768	On included adapter/1,024 x 768, 800 x 600	Integrated on system board/320 x 200
Display	Optional	Included, 14-inch, multifrequency	Included, 14-inch, analog color	Inch
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet	None	None	Ethernet
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	From manufacturer	Not available	Not available
Dimensions (H x W x D, inches)	4.13 x 15.8 x 16	6 x 21.5 x 16.75	6.00 x 21.25 x 16.75	4.2 x 15.35 x 15.75
Weight (pounds)	Vendor did not specify	55.00	55.00	17.60
AC Power Supply (watts)	Vendor did not specify	200	200	85
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	None	None	MS-DOS
Operating System(s) Supported	MS-DOS, Vendor MS-OS/2, UNIX, UNIX derivative	IBM PC-DOS, Enhanced MS-DOS, MS-DOS, Vendor MS-OS/2, UNIX, UNIX deriv.	IBM PC-DOS, IBM OS/2 Standard, IBM OS/2 Extended, Enhanced MS-DOS	IBM PC-DOS, MS-DOS
Additional Software Included	Util./diagn.	BIOS, setup, diagnostics, none	BIOS, setup, diagnostics, none	BIOS
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD	VAR/VAD, direct from vendor	Vendor did not specify	Computer retail, VAR/VAD
Parts Warranty	1 year	15 months	15 months	1 year
Labor Warranty	1 year	15 months	Vendor did not specify	1 year
Service Supported by	Authorized dealers	Vendor	Vendor	Authorized dealers
Service Features	On site, toll free	Toll free, 30-day money back	Toll free, 30-day money back	30-day money back
<b>Base Price (\$)</b>	<b>7,799</b>	<b>2,895</b>	<b>3,000</b>	<b>655</b>

Vendor	Twinhead Corp.	Twinhead Corp.	Twinhead Corp.	Twinhead Corp.
Product	SUPERSET-400	SUPERSET-490	SUPERSET-600 33C	SUPERSET-600 425
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80C286/12	80386ex/16	80386/33	i486/25
Co-Processor Options	80287	80387SX	80387, Weitek 3167	Weitek 3167
Standard RAM (bytes)/Speed (ns)	1.0M/120	1.0M/100	1.0M/80	1.0M/80
RAM Expansion Capacity (bytes)	8.0M	8.0M	8.0M	8.0M
Maximum System RAM (bytes)	8.0M	8.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Intel, 64K/15	Proprietary, 64K/15
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	1 8-bit, 3 16-bit	1 8-bit, 3 16-bit	4 16-bit	4 16-bit
Available Expansion Slots	1 8-bit, 3 16-bit	1 8-bit, 3 16-bit	4 16-bit	4 16-bit
Serial Ports	1 on main board	1 on main board	2 on main board	2 on main board
Parallel Ports	1 on main board			
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	Mouse	Mouse, 101-key keyboard port, ext. video	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	2 half-height, 1 third-height	2 half-height, 1 third-height	1 half-height, 3 third-height	1 half-height, 3 third-height
Diskette Drives Included (bytes)	1 1.2M	1 1.2M	1 1.2M	1 1.2M
Diskette Drive Options (bytes)	1.2M, 1.44M	1.2M, 1.44M	1.2M, 1.44M	1.2M, 1.44M
Hard Disk Interface	AT/IDE	AT/IDE	AT/IDE	AT/IDE
Hard Disk Size (bytes)/AAT (ms)	None	Vendor did not specify	None	None
Optional Mass Storage	40M, 100M	40M, 100M	40M, 100M, tape drive	40M, 100M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Integrated on system board/320 x 200	Integrated on system board/320 x 200	Integrated on system board/800 x 600	Integrated on system board/800 x 600
Display	Inch	Inch	Vendor did not specify	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet	Ethernet	Ethernet	Ethernet
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify	Not available	Vendor did not specify	Vendor did not specify
Dimensions (H x W x D, inches)	5.28 x 15.75 x 15.75			
Weight (pounds)	25.30	25.30	25.30	25.30
AC Power Supply (watts)	145	145	145	145
<b>Software</b>				
Operating System(s) Bundled	MS-DOS	MS-DOS	MS-DOS	MS-DOS
Operating System(s) Supported	IBM PC-DOS, IBM OS/2 Standard, MS-DOS, UNIX			
Additional Software Included	BIOS, setup	BIOS, setup	BIOS, setup	BIOS, setup
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD	Computer retail, VAR/VAD
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor did not specify	Authorized dealers	Authorized dealers	Authorized dealers
Service Features	30-day money back	30-day money back	30-day money back	30-day money back
<b>Base Price (\$)</b>	1,195	1,495	2,995	4,995

Vendor	Unisys	Unisys	Unisys	Unisys
Product	Personal Workstation 2 300/10	Personal Workstation 2 500/12	Personal Workstation 2 500/18A	Personal Workstation 2 800/18
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/10	80286/12	80386sx/16	80386/16
Co-Processor Options	80287	80287	80387SX	80387
Standard RAM (bytes)/Speed (ns)	640K	640K	1.0M/100	1.0M
RAM Expansion Capacity (bytes)	1.6M	4.6M	8.0M	1.0M
Maximum System RAM (bytes)	1.6M	4.6M	8.0M	9.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	Split AT
Bus Speed (MHz)	Vendor did not specify	Vendor did not specify	10, 8	Vendor did not specify
Total Expansion Slots	Vendor did not specify	Vendor did not specify	1 8-bit, 4 16-bit, 0 32-bit	Vendor did not specify
Available Expansion Slots	Vendor did not specify	Vendor did not specify	16-bit, 0 32-bit	Vendor did not specify
Serial Ports	1 on main board	1 on main board	2 on main board	2 on main board
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on main board
Other I/O Devices Included	Vendor did not specify	Vendor did not specify	None	Vendor did not specify
Other I/O Interfaces	Ext. video	Ext. video	None	101-key keyboard port, ext. video
<b>Mass Storage</b>				
Internal Drive Bays Available	2 half-height	2 half-height	2 half-height, 1 third-height	2 full-height, 3 half-height
Diskette Drives Included (bytes)	1 1.44M	1 1.44M	None	1 1.44M
Diskette Drive Options (bytes)	360K, 1.2M, 720K	360K, 1.2M, 720K	360K, 1.2M	360K, 1.2M, 720K, 1.44M
Hard Disk Interface	ST506/412	ST506/412	ST506/412, SCSI	ST506/412
Hard Disk Size (bytes)/AAT (ms)	20M/50	20M/50	None	40M/, 30
Optional Mass Storage	Tape drive	40M, 70M, 120M, tape drive	20M, 40M, 80M, tape drive	40M, 70M, 120M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Optional	Included (detachable)
Number of Keys/Function Keys	105/12	105/12	101/12	105/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/640 x 480	Adapter optional/640 x 480	Adapter optional/640 x 480	Adapter optional
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, Token-ring, Omnet	Ethernet, Token-ring, Omnet	Ethernet, Token-ring, Omnet	Ethernet, Token-ring, Omnet
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Not available	Not available	Not available	From manufacturer
Dimensions (H x W x D, inches)	4.00 x 15.00 x 15.70	4.00 x 15.00 x 15.70	5.0 x 15.0 x 15.0	6.50 x 21.00 x 17.00
Weight (pounds)	23.00	22.00	22.00	48.00
AC Power Supply (watts)	114	135	220/110 switchable	194
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify	Vendor did not specify	None	Vendor did not specify
Operating System(s) Supported	MS-DOS, Vendor MS-OS/2, UNIX derivative	MS-DOS, Vendor MS-OS/2, UNIX derivative	MS-DOS, Vendor MS-OS/2, UNIX derivative	MS-DOS, Vendor MS-OS/2, UNIX derivative
Additional Software Included	Comm., util./diagn.	Comm., util./diagn.	BIOS, setup, util./diagn.	Comm., util./diagn.
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor	VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Vendor, authorized dealers, third party	Vendor, authorized dealers, third party	Vendor	Vendor, authorized dealers, third party
Service Features	On site, toll free	On site, toll free	On site, toll free	On site, toll free
<b>Base Price (\$)</b>	1,006/available for GSA	2,695/available for GSA	2,256	4,318

Vendor	Unisys	Unisys	Verayss, Inc.	VNS America Corp.
<b>Product</b>	<b>Personal Workstation 2 800/20</b>	<b>Personal Workstation 2 800/25A</b>	<b>DS/PC 200</b>	<b>American Tail 386/25 386T</b>
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/20	80386/25	8088/10	80386/25
Co-Processor Options	80387	80387, Weitek 3167	8087	80387, 80287
Standard RAM (bytes)/Speed (ns)	1.0M	2.0M	640K/100	1.0M/80
RAM Expansion Capacity (bytes)	1.0M	18.0M	640K	8.0M
Maximum System RAM (bytes)	9.0M	18M	8.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Proprietary, 64K	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	Split AT	AT	XT	AT passive backplane
Bus Speed (MHz)	Vendor did not specify	Vendor did not specify	4.77	10
Total Expansion Slots	Vendor did not specify	1 8-bit, 5 16-bit, 2 32-bit	4 8-bit	2 8-bit, 5 16-bit, 1 32-bit
Available Expansion Slots	Vendor did not specify	Vendor did not specify	4 8-bit	1 8-bit, 3 16-bit, 1 32-bit
Serial Ports	2 on main board	2 on main board	1 on main board	2 on adapter
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on adapter
Other I/O Devices Included	Vendor did not specify	Vendor did not specify	None	None
Other I/O Interfaces	101-key keyboard port, ext. video	Mouse, SCSI, ext. diskette drive, 101-key keyboard port, ext. video, ext. hard disk, numeric keypad port	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	2 full-height, 3 half-height	5 half-height	3 third-height	2 full-height, 6 half-height
Diskette Drives Included (bytes)	1 1.44M	1 1.44M	1 720K	1 1.2M; 1 1.44M
Diskette Drive Options (bytes)	360K, 1.2M, 720K, 1.44M	1.2M, 1.44M	1.2M, 720K	360K, 1.2M, 1.44M
Hard Disk Interface	ST506/412	SCSI	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	40M/30	80M/23	None	40M/28
Optional Mass Storage	40M, 70M, 120M, tape drive	320M, tape drive	20M, 40M	40M, 70M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Optional	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	105/12	Vendor did not specify	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	Integrated on system board/720 x 348	On included adapter/Hercules
Display	Optional	Optional	Included, 12-inch digital monochrome	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet, Token-ring, Omnicnet	Ethernet, Token-ring, Omnicnet	None	Vendor did not specify
<b>Product Design</b>				
Type of Unit	Desktop	Floorstanding	Desktop	Floorstanding
Tempest Version	From manufacturer	Not available	Not available	Not available
Dimensions (H x W x D, inches)	6.50 x 21.00 x 17.00	21.30 x 6.50 x 18.70	4.5 x 15.2 x 15.1	Vendor did not specify
Weight (pounds)	48.00	52.00	22.00	Vendor did not specify
AC Power Supply (watts)	194	220	85	220
<b>Software</b>				
Operating System(s) Bundled	Vendor did not specify	Vendor did not specify	MS-DOS	MS-DOS, UNIX, UNIX derivative, customer request
Operating System(s) Supported	MS-DOS, Vendor MS-OS/2, UNIX derivative	MS-DOS, Vendor MS-OS/2, UNIX derivative	MS-DOS	MS-DOS, Vendor MS-OS/2, UNIX, UNIX derivative
Additional Software Included	Comm., util./diagn.	Windows, util./diagn.	BIOS, comm., applications, util./diagn., desk accessory	BIOS, setup
<b>Service/Support</b>				
Distribution Channels	Computer retail, VAR/VAD, direct from vendor	Computer retail, VAR/VAD, direct from vendor	VAR/VAD, direct from vendor	Computer retail, general retail, VAR/VAD, direct
Parts Warranty	1 year	1 year	18 months	1 year
Labor Warranty	1 year	1 year	Vendor did not specify	1 year
Service Supported by	Vendor, authorized dealers, third party	Vendor, authorized dealers, third party	Vendor, authorized dealers	Vendor, authorized dealers, third party
Service Features	On site, toll free	On site, toll free	On site	On site, toll free, 30-day money back
<b>Base Price (\$)</b>	4,075	7,315/available for GSA	1,750	2,495

Vendor	Zendex Corp.	Zendex Corp.	Zendex Corp.	Zenith Data Systems Corp.
Product	ZX-310/17AC	ZX-310/40B	ZX-310/82A	Z-159 2
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/20	80286/20	80286/20	8088/8
Co-Processor Options	80287	80287	80287	8087
Standard RAM (bytes)/Speed (ns)	1.0M/80	1.0M/80	2.0M/80	768K/150
RAM Expansion Capacity (bytes)	1.0M	1.0M	2.0M	1.2M
Maximum System RAM (bytes)	2.0M	2.0M	2.0M	5M
RAM Cache, Size (bytes)/Speed (ns)	Intel, 8K/30	Intel, 8K/30	Intel, 8K/30	Not supported
<b>Input/Output</b>				
Bus Architecture	Multibus	Multibus	Multibus	XT
Bus Speed (MHz)	10	10	10	8
Total Expansion Slots	10 8-bit, 8 16-bit	10 8-bit, 8 16-bit	10 8-bit, 8 16-bit	6 8-bit, 0 16-bit, 0 32-bit
Available Expansion Slots	Vendor did not specify	Vendor did not specify	Vendor did not specify	5 8-bit, 0 16-bit, 0 32-bit
Serial Ports	2 on main board	2 on main board	14 on adapter	1 on main board
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on main board
Other I/O Devices Included	Vendor did not specify	Vendor did not specify	Vendor did not specify	None
Other I/O Interfaces	SCSI, ext. diskette drive, ext. video, ext. hard disk, audio	SCSI, ext. diskette drive, ext. video, ext. hard disk, audio	SCSI, ext. diskette drive, ext. video, ext. hard disk, audio	None
<b>Mass Storage</b>				
Internal Drive Bays Available	1 full-height, 2 half-height	1 full-height, 2 half-height	1 full-height, 2 half-height	3 half-height
Diskette Drives Included (bytes)	1	1	1	2 360K
Diskette Drive Options (bytes)	None	None	None	720K
Hard Disk Interface	SCSI	SCSI	SCSI	None
Hard Disk Size (bytes)/AAT (ms)	20M/40	40M/40	80M/40	None
Optional Mass Storage	Tape drive	Tape drive	Tape drive	20M
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	84/10
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	Adapter optional	Adapter optional	On included adapter/320 x 200
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Ethernet	Ethernet	Ethernet	None
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Dimensions (H x W x D, inches)	Vendor did not specify	Vendor did not specify	Vendor did not specify	6.30 x 16.00 x 16.50
Weight (pounds)	Vendor did not specify	Vendor did not specify	Vendor did not specify	42.00
AC Power Supply (watts)	120	120	120	168
<b>Software</b>				
Operating System(s) Bundled	None	None	None	Enhanced MS-DOS
Operating System(s) Supported	UNIX derivative, RMX-86	UNIX derivative, RMX-86	UNIX derivative, RMX-86	MS-DOS
Additional Software Included	Util./diagn.	Util./diagn.	Util./diagn.	Util./diagn.
<b>Service/Support</b>				
Distribution Channels	Direct from vendor	Direct from vendor	Direct from vendor	Computer retail, direct from vendor
Parts Warranty	90 days	90 days	90 days	1 year
Labor Warranty	90 days	90 days	90 days	1 year
Service Supported by	Vendor	Vendor	Vendor	Authorized dealers
Service Features	Toll free	Toll free	Toll free	Vendor did not specify
Base Price (\$)	7,950	7,950	7,950	1,599/available for GSA

Vendor	Zenith Data Systems Corp.			
Product	Z-159 3	Z-248/12 1	Z-248/12 20	Z-248/12 40
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	8088/8	80288/12	80288/12	80288/12
Co-Processor Options	8087	80287	80287	80287
Standard RAM (bytes)/Speed (ns)	768K/150	1.0M/85	1.0M/85	1.0M/85
RAM Expansion Capacity (bytes)	1.2M	6M	6M	6M
Maximum System RAM (bytes)	5M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	XT	AT	AT	AT
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	6 8-bit, 0 16-bit, 0 32-bit	1 8-bit, 4 16-bit, 0 32-bit	1 8-bit, 4 16-bit, 0 32-bit	2 8-bit, 5 16-bit, 0 32-bit
Available Expansion Slots	5 8-bit, 0 16-bit, 0 32-bit	1 8-bit, 4 16-bit, 0 32-bit	1 8-bit, 4 16-bit, 0 32-bit	1 8-bit, 3 16-bit, 0 32-bit
Serial Ports	1 on main board	2 on adapter	2 on adapter	2 on adapter
Parallel Ports	1 on main board	1 on adapter	1 on adapter	1 on adapter
Other I/O Devices Included	None	None	None	None
Other I/O Interfaces	None	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Mass Storage</b>				
Internal Drive Bays Available	3 half-height	2 full-height, 2 half-height	2 full-height, 2 half-height	2 full-height, 2 half-height
Diskette Drives Included (bytes)	1 360K	1 1.2M	1 1.2M; 1 1.44M	1 1.44M
Diskette Drive Options (bytes)	720K	360K, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M
Hard Disk Interface	ST506/412	ST506/412	ESDI	ST506/412
Hard Disk Size (bytes)/AAT (ms)	20M/85	None	160M/18	40M/28
Optional Mass Storage	None	40M, 80M, 160M	40M, 80M, 160M	40M, 80M, 160M
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	84/10	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/320 x 200	Adapter optional	Adapter optional	On included adapter/640 x 480
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	None	None	None	None
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify			
Dimensions (H x W x D, inches)	6.30 x 16.00 x 16.50	6.50 x 21.00 x 16.50	6.50 x 21.00 x 16.50	6.50 x 21.00 x 16.50
Weight (pounds)	42.00	35.00	35.00	35.00
AC Power Supply (watts)	168	200	200	200
<b>Software</b>				
Operating System(s) Bundled	Enhanced MS-DOS	Enhanced MS-DOS	Enhanced MS-DOS	Enhanced MS-DOS
Operating System(s) Supported	MS-DOS	Enhanced MS-DOS, Vendor MS-OS/2	Enhanced MS-DOS, Vendor MS-OS/2	Enhanced MS-DOS, Vendor MS-OS/2
Additional Software Included	Util./diagn.	Util./diagn.	Windows, util./diagn.	Windows, util./diagn.
<b>Service/Support</b>				
Distribution Channels	Computer retail, direct from vendor			
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Authorized dealers	Authorized dealers	Authorized dealers	Authorized dealers
Service Features	Vendor did not specify			
<b>Base Price (\$)</b>	2,199/available for GSA	2,099	2,099	3,399

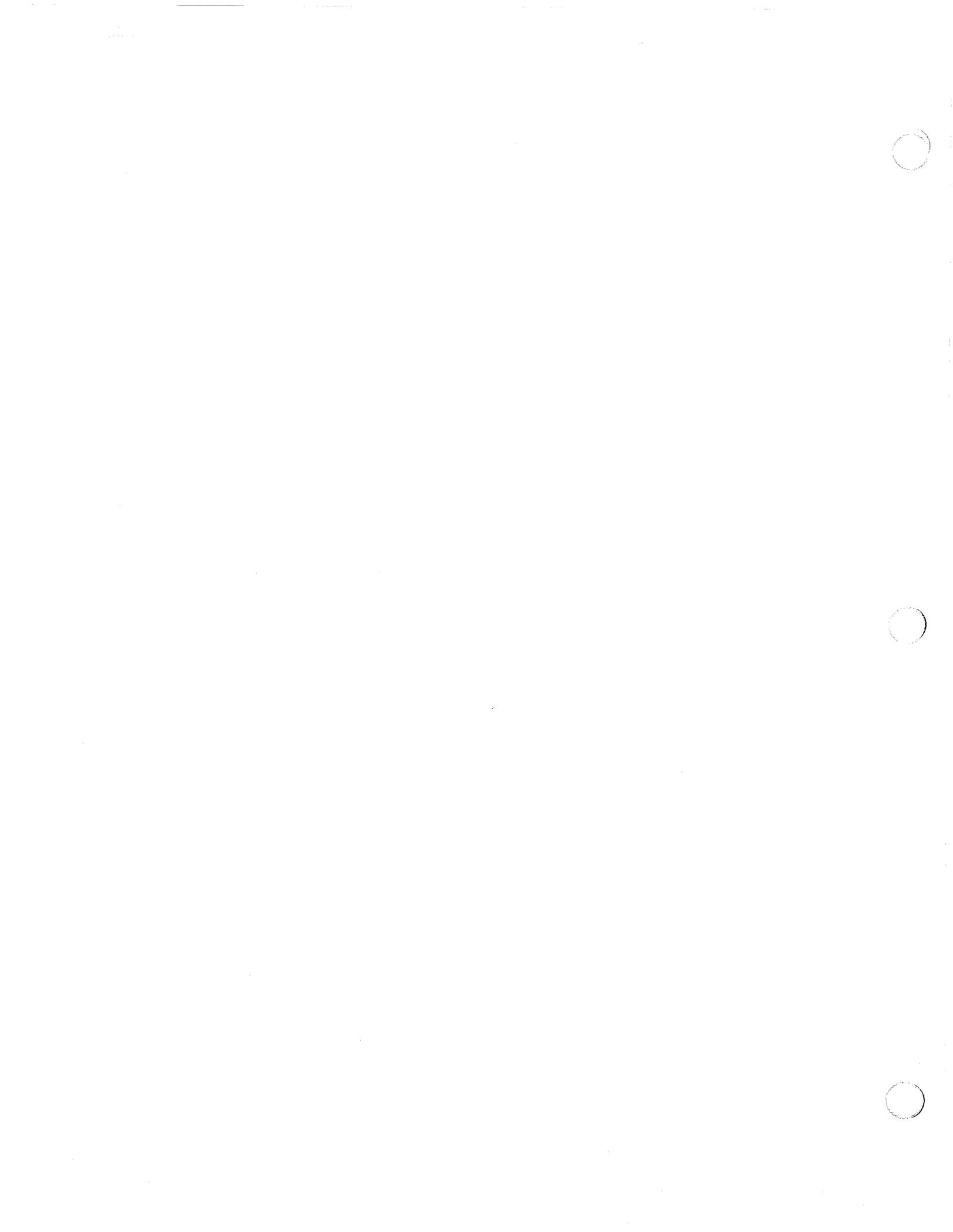
Vendor	Zenith Data Systems Corp.			
Product	Z-286 LP/12 1	Z-286 LP/12 20	Z-286 LP/12 40	Z-386/16 40
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80286/12	80286/12	80286/12	80386/16
Co-Processor Options	80287	80287	80287	80387, 80287
Standard RAM (bytes)/Speed (ns)	1.0M/85	1.0M/85	1.0M/85	1.0M/100
RAM Expansion Capacity (bytes)	6M	6M	6M	Vendor did not specify
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	16.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported	Not supported	Not supported	Proprietary, 64K
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	AT passive backplane
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	0 8-bit, 3 16-bit, 0 32-bit	0 8-bit, 3 16-bit, 0 32-bit	0 8-bit, 3 16-bit, 0 32-bit	1 8-bit, 2 16-bit, 7 32-bit
Available Expansion Slots	0 8-bit, 2 16-bit, 0 32-bit	0 8-bit, 2 16-bit, 0 32-bit	0 8-bit, 2 16-bit, 0 32-bit	1 8-bit, 1 16-bit, 3 32-bit
Serial Ports	2 on main board	2 on main board	2 on main board	1 on adapter
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on adapter
Other I/O Devices Included	None	None	None	Mouse
Other I/O Interfaces	Vendor did not specify	Vendor did not specify	Vendor did not specify	None
<b>Mass Storage</b>				
Internal Drive Bays Available	1 full-height, 2 half-height	1 full-height, 2 half-height	1 full-height, 2 half-height	1 full-height, 4 half-height
Diskette Drives Included (bytes)	1 1.44M	1 1.44M	1 1.44M	1 1.2M
Diskette Drive Options (bytes)	360K	360K	360K	360K, 1.44M
Hard Disk Interface	ST506/412	ST506/412	ST506/412	ST506/412
Hard Disk Size (bytes)/AAT (ms)	None	20M/85	40M/85	40M/28
Optional Mass Storage	20M, 40M	20M, 40M	20M, 40M	80M, 160M
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/640 x 480			
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	None	None	None	None
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify			
Dimensions (H x W x D, inches)	3.88 x 14.00 x 15.00	3.88 x 14.00 x 15.00	3.88 x 14.00 x 15.00	6.50 x 21.00 x 16.50
Weight (pounds)	18.00	18.00	18.00	35.00
AC Power Supply (watts)	80	80	80	200
<b>Software</b>				
Operating System(s) Bundled	Enhanced MS-DOS	Enhanced MS-DOS	Enhanced MS-DOS	Enhanced MS-DOS
Operating System(s) Supported	Enhanced MS-DOS, Vendor MS-OS/2	Enhanced MS-DOS, Vendor MS-OS/2	Enhanced MS-DOS, Vendor MS-OS/2	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative
Additional Software Included	None	Windows	Windows	Windows
<b>Service/Support</b>				
Distribution Channels	Computer retail, direct from vendor			
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Authorized dealers	Authorized dealers	Authorized dealers	Authorized dealers
Service Features	Vendor did not specify			
<b>Base Price (\$)</b>	2,299/available for GSA	2,699/available for GSA	3,099/available for GSA	5,499/available for GSA

Vendor	Zenith Data Systems Corp.	Zenith Data Systems Corp.	Zenith Data Systems Corp.	Zenith Data Systems Corp.
Product	Z-386/20 1	Z-386/20 40	Z-386/20 70	Z-386/25 1
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/20	80386/20	80386/20	80386/25
Co-Processor Options	80387, Weitek 3167	80387, Weitek 3167	80387, Weitek 3167	80387, Weitek 3167
Standard RAM (bytes)/Speed (ns)	1.0M	1.0M	1.0M	2.0M/100
RAM Expansion Capacity (bytes)	8.0M	8.0M	8.0M	8.0M
Maximum System RAM (bytes)	16.0M	16.0M	16.0M	32M
RAM Cache, Size (bytes)/Speed (ns)	Proprietary	Proprietary	Proprietary	Proprietary, 64K
<b>Input/Output</b>				
Bus Architecture	AT	AT	AT	Split AT
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	3 16-bit, 4 32-bit	3 16-bit, 4 32-bit	3 16-bit, 4 32-bit	0 8-bit, 2 16-bit, 5 32-bit
Available Expansion Slots	3 16-bit, 4 32-bit	3 16-bit, 4 32-bit	3 16-bit, 4 32-bit	0 8-bit, 2 16-bit, 3 32-bit
Serial Ports	2 on main board	2 on main board	2 on main board	2 on adapter
Parallel Ports	1 on main board	1 on main board	1 on main board	1 on adapter
Other I/O Devices Included	None	None	None	Vendor did not specify
Other I/O Interfaces	None	None	None	Vendor did not specify
<b>Mass Storage</b>				
Internal Drive Bays Available	3 half-height	3 half-height	3 half-height	1 full-height, 4 half-height
Diskette Drives Included (bytes)	1 1.44M	1 1.44M	1 1.44M	1 1.44M
Diskette Drive Options (bytes)	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M, 1.44M	360K, 1.2M
Hard Disk Interface	ESDI	ESDI	ESDI	ESDI
Hard Disk Size (bytes)/AAT (ms)	None	40M/18	70M/18	None
Optional Mass Storage	40M, 70M, tape drive	40M, 70M, tape drive	40M, 70M, tape drive	70M, 150M, 320M
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	Adapter optional	On included adapter/640 x 480	On included adapter/640 x 480	Adapter optional
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	Vendor did not specify	Vendor did not specify	Vendor did not specify	None
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Dimensions (H x W x D, inches)	Vendor did not specify	Vendor did not specify	Vendor did not specify	6.50 x 21.00 x 16.50
Weight (pounds)	Vendor did not specify	Vendor did not specify	Vendor did not specify	35.00
AC Power Supply (watts)	Vendor did not specify	Vendor did not specify	Vendor did not specify	200
<b>Software</b>				
Operating System(s) Bundled	Enhanced MS-DOS	Enhanced MS-DOS	Enhanced MS-DOS	Enhanced MS-DOS
Operating System(s) Supported	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative	Enhanced MS-DOS, MS-DOS, UNIX derivative
Additional Software Included	BIOS, setup, windows, util./diagn.	BIOS, setup, windows, util./diagn.	BIOS, setup, windows, util./diagn.	None
<b>Service/Support</b>				
Distribution Channels	Computer retail, direct from vendor	Computer retail, direct from vendor	Computer retail, direct from vendor	Computer retail, direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Authorized dealers	Authorized dealers	Authorized dealers	Authorized dealers
Service Features	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Base Price (\$)</b>	4,299	5,299	5,699	6,199/available for GSA

Vendor	Zenith Data Systems Corp.			
Product	Z-386/25 150	Z-386/25 320	Z-386/25 70	Z-386/33 1
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/25	80386/25	80386/25	80386/33
Co-Processor Options	80387, Weitek 3167	80387, Weitek 3167	80387, Weitek 3167	80387, Weitek 3167
Standard RAM (bytes)/Speed (ns)	2.0M/100	2.0M/100	2.0M/100	2.0M/100
RAM Expansion Capacity (bytes)	8.0M	8.0M	8.0M	8.0M
Maximum System RAM (bytes)	32M	32M	32M	32M
RAM Cache, Size (bytes)/Speed (ns)	Proprietary, 64K	Proprietary, 64K	Proprietary, 64K	Proprietary, 64K
<b>Input/Output</b>				
Bus Architecture	Split AT	Split AT	Split AT	Split AT
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	0 8-bit, 2 16-bit, 5 32-bit			
Available Expansion Slots	0 8-bit, 1 16-bit, 3 32-bit	0 8-bit, 1 16-bit, 3 32-bit	0 8-bit, 1 16-bit, 3 32-bit	0 8-bit, 2 16-bit, 3 32-bit
Serial Ports	2 on adapter	2 on adapter	2 on adapter	2 on adapter
Parallel Ports	1 on adapter	1 on adapter	1 on adapter	1 on adapter
Other I/O Devices Included	Vendor did not specify			
Other I/O Interfaces	Vendor did not specify	Vendor did not specify	Vendor did not specify	None
<b>Mass Storage</b>				
Internal Drive Bays Available	1 full-height, 4 half-height			
Diskette Drives Included (bytes)	1 1.44M	1 1.44M	1 1.44M	1 1.44M
Diskette Drive Options (bytes)	360K, 1.2M	360K, 1.2M	360K, 1.2M	360K, 1.2M
Hard Disk Interface	ESDI	ESDI	ESDI	None
Hard Disk Size (bytes)/AAT (ms)	150M/18	320M/16	70M/18	None
Optional Mass Storage	70M, 150M, 320M	70M, 150M, 320M	70M, 150M, 320M	150M, 320M
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/640 x 480	On included adapter/640 x 480	On included adapter/640 x 480	Adapter optional
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	None	None	None	None
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify			
Dimensions (H x W x D, inches)	6.50 x 21.00 x 16.50			
Weight (pounds)	35.00	35.00	35.00	35.00
AC Power Supply (watts)	200	200	200	200
<b>Software</b>				
Operating System(s) Bundled	Enhanced MS-DOS	Enhanced MS-DOS	Enhanced MS-DOS	Enhanced MS-DOS
Operating System(s) Supported	Enhanced MS-DOS, MS-DOS, UNIX derivative	Enhanced MS-DOS, MS-DOS, UNIX derivative	Enhanced MS-DOS, MS-DOS, UNIX derivative	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative
Additional Software Included	Windows	Windows	Windows	None
<b>Service/Support</b>				
Distribution Channels	Computer retail, direct from vendor	Computer retail, direct from vendor	Computer retail, direct from vendor	Direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Authorized dealers	Authorized dealers	Authorized dealers	Authorized dealers
Service Features	Vendor did not specify			
<b>Base Price (\$)</b>	8,299/available for GSA	9,999/available for GSA	7,499/available for GSA	7,499

Vendor	Zenith Data Systems Corp.	Zenith Data Systems Corp.	Zenith Data Systems Corp.	Zenith Data Systems Corp.
Product	Z-386/33 150	Z-386/33 320	Z-386SX 1	Z-386SX 40
<b>Processor/Memory</b>				
CPU/Clock Speed (MHz)	80386/33	80386/33	80386sx/16	80386sx/16
C>Processor Options	80387, Weitek 3167	80387Weitek 3167	80387SX	80387SX
Standard RAM (bytes)/Speed (ns)	2.0M/100	2.0M/100	2.0M	2.0M
RAM Expansion Capacity (bytes)	8.0M	8.0M	16.0M	16.0M
Maximum System RAM (bytes)	32M	32M	8.0M	8.0M
RAM Cache, Size (bytes)/Speed (ns)	Proprietary, 64K	Proprietary, 64K	Not supported	Not supported
<b>Input/Output</b>				
Bus Architecture	Split AT	Split AT	AT	AT
Bus Speed (MHz)	8	8	8	8
Total Expansion Slots	0 8-bit, 2 16-bit, 5 32-bit	0 8-bit, 2 16-bit, 5 32-bit	3 16-bit, 1 32-bit	3 16-bit, 1 32-bit
Available Expansion Slots	0 8-bit, 1 16-bit, 3 32-bit	0 8-bit, 1 16-bit, 3 32-bit	3 16-bit, 1 32-bit	3 16-bit, 1 32-bit
Serial Ports	2 on adapter	2 on adapter	2 on main board	2 on main board
Parallel Ports	1 on adapter	1 on adapter	1 on main board	1 on main board
Other I/O Devices Included	Vendor did not specify	Vendor did not specify	None	None
Other I/O Interfaces	None	None	None	None
<b>Mass Storage</b>				
Internal Drive Bays Available	1 full-height, 4 half-height	1 full-height, 4 half-height	Vendor did not specify	Vendor did not specify
Diskette Drives Included (bytes)	1 1.44M	1 1.44M	1 1.44M	1 1.44M
Diskette Drive Options (bytes)	360K, 1.2M	360K, 1.2M	1.2M, 1.44M	Vendor did not specify
Hard Disk Interface	ESDI	ESDI	None	ST506/412
Hard Disk Size (bytes)/AAT (ms)	150M/18	320M/, 16	None	40M/25
Optional Mass Storage	150M, 320M	150M, 320M	40M, 80M, tape drive	40M, 80M, tape drive
<b>Keyboard</b>				
Availability	Included (detachable)	Included (detachable)	Included (detachable)	Included (detachable)
Number of Keys/Function Keys	101/12	101/12	101/12	101/12
<b>Video/Display</b>				
Video Controller/Resolution (pixels)	On included adapter/640 x 480	On included adapter/640 x 480	On included adapter/640 x 350	On included adapter/640 x 350
Display	Optional	Optional	Optional	Optional
<b>Local Area Network Support</b>				
Vendor LAN Options	None	None	Vendor did not specify	Vendor did not specify
<b>Product Design</b>				
Type of Unit	Desktop	Desktop	Desktop	Desktop
Tempest Version	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Dimensions (H x W x D, inches)	6.50 x 21.00 x 16.50	6.50 x 21.00 x 16.50	Vendor did not specify	Vendor did not specify
Weight (pounds)	35.00	35.00	Vendor did not specify	Vendor did not specify
AC Power Supply (watts)	200	200	150	150
<b>Software</b>				
Operating System(s) Bundled	Enhanced MS-DOS	Enhanced MS-DOS	Vendor did not specify	Vendor did not specify
Operating System(s) Supported	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative	Enhanced MS-DOS, Vendor MS-OS/2, UNIX derivative	Enhanced MS-DOS, Vendor MS-OS/2	Enhanced MS-DOS, Vendor MS-OS/2
Additional Software Included	Windows	Windows	BIOS, setup, util./diagn.	BIOS, setup, windows, util./diagn.
<b>Service/Support</b>				
Distribution Channels	Direct from vendor	Direct from vendor	Computer retail, direct from vendor	Computer retail, direct from vendor
Parts Warranty	1 year	1 year	1 year	1 year
Labor Warranty	1 year	1 year	1 year	1 year
Service Supported by	Authorized dealers	Authorized dealers	Authorized dealers	Authorized dealers
Service Features	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Base Price (\$)</b>	9,599	11,299	2,333	3,999

<b>Vendor</b>	Zenith Data Systems Corp.
<b>Product</b>	Z-388SX 80
<b>Processor/Memory</b>	
CPU/Clock Speed (MHz)	80386sx/16
Co-Processor Options	80387SX
Standard RAM (bytes)/Speed (ns)	2.0M
RAM Expansion Capacity (bytes)	16.0M
Maximum System RAM (bytes)	8.0M
RAM Cache, Size (bytes)/Speed (ns)	Not supported
<b>Input/Output</b>	
Bus Architecture	AT
Bus Speed (MHz)	8
Total Expansion Slots	3 16-bit, 1 32-bit
Available Expansion Slots	3 16-bit, 1 32-bit
Serial Ports	2 on main board
Parallel Ports	1 on main board
Other I/O Devices Included	None
Other I/O Interfaces	None
<b>Mass Storage</b>	
Internal Drive Bays Available	Vendor did not specify
Diskette Drives Included (bytes)	1 1.44M
Diskette Drive Options (bytes)	Vendor did not specify
Hard Disk Interface	ST506/412
Hard Disk Size (bytes)/AAT (ms)	80M/18
Optional Mass Storage	40M, 80M, tape drive
<b>Keyboard</b>	
Availability	Included (detachable)
Number of Keys/Function Keys	101/12
<b>Video/Display</b>	
Video Controller/Resolution (pixels)	On included adapter/640 x 350
Display	Optional
<b>Local Area Network Support</b>	
Vendor LAN Options	Vendor did not specify
<b>Product Design</b>	
Type of Unit	Desktop
Tempest Version	Vendor did not specify
Dimensions (H x W x D, inches)	Vendor did not specify
Weight (pounds)	Vendor did not specify
AC Power Supply (watts)	150
<b>Software</b>	
Operating System(s) Bundled	Vendor did not specify
Operating System(s) Supported	Enhanced MS-DOS, Vendor MS-OS/2
Additional Software Included	BIOS, setup, windows, util./diagn.
<b>Service/Support</b>	
Distribution Channels	Computer retail, direct from vendor
Parts Warranty	1 year
Labor Warranty	1 year
Service Supported by	Authorized dealers
Service Features	Vendor did not specify
<b>Base Price (\$)</b>	4,699



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# Modems: Market Overview

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**Synopsis****Editor's Note**

This report explores the modem market. For an overview of modem technology, see Report 570-201. For detailed information on approximately 500 modems designed to work with microcomputers, see Report 570-301.

**Market Highlights**

ISDN has been characterized as the modem killer, but is the Goliath ISDN bearing down mightily on the David-sized modem? Apparently not yet. The modem companies, meanwhile, have been busily assembling new arsenals of innovative products that will help keep the giant at bay. Eventually, digital will replace analog, but predictions vary, and industry analysts are not setting a firm date for the interment of the modem.

The responses to our survey indicate that the modem industry is alive and well. Microcomputer modems detailed in the comparison columns total approximately 500 from over 60 vendors, covering modems in the following categories: low, medium, high, fiber optics, modem eliminators, radio frequency, and line drivers. Vendors are incorporating the latest MNP error correcting proto-

cols and the latest CCITT recommendations into their products. Speeds are going higher without sacrificing clarity or reliability. Many features that were once high-priced options are now standard.

In 1989, users welcomed price reductions on some very sophisticated devices. Companies teamed up to combine resources and curb research and development expenditures. U.S. vendors looked for markets across the seas, both Atlantic and Pacific, and adjusted their products for use in the global village. The facsimile revolution has hit the modem industry, and modem vendors are gearing up to meet the challenge.

Yet, it is much too early to bid the modem goodbye. This report also profiles leading vendors who are doing their best to keep the industry fresh and profitable.

## Market Leaders

### AT&T Paradyne

In March 1989, AT&T acquired Paradyne, a data communications equipment supplier. Paradyne attracted AT&T's interest chiefly because of its strong presence in the international marketplace. After AT&T received the go-ahead to compete in the data communications arena, the company began scouting for opportunities to increase its visibility on the world scene. Paradyne, now AT&T Paradyne, filled that need. It had distributorships in 47 countries and sales offices in the United States, United Kingdom, Japan, Hong Kong, and Canada.

AT&T Paradyne's modem line-up includes the Paradyne 3400 Series and the AT&T Data-Phone II modems, both marketed under the AT&T Paradyne name. Although the 3400 Series and Data-Phone II are complementary product lines, migration capabilities have not been worked out.

One of the most sophisticated modems on the market, the 3400 Series of network-managed modems transcends the ordinary by working with the ANALYSIS System and with Personality Modules, so named because they allow users to adjust modem characteristics to suit their applications.

### Codex

Codex anticipated the demand for V.32 devices, beating competitors to market by shipping V.32 modems in 1986. In January 1989, the company

upgraded its V.32 product line by introducing the 2264 for the U.S. and the 2266 for international networks. A world leader in V.32 technology, Codex has installed over 20,000 such devices internationally.

A member of the committee that drafted the V.32 recommendation in 1984, Codex has not wavered from its commitment to the standard. Foreseeing a strong demand into the 1990s for products incorporating high-speed dial modem technology, Codex proposes V.32 as the solution for cutting dial line costs while retaining reliability in sensitive applications such as leased-line backup, off-hour polling, and transmitting CAD/CAM graphics.

In 1989, Codex enhanced its modem and network management lines by adding direct interfaces to IBM's NetView. The DualVIEW Management Option enables the 2600 Series to be managed by two independent systems. Users can manage the 2600 Series from a Codex Network Management System and directly from IBM's NetView.

In addition to V.32 modems, Codex produces the 2500 Series of network-managed modems for users new to network management.

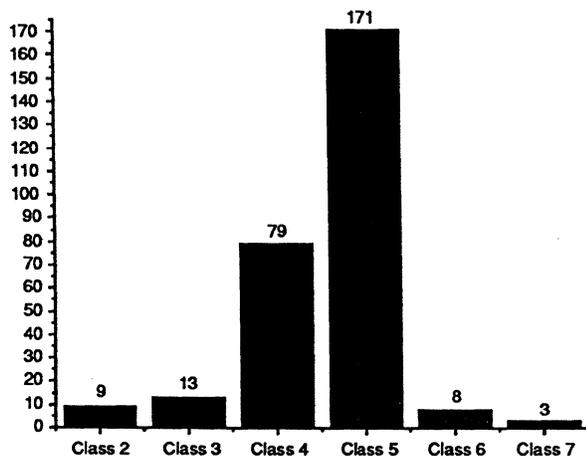
To support its digital networking strategy and expand solutions capabilities, Codex entered into a new field in December 1989 by announcing the formation of a LAN Internetworking Group. The first product of the group, the 6310 EtherSpan Bridge, is a full-functioned IEEE 802.3 Ethernet MAC Learning Bridge. The 6310 bundles any multiple of 24 DS0 64K bps circuits.

### General DataComm

General DataComm maintains a strong presence in the modem market by offering an exceptionally comprehensive line of products. Recently, the company has promoted the "uncluttered desk" concept through its line of desktop modems. General DataComm has incorporated V.32 features into its desktop line via the DeskTop V.32.

Outside the U.S., General DataComm has entered into contracts with Telecom Canada and the Hong Kong and Shanghai Banking Corporation. The two-year agreement with Telecom Canada covers a full line of modems featuring data rates ranging from 300 bps to 9600 bps. The five-year agreement with Hong Kong and Shanghai Banking Corporation authorizes General DataComm to supply, install, and maintain equipment

Figure 1.  
Products with MNP Class Identified



and software for the financial organization's world-wide information network.

### **Hayes Microcomputer Products**

Hayes has an enviable position in the microcomputer modem market: its name almost generically signifies modem because its AT Command set has become a de facto standard in the industry. In October 1989, Hayes announced a major repositioning of its products and marketing strategy, which focused on encouraging users to move into higher-speed brackets and to make use of sophisticated features. As a catalyst for change, Hayes reduced prices on modems in the Advanced System Product and Standard Business Product segments. Hayes offered a 28 percent reduction for V-series Smartmodem 2400 and a 23 percent reduction on V-series Smartmodem 9600.

Dennis C. Hayes, president of the company, outlined the reasons for repositioning. "Hayes is well known for leadership in technology, features, quality, and service. This new positioning addresses the perception that Hayes products are too expensive and eliminates price as a factor in the purchase decision. Our competitors may not appreciate this strategy, but end users and resellers will appreciate the new prices and margins."

Hayes actively participated in the adaptation of V.42 bis as the standard for data compression, which includes enhancements proposed by IBM, British Telecom, and Hayes. Shortly after the CCITT Study Group XVIII approved V.42 bis, Hayes announced support for the standard in its V-series system products. In December 1989, customers with V-series products incorporating V.42 could upgrade to V.42 bis.

Recognizing the emergence of a PC fax market, Hayes acquired the JT Fax brand and its line of hardware and software facsimile products for microcomputers from Asher Technologies and Quadram, L.P., subsidiaries of Intelligent Systems Master L.P., in June 1989.

### **IBM**

Until recently, users did not identify IBM with the modem market. In 1988, IBM changed that perception by introducing the 7860 high-end, leased line modem as part of its strategy to position itself as a provider of total network solutions. In addition, IBM promotes the use of the modems with its

NetView network management system, which centralizes monitoring and control.

The 7860s are 19.2K bps models with innovative features, most notably a multipoint capability that eliminates the need for separate modems or controller ports. IBM incorporated very large scale integrated (VLSI) circuits into the products and built them around a powerful, single digital signal processor. The 7860 also supports bidirectional 14.4K operation in multipoint mode and 9600 bps operation with Trellis Coded Modulation.

By letting loose a barrage of communication products, IBM has not yet captured the flag, but is steadily encroaching on the opposition's territory. The 7860 sent tremors through the industry, which realizes only too well that IBM's huge installed base represents a receptive audience.

### **Microcom**

A pioneer in error-correction protocols, Microcom continues to stretch the limits of the technology. The modem market welcomed Microcom Networking Protocol (MNP) with such enthusiasm that many vendors installed it on their products and enhanced their lines with new versions. The most recent class of MNP, MNP 10, made its debut on Microcom's QX/2400t modem in November 1989. MNP 10 tackles the tough job of optimizing data transmission over poor lines and cellular connections. Reflecting the trend of "combination modems," the QX/2400t also features MNP 7, which sustains throughputs of up to 12,000 bits per second over dial-up lines. Priced at \$699, QX/2400t responds quite well to the needs of an imperfect world populated with less than ideal line equipment and transmission environments.

When Microcom spots a need, such as the elimination of cumbersome equipment and cables, it quickly moves to fill the void. In November 1989, the company announced the QX/24LTc laptop modem featuring MNP Class 5. Functioning as an internal laptop modem, QX/24LTc enables executives, journalists, technicians, and other professionals who frequently access computers to communicate simply by plugging into a phone line. MNP 5 data compression techniques reduce the cost of the phone connection and support speeds up to 4800 bps. Microcom priced the QX/24LTc at \$599.

Although innovative, Microcom does not pursue novelty at the expense of quality, as evidenced by its rating in *PC Digest*, which issues independent comparative ratings reports produced by National Software Testing Labs (NSTL) of Plymouth Meeting, PA. In a comparison of high-speed modems from 10 leading vendors that included U.S. Robotics, Racal-Vadic, General DataComm, Multi-Tech, Hayes, SmarTeam, Telebit, Ven-Tel, and Cermetek, Microcom's QX/V.32c modem outdistanced all of them. NSTL awarded an overall rating of 8.5 out of a possible 10 to the product, stating that its outstanding performance "is largely attributable to its MNP Level 7 data compression. The Microcom's (QX/V.32c) maximum system connection of 38,000 bps also boosts its performance."

### Racal-Milgo

At TCA in San Diego in September 1989, Racal-Milgo performed the first public demonstration of its Excalibur family of integrated network access products, which include leased line and dial-up modems, and digital access devices. With these products, Racal-Milgo is easing its customers into the digital '90s by offering them economical migration paths.

In keeping with the trend toward trim products, the standalone units of the Excalibur family reside in compact, desktop enclosures that can fit in attache cases. A central site nest accommodates central-site Excalibur configurations by providing high-density mounting space for all printed circuit boards.

Racal-Milgo has aimed the Excalibur family at the international market for high-speed leased line and dial modems. Since the company has an installed customer base of network users in 82 countries, Excalibur should generate a high level of interest. The Communications Management Series (CMS) external network management system can direct the family. Customers can, however, control these devices via a common central site nest control system and LCD front panel display for remote units.

### Survey Results

Microcom Networking Protocol (MNP) continues to win favor with vendors. The survey indicated that 269 vendors have incorporated one of the

classes of MNP into their products. Some of them designated which Class of MNP they used, the classes running between 1 and 10. Microcom introduced Class 10 as part of its QX/2400t modem in November 1989. Class 9 did not appear in any of the vendors' products. This class of MNP connects MNP- and non-MNP-compatible modems at the highest performance levels. Figure 1 shows the breakout of the various MNP classes recorded in the survey.

MNP Class 5 ranks as the dominant choice of vendors at this time, followed by MNP Class 4. MNP Class 5 handles data compression and dynamically adjusts to the type of data being sent. MNP Class 4 attains up to 120 percent link throughput efficiency, automatically adjusts packet sizes to meet line conditions, and reduces protocol overhead. A combination of MNP Class 4 and 5 increases link throughput up to 200 percent.

Modems conforming to V.33 specifications cropped up during the survey, but not too frequently. Fifty-five products used V.33, representing 6.52 percent of the modems in the low/medium/high section of the survey. Possibly, the small showing of V.33 results from its being the standard for leased-line, full-duplex modems running at speeds up to 14.4K bps. Since many users skip 14.4K bps on their way to 19.2K bps, V.33 has not made much of an impact. Some vendors offer proprietary versions of V.33 or combine it with V.32. The trend toward speeds up to 19.2K is reflected in the survey. Vendors reported 50 products which attain that level.

The two most recent CCITT recommendations, V.42 (for error correction) and V.42 bis (for data compression), have only sparsely shown up in the surveyed products. Perhaps vendors have been reluctant to introduce V.42 and V.42 bis products because the CCITT did not ratify V.42 until 1988 and V.42 bis until late in 1989. Of 269 products in the low/medium/high categories, only 9 used V.42 and 2 used V.42 bis.

Many vendors marketing Radio Frequency modems are directing their products toward the cellular market. In the fiber optic category of the survey, plastic as a transmission medium shows up fairly often. A breakout of the categories of products surveyed and the number in each category follows:

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Low speed	311
Medium speed	238
High speed	108
Line Drivers	72
Limited Distance	134
Fiber Optic	92
Radio Frequency	55
Modem Eliminators	30

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### **Trends and Issues**

During 1989, the modem industry witnessed price reductions, a flurry of international activity, marketing agreements and acquisitions, and the emergence of modems with fax capabilities.

#### **Lower Prices**

Codex has taken the lead in bringing down prices in the 19.2K modem market. In January 1990, Codex triggered pricing realignments throughout the industry by announcing a 19.2K bps leased-line modem selling for \$2,995, almost half the price of the company's existing 19.2K device, the Model 2382. The new model, the 3380, is a leased-line modem with diagnostic features. By pricing the 3380 so attractively, Codex is signaling users of 9.6K bps modems that the time has come for them to enter the 19.2K bps camp.

Now that prices have come tumbling down, users of 9.6K bps have lost their last objection to switching to 19.2K. Codex attributes the price slashing of the 3380 to a manufacturing process that refined production procedures and pared down costs. Users of the 3380 can configure remote modems from the local modems, a feature that eliminates the need to send staff to remote locations.

Another leading vendor, Hayes Microcomputer Products, has taken a similar approach. In October 1989, the company adopted a marketing strategy to change its image in the marketplace as a producer of excellent, but expensive modems. To accomplish this goal, Hayes made deep price reductions, as much as 43 percent on some products. The price of the Smartmodem 1200B dropped from \$349 to \$199. The price of the Smartmodem 1200B/Smartcom II modem dropped from \$399 to \$249, a difference of 38 percent.

### **International Activity**

In preparation for the opening up of European markets in 1992, U.S. vendors are producing products that will meet PTT standards in various countries and are making a point of indicating where their products can operate. Vendors without strong international bases are teaming up with companies that have already established them. A case in point is AT&T's acquisition of Paradyne, undertaken primarily because of Paradyne's strong foothold in the international market.

Vendors have set their sights beyond Europe as well. They are seeking and receiving approvals to market their products in the Middle East, Far East, South America, and the Pacific Rim.

Data Race won an order to supply the Turkish PTT with 200 standalone and 200 rackmount Rally 9600 modems equipped with asynchronous adapters. This year, the Turkish national phone company is expected to order 3,000 Rally 9600 modems. Staking out marketing territory in the United Kingdom, U.S. Robotics acquired Miracom Technology Ltd., a British modem manufacturer.

Activity, however, is not all one-sided. To stretch their market opportunities, international vendors look to the United States. British Telecom acquired Mitel Datacom in 1988 and combined Mitel's operations with the data communications division of British Telecom, forming BT Datacom. Fortified by its parent company's research and development funds of \$300 million, BT Datacom introduced an international version of its 4142TCX modem in April 1989.

### **Alliances and Acquisitions**

Many vendors are entering into marketing and technology agreements to pool their expertise and resources.

In August 1989, CASE/Datatel entered into a joint marketing and service agreement with NCR which authorizes NCR to offer CASE/Datatel communications products, including dial-up, leased line, and limited distance modems. Under the non-exclusive agreement, NCR can purchase from CASE/Datatel and resell the products to its customers or the two companies can market jointly.

Hayes joined forces in a marketing alliance with Prodigy Services Company and developed the Personal Modem 2400 for the PRODIGY interactive personal service. Prodigy markets the modem

with the PRODIGY Service Start-up Kit, which contains software and three months' use of the service. Developed by a partnership of IBM and Sears, PRODIGY enables subscribers with personal computers in their homes to conduct a variety of transactions such as shopping, securities trading, banking, and reservations.

In another alliance, Hayes and Silicon Systems announced in August 1989 the development of the first complete V.42 circuit set for 2400 bps modems. This integrated circuit is the first to incorporate CCITT V.42 and the Hayes Standard AT Command, as well as Hayes AutoSync, Hayes Adaptive Compression, and Hayes Automatic Feature Negotiation, all of which are featured in Hayes V-series products.

Telebit announced an agreement with ACCESS Graphics Technology of Boulder, CO, that authorizes ACCESS Graphics to distribute Telebit's high-speed, dial-up modems. A national distributor, ACCESS also represents the products of Digital Equipment Corporation, Vermont Microsystems, Mitsubishi, Calcomp, Hitachi, Hewlett-Packard, and Summagraphics.

Emerald Technology signed an agreement with LeeMah DataCom Security under which Emerald will sell security systems produced by LeeMah as dial-back security units to its IBM mid-range users. LeeMah markets InfoKey, an analog security device that performs three security checks before authorizing dial-in access to host computers from remote locations.

Concord Data Systems entered into a joint marketing agreement with Communications Research Group of Baton Rouge, LA, which calls for Concord to promote Communications Research Group's BLAST file transfer and terminal emulation software. In return, Communications Research distributes BLAST preset for operation with a Concord modem. BLAST supports the industry-standard AT command set, command sets based on V.32, and other high-speed modems from Hayes, Telebit, Universal Data Systems, Microcom, U.S. Robotics, Concord, and Data Race.

In September 1989, Telenetics announced the acquisition of the security modem business of Tri-Data Systems. The agreement covers the "Oz" trademark for 2400 and 9600 bps models. Both companies had worked together before the acquisition, cross-licensing products. Security modems under the Oz trademark have been on the market for almost 10 years and have a substantial installed base.

### Modems for Fax

As fax usage increases, vendors are responding with modems to support it. Rockwell International, Semiconductor Products Division, recognized the need early and developed the MONOFAX line of single device package modems for facsimile applications. In September 1989, Rockwell introduced the R96DFX as the latest 9600 bps in the MONOFAX line. The unique characteristic of the product is its capability to support HDLC framing and DTMF detection without the addition of external components. The MONOFAX line also includes 2400 bps and 4800 bps versions. Rockwell has set a price of \$48.50 each based on a quantity of 10,000.

Zoom Telephonics of Boston is marketing Zoom/Modem HC 2400S with Sendfax (Sendfax is a trademark of Sierra Semiconductor). After writing a letter on a PC, a user can send the letter to any Group 3 fax machine. The Zoom/Modem HC 2400S is a full-featured 2400/1200/300 bps modem with Hayes compatibility. It features auto dial/auto answer, call progress tone detection, support for four COM ports, a high-speed UART, and a wait-state generator. The suggested retail price of under \$200 adds to the attractiveness of the product.

In November 1989, Everex Systems announced the release of the internal EverFax 24/96 and the external EverFax 24/96E. Both units combine 9600 bps fax capability with a 2400 bps Hayes-compatible data modem and feature MNP Class 5 data compression and Class 2 through Class 4 error correction. The EverFax 24/96 lists for \$399 and the EverFax 24/96E for \$499. ■

# Modems: Technology Overview

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## Synopsis

### Editor's Note

This report focuses entirely on the technology of modems. For insight into the modem market, see Report 570-101. For detailed information on approximately 500 microcomputer modems offered by over 60 vendors, see Report 570-301.

### Technology Highlights

Until ISDN becomes a reality, the modem will remain an integral part of computer systems. This relatively inexpensive commodity item still supports data transmission over the analog telephone system. Converting digital signals into analog signals requires a process called *modulation*. After the modulated signals reach their destinations, the *demodulation process* changes them to their original digital formats. The term "modem" originated from the dual functions of the device: modulation and demodulation.

Anticipating an ongoing need for their products, modem vendors have refined the technology over the years by increasing speeds, pricing competitively, enhancing reliability, and designing more compactly. By

incorporating Very Large Scale Integration (VLSI) manufacturing techniques into their products, vendors have produced sophisticated high-speed modems.

No longer viewed as isolated units in a communications scheme, many modems now operate with network management systems, which support central-site monitoring and control of a large number of devices. Many modems also incorporate features once considered value-added, such as auto dial, auto answer, and self-diagnosis.

Most modems are compatible not only with AT&T and Hayes standards, but also with recommendations of the CCITT. Recently, V.32 has emerged as the standard of choice by many vendors because V.32 modems broaden the range of 9600 bps networks and can function as leased-line or dial-up units. The latest standard to affect the industry, V.42 bis, deals with data compression methods.

# Analysis

## Technology Basics

### Modems: Common Elements

Although there are many different types of modems, all units share common elements: power supply, transmitter, and receiver. The power supply usually takes 120 or 220 V AC and transforms it into the DC voltage required to operate the modem's internal circuitry. The transmitter modulates the digital data into analog form; the receiver demodulates analog signals and reverts them to their original digital format (see Figure 1).

Modems designed for asynchronous or synchronous operation differ in one major aspect: a synchronous modem contains a clock source and phasing circuits; an asynchronous modem does not. Asynchronous modems do not need clocking sources because data is transmitted at irregular intervals. In synchronous transmission, data is sent continuously in regular, clocked intervals.

Additional components of modems are:

*Data encoder:* Part of the transmitter, this unit determines the modulation changes to the carrier frequency at each sampling segment.

*Modulator:* Also part of the transmitter, this component changes the carrier frequency, as determined by the encoder.

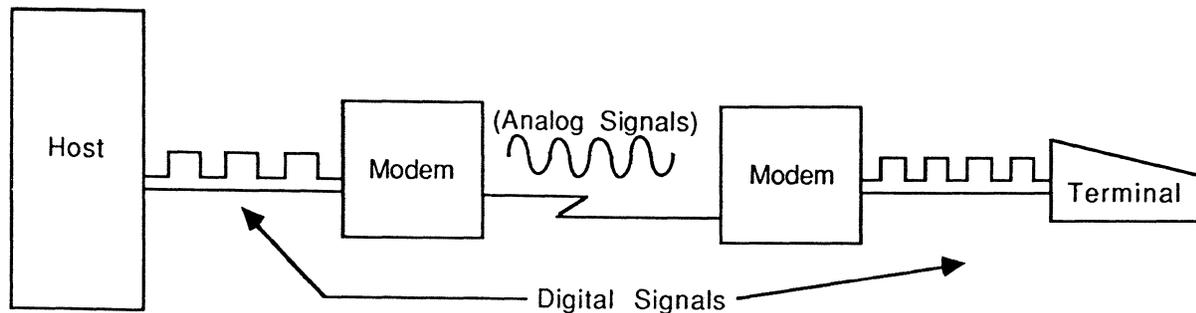
*Filters:* Part of the transmitter and receiver, these circuits transmit signals of frequencies within one or more bands. They also screen signals of other frequencies, thus eliminating noise and other impairments to the information stream.

*Line amplifier:* Part of the transmitter providing the connection between the modem and the carrier, an amplifier boosts the strength or amplitude of a signal. In a modem, the line amplifier is actually a variable-gain device, usually adjustable in two-decibel steps to accommodate the modem's transmit signal to the requirements of the communications line. The amplifier is configured so that its impedance matches that of the line over the represented frequency range.

*AGC amplifier:* Part of the receiver, this unit supplies automatic gain control (AGC), allowing the modem to compensate for amplitude variations on the line.

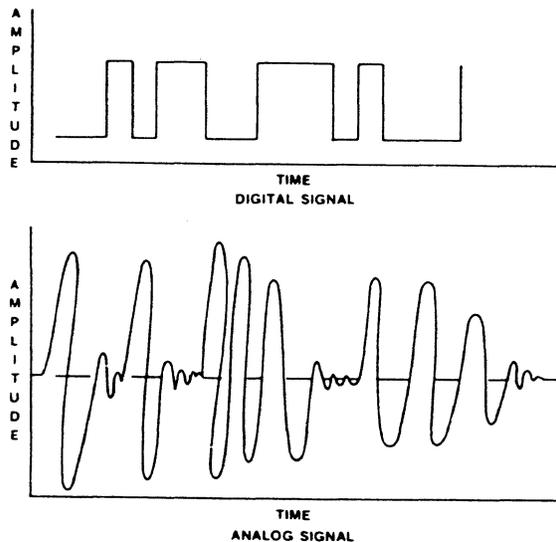
*Equalizer:* Generally incorporated into modems transmitting data at 2400 bps and higher, this element is basically an inverse filter whose amplitude and phase characteristics are the inverse of those

Figure 1.  
Conversion Process



*A modem accepts digital signals from the sending device and converts them into analog pulses that are sent over the public telephone network. At the receiving end, a corresponding modem converts the analog signals back into digital ones.*

Figure 2.  
Digital versus Analog Signals



presented on the telephone line. The equalizer corrects amplitude and delay distortions that, if uncorrected, can lead to interference during transmission.

**Demodulator:** Part of the receiver, this unit retrieves data from a modulated carrier wave and passes it on to the decoder.

**Decoder:** In conjunction with the demodulator, the decoder formats received data into a serial binary pattern and sends it to the receiving data device. This component is also part of the receiver.

### Digital vs. Analog

Modems are essential components of a data communications network because they allow communication between *digital* devices transmitting information over the public or private telephone network comprised of *analog* facilities. Without conversion, soundless digital signals cannot be sent over an analog facility, which is designed to carry sounds. Figure 2 illustrates the differences in the ways in which digital and analog signals are formed.

Analog signals are waves, and digital signals are a series of pulses with very short rise (leading edge of signal) and fall (trailing edge) times, culminating in a squared-off signal pattern. Technically, these quick transitions result from high-frequency harmonic signals that are often over 10,000 cycles

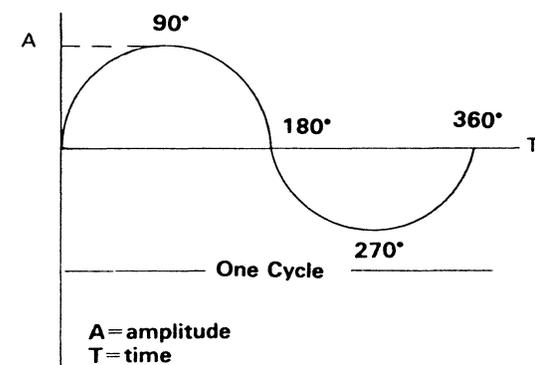
per second. In a digital datastream, information sent in a series of pulses represents a binary 1 or 0—a rise represents a binary 1, and a fall represents a binary 0 (see Figure 2, top diagram). Since the telephone system is designed to carry the human voice within a frequency range from 300 Hz to 3300 Hz, it cannot accommodate these high-frequency signals. Any attempt to send such information down an analog facility will result in a blurring or distortion of the digital pulse, making it lose its “squared-off” appearance. Once this happens, it is impossible to see where a digital pulse begins and ends. The information becomes useless.

Other factors affect the integrity of digital transmissions. A loss of signal strength occurs as the distance between modems increases. Transmission speed also affects data integrity—the higher the data rate, the more pulses sent. As more pulses are sent, they grow closer together and become more prone to distortion. Random noise, caused by molecular vibrations on a communications circuit, generates a low-level mixture of electromagnetic waves at different frequencies, producing a “hiss” on the line. If the transmission signal power falls beyond an acceptable level, the digital bit stream may become corrupted. Noise from other sources, such as electrical equipment or atmospheric conditions, also affects the digital datastream.

### Modulation

Since the public telephone network was designed to carry analog signals, digital signals must be converted into analog form by a process called *modulation*. Modems modulate the digital signals used

Figure 3.  
Sine Waves



Analog signals are transmitted over the public network in sine waves, depicted here.

by computers and other types of data equipment into audio tones that can be carried by the analog network. Once the modulated signals reach their destinations, they are *demodulated* to their original digital formats and sent to receiving data equipment. Figure 1 shows modulation and demodulation on a point-to-point communications link.

Modems support modulation techniques to fulfill the requirements of various applications. Simple, slow-speed devices use a technique called frequency-shift keying (FSK); higher-speed devices of 9600 bps and above use a technique called quadrature amplitude modulation (QAM).

The terminology and mathematical theory describing electrical signals are based on the concept that a signal is composed of multiple simple signals called sine waves. Most modems transmit a continuous sine wave, defined by two parameters: amplitude and time. Once defined, the wave possesses two properties convenient to mathematical manipulation: frequency and phase. Any combination of three of the parameters—amplitude, frequency, and phase—can serve as the basis for a modulation technique. The three basic types of modulation techniques are *amplitude modulation*, *frequency modulation*, and *phase modulation*.

### Amplitude Modulation (AM)

The simplest technique, amplitude modulation generates a single carrier frequency signal. If the resultant wave is of high amplitude, it denotes a binary 1; if it is of low amplitude, it denotes a binary 0. AM is highly susceptible to line interference. Quadrature amplitude modulation (QAM), a combination of amplitude modulation and phase modulation, is essentially a four-phase technique. This method uses two signals at the same frequency, but they are 90 degrees out of phase with each other. For each signal, four possible levels of amplitude can be applied (A1, A2, A3, and A4). By combining the two signals that are 90 degrees out of phase, 16 different conditions, each representing four bits of information, can be generated. It is also possible to represent 32 different states, generating twice as much information.

### Frequency Modulation

The most common frequency modulation is *Frequency-Shift Keying (FSK)*, a two-level technique used on AT&T 103 and 113 Series modems. FSK modulation represents changes in the binary

bit pattern by alterations in the frequency of an audio tone. This line is assumed to be in a steady binary 1 or "mark" state when it is idle, represented by one frequency of tone. When the data bit value 0 is sent, the modem changes to another tone frequency, causing a unique, almost musical, effect during the sending of data. FSK modulation works well for relatively low speeds, but as the speed of the digital signal increases, the time allocated to shift frequencies is reduced. Both the production and detection of audible changes become more difficult.

### Phase Modulation

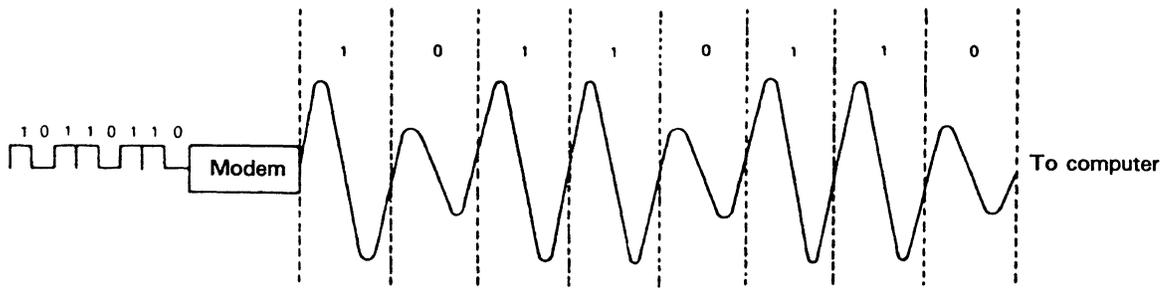
*Phase-shift keying (PSK)* uses changes in the phase of a signal or its timing relationship to a fixed reference to indicate a change in the bit pattern. A reference oscillator determines the phase angle change of the incoming signal, which, in turn, determines which bit or dibit is being transmitted. *Differential Phase-Shift Keying (DPSK)* compares the phase angle of the incoming signal to the previously received dibit. One change in phase is interpreted as a binary 0 if the preceding phase has been interpreted as a binary 1. This method does not require a separate reference wave, thereby reducing the amount of circuitry in the modem. PSK is used in many medium-speed modems and is combined with amplitude modulation in high-speed applications to form *quadrature amplitude modulation (QAM)*, the technique for 9600 bps and higher.

### Communications Facilities

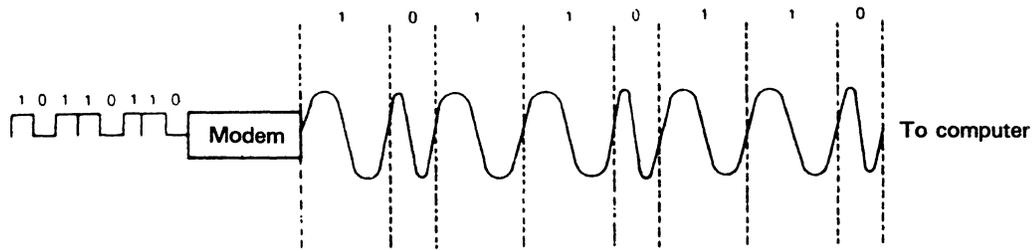
Primarily because of cost, most data communications applications use the public switched (dial-up) network (DDD) or equivalent leased lines. Many other facilities exist, however, such as radio links, direct cable connections, fiber optic links, infrared links, lasers, and other common-carrier facilities. The public telephone network and equivalent leased lines are referred to as voice grade lines. Lines of lower capacity are called narrow-band lines; ones of higher capacity are called broadband or wideband lines. Communications line describes a path over which a particular connection is established. The exact physical nature of the connection can vary, and several different types of links can be used for one connection.

In general, a narrow-band line accommodates up to 300 bits per second, a voice grade line up to

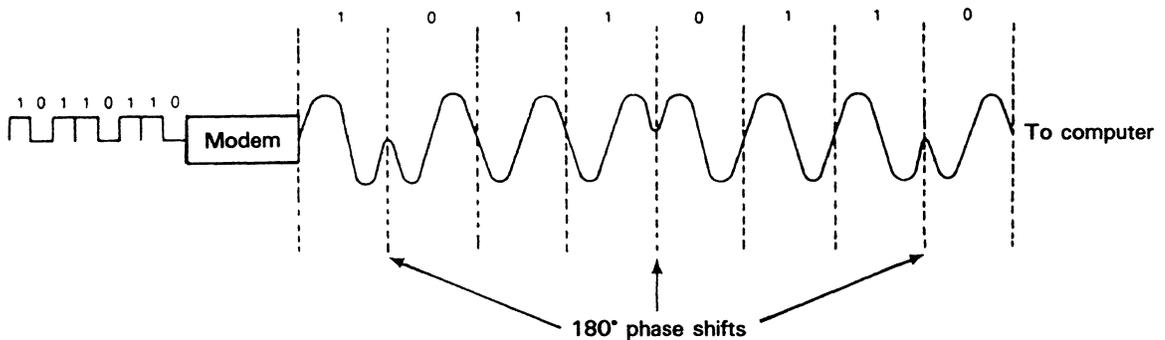
Figure 4.  
Basic Modulation Techniques



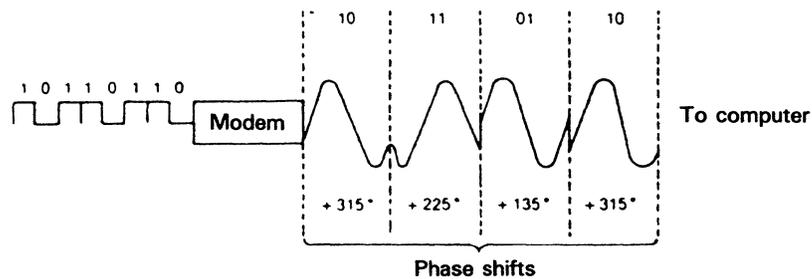
**Amplitude modulator (AM)** converts digital data to analog signals using a single frequency carrier signal. A high amplitude wave denotes a mark (binary 1), and a low amplitude wave denotes a space (binary 0). Amplitude modulation is seldom used alone for modems because the signals it produces are susceptible to noise and because of the length of time it takes to sample the amplitude of the signal.



**Frequency-shift keying (FSK)** uses a constant amplitude carrier signal and two frequencies to distinguish between a mark and a space. One of the simpler modulation schemes, FSK is normally used in 1200-bps and slower modems.

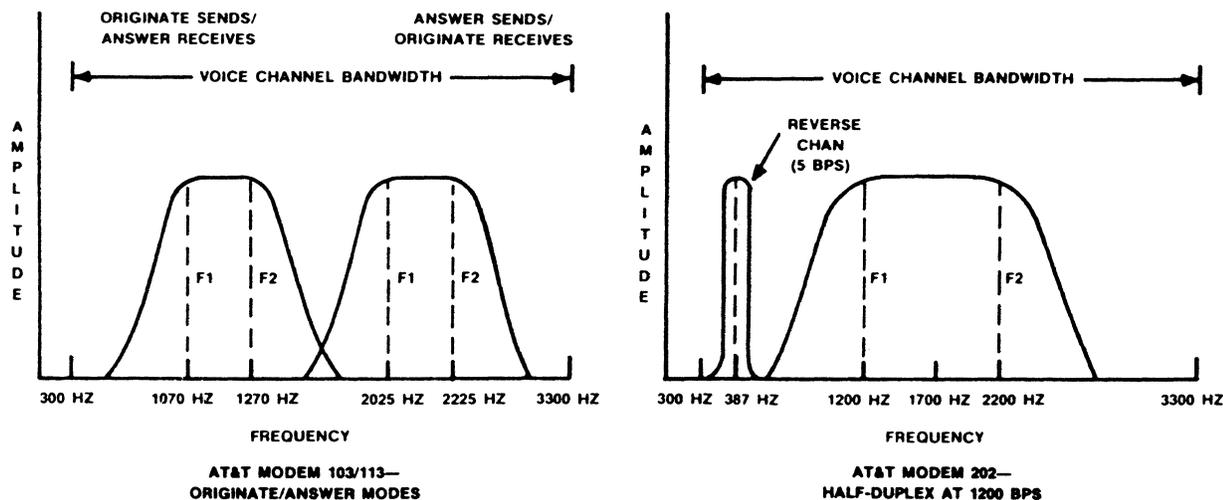


**Phase-shift keying (PSK)** uses a phase shift at transition points in the carrier frequency to represent separate marks and spaces. In the example, a 180° phase shift indicates a space. High-speed modems use as many as eight phase shifts.



**Differential phase-shift keying (DPSK)** uses different phase shifts to represent the four possible combinations of 0 and 1 bits: In the example, a 45° represents "00", 135° stands for "01", 225° for "11" and 315° for "10." The pairs are called di-bits. By sending di-bits instead of single bits over the same carrier, DPSK modems achieve high transfer rates. Still other modems use combination encoding techniques such as quadrature amplitude modulation (QAM) that send three (tri-bit) or more bits per cycle to reach even higher rates.

Figure 5.  
Modem Bandwidth Usage



9600 bits per second, and a wideband line considerably more. Cables and other types of facilities generally have large capacities, but are limited by technical considerations.

*Dial-up modems* operate on the public switched telephone network, while *leased-line* units operate on private facilities. *Limited-distance* modems operate on private lines in local applications, while *line drivers* and *modem eliminators* operate on the customer's premises. Figure 6 shows the relationship between the communication facility and modem types.

### Bandwidth

Bandwidth refers to the information-carrying capacity of a transmission facility. It actually defines the range of frequencies, measured in hertz (cycles per second), that a transmission medium can accommodate without interference or signal loss. The greater the range of frequencies a medium can handle, the greater its information-carrying capacity. Most modems transmit data within a 300 to 3000 Hz frequency range in the middle of a bandwidth.

Although signal characteristics are usually optimal in the middle of a bandwidth, transmission limited to the middle of the band restricts the amount of bandwidth available for data. To compensate for this factor, conventional modems use sophisticated, multiple-bit encoding algorithms to squeeze as much data as possible over one carrier in each direction. The downside of this solution, however, is an increase in data lost during line hits

or other error-inducing conditions on the transmission medium. The goal of much modem design work is to minimize data loss while transferring greater amounts of data.

### Transmission Characteristics

#### Data Rates

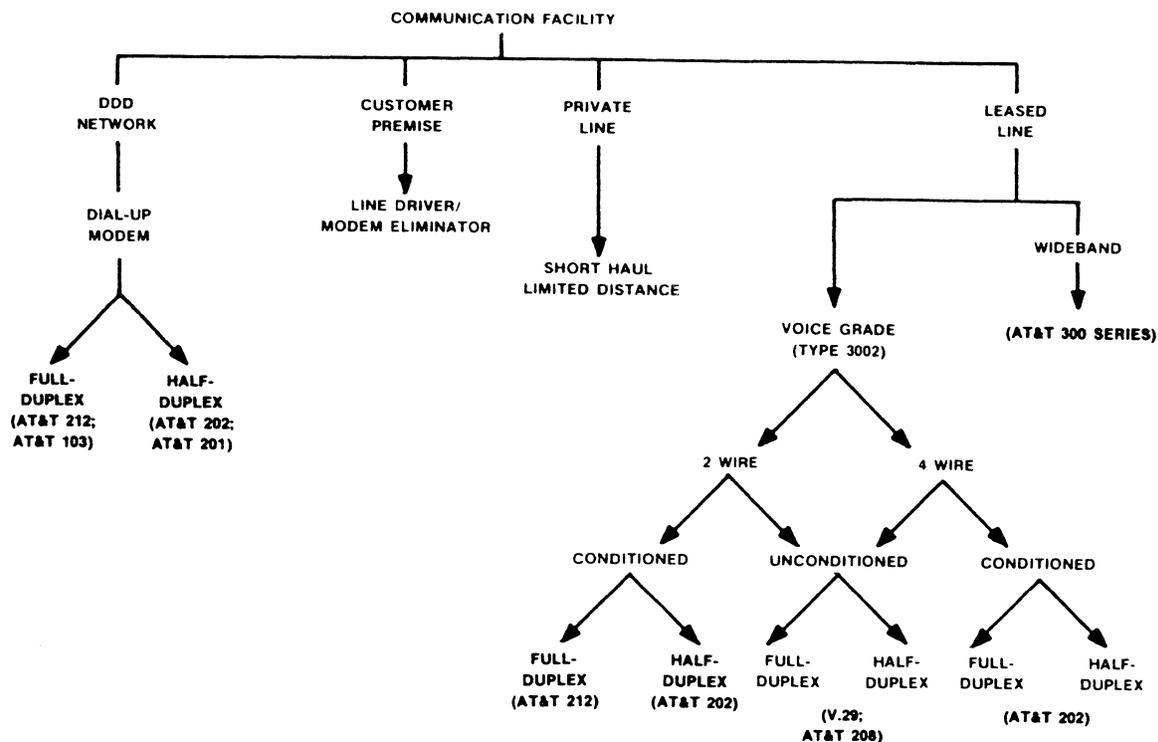
Depending on other transmission characteristics, modems operate at a fixed speed or at the speed of the sending device—up to a specified limit. Some modems can be equipped to operate at several different speeds. Users can adjust operation speeds via software commands or changes in components, wires, or switch settings.

A modem's *fallback rate* refers to its capability to detect poor line conditions and to lower transmission speed to prevent errors. For example, a modem operating at 9600 bps may fall back to 7200 bps or 4800 bps when line conditions deteriorate.

As the data rate increases in limited-distance modems, the distance over which transmission is effective decreases.

Data transmission speed is usually measured in *bits per second (bps)*, but it is not uncommon for a data rate to be expressed in *baud*. Although often used synonymously, the terms bps and baud rarely mean the same thing. The bps designation expresses the data signaling rate, while baud measures modulation rate.

Figure 6.  
Communications Facility Versus Modem Type



### Line Conditioning

The telephone network is not a perfect electrical path, even for voice communication. As the speed of data exchange increases, it becomes increasingly difficult for modems to manage the precise signaling required for accurate information transfer. A number of problems affect the performance of a circuit, such as line failure, electrical interference, or random noise.

Variation in the strength of the signal itself, independent of noise, can cause a problem called *amplitude distortion*. To combat amplitude distortion, modems must adjust the properties of the communications line to prevent the signal from getting too far out of shape. Circuit problems also arise from changes in the analog signal, caused by uneven propagation of low and high frequencies, a condition known as *phase jitter*.

To minimize problems in leased circuit transmission, users can pay a premium for a line that is specially *conditioned*. The telephone company will either select a path that meets the more stringent requirements of the conditioning or it will service the path to meet necessary standards.

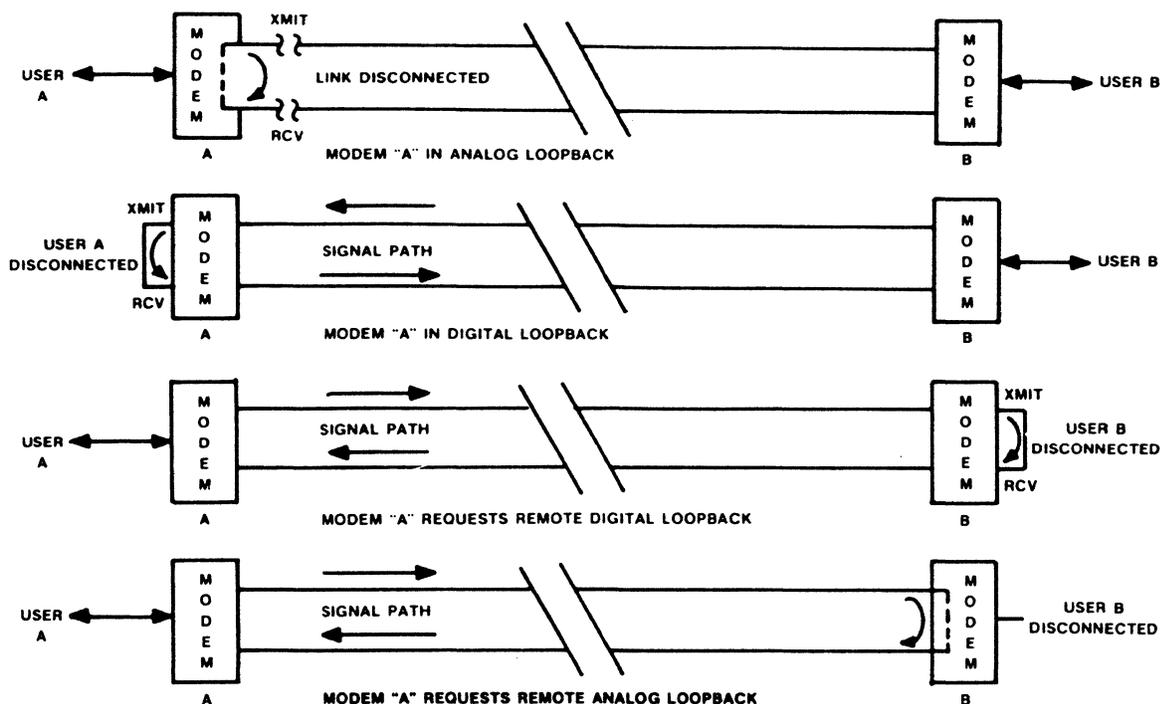
### Synchronization

To ensure an orderly data flow across a communications facility, a time relationship, known as synchronization, must exist among the bits that make up the messages. The two basic forms of synchronization are asynchronous and synchronous.

*Asynchronous* or stop-start transmission refers to data transmitted in an irregular manner, one character at a time as it is being keyed. The time interval between sequentially keyed characters varies in duration because of the impracticality of keying consecutive characters at precise intervals. With asynchronous transmission, each character (byte) is delineated with one start bit, one or two stop bits, and an optional parity bit. The parity bit is part of a simple error detection scheme known as parity checking.

*Synchronous* transmission occurs in a continuous stream. Data transmitted from files on storage media can be handled as a continuous datastream. Electronic or mechanical methods can accurately control the flow. Since only a few control characters are needed to delineate large blocks

Figure 7.  
Analog and Digital Loopback Tests



of several characters (bytes), communications overhead is lower and more time can be spent transmitting useful data. Circuitry to establish the timing of the datastreams is more complicated, however, making synchronous modems more expensive than asynchronous models.

Asynchronous modems can usually transmit data at any rate up to the specified maximum rate of the modem. Synchronous modems operate at fixed transmission rates, established by internal or external clocking sources.

Modems operate in these transmission modes: simplex, half-duplex, or full-duplex. The simplex mode supports unidirectional data transmission, i.e., data is transmitted only or received only. The half-duplex mode supports data transmission in either direction, but not simultaneously. In full-duplex mode, data is transmitted in both directions simultaneously. Many modems operate in both half- and full-duplex modes.

### Equalization

Equalization neutralizes the undesirable electrical characteristics of a communications line that distort transmission, increase the error rate, and degrade operating performance. This technique

matches line conditions to take full advantage of the line's data rate capability. The faster the modem, the greater the need for equalization and the more complex the equalizer. Most low- and medium-speed modems contain fixed (nonadjustable) equalizers.

*Fixed equalization* handles the average group delay distortion for all telephone lines and may be of no use if the actual connection does not fall within this range. *Manually adjustable equalizers* are preset at the time of installation to match the line and are normally used for leased or private service. *Compromise equalization* compensates only for a fixed distortion on a specific, standard telephone line. Most AT&T 212A-compatible modems use compromise equalization.

Modems built around microprocessors offer distinct advantages: improved equalization, increased reliability, added flexibility, and faster speeds. The powerful capabilities of a microprocessor support the implementation of sophisticated algorithms that enable equalizations to be performed automatically on changing line conditions. Many newer medium-speed and nearly all high-speed modems offer *automatically adaptive equalization*, which samples the line several times a

second to determine the parts of the transmitted signal that need enhancement to be readable. Many new modems check the need for signal enhancement before they transmit, a technique known as *forward compensation*.

### Error Correction

One of the chief problems of data transmission is the varying quality of the analog voice grade telephone lines. In addition to the usual limitations of the analog line, many errors can enter the bit stream from transient noise, harmonic distortion, phase jitter, and other signal disruptions. Current solutions to these problems include expensive line conditioning and/or the selection of modems that perform sophisticated line equalization functions.

Forward error correction (FEC) techniques enable a processor to put a bit stream through a series of complex algorithms before transmission occurs, resulting in a rearranged bit sequence with extra bits added to the original block of data. At the receiving end of the communications circuit, another processor decodes the bit stream. The bits inserted at the transmitting end determine if the block was received correctly. These bits correct any blocks received incorrectly. All these adjustments occur without retransmission of any part of the original data.

To accommodate the growth in the use of microcomputer dial-up links, error correction protocols have been introduced to ensure file transfer data integrity. Online information services, electronic mail facilities, and packet networks all require different protocols. Furthermore, PC-to-host links have their own protocol specifications. No single protocol meets all communications needs, but users have several options. Some facilities have circumvented the protocol compatibility issue by implementing error-correcting modems that allow a host to communicate with various ASCII-based systems without disturbing the host software or communications port.

*MNP*: Microcom Networking Protocol (MNP) conforms to the International Organization for Standardization (ISO) Model for Open Systems Interconnection (OSI). Microcom claims that MNP offers several advantages over xmodem, the leading software-based protocol. According to the vendor, MNP supports five of the seven OSI layers, while xmodem supports one.

Direct support of the OSI model allows MNP to adapt to different systems. The model's layered design and its protocol separate different functions, such as electrical connection and data link. Modifications do not require total redesign. MNP is a full-duplex protocol, and xmodem is half duplex. In full-duplex mode, ACKs and NAKs sent along with the data block do not interrupt the flow of data, thereby increasing throughput. In half-duplex transmission, data transfer is halted because transmission occurs in only one direction. MNP also shortens the data block size on noisy lines and sends packet acknowledgments as part of the frame.

MNP is divided into Classes 1 through 10. *MNP Classes 1 to 3* packetize data and protect data integrity via CRC, a method for detecting packet errors. When necessary, devices equipped with these classes ensure that packets are retransmitted. *MNP Class 4* attains up to 120 percent link throughput efficiency, automatically adjusts packet sizes to meet line conditions, and reduces protocol overhead. *MNP Class 5 Data Compression* dynamically adjusts to the type of data being sent. A combination of MNP Class 5 and Class 4 increases link throughput by up to 200 percent. *MNP Class 7 Enhanced Data Compression* offers higher compression efficiencies. When combined with Class 4, Class 7 improves throughput by delivering efficiencies up to 300 percent.

*MNP Class 9* includes features such as Enhanced Universal Link Negotiation, Piggy Back Acknowledgments, and Multiple Selective Negative Acknowledgments. Enhanced Universal Link Negotiation supports the connection of MNP- and non-MNP-compatible modems at the highest performance levels. The Piggy Back Acknowledgments feature integrates Packet Acknowledgments into data frames, thereby lowering link overhead. The Multiple Selective Negative Acknowledgments feature dispenses with unnecessary retransmissions by rejecting data frames erroneously received.

In November 1989, Microcom announced *MNP Class 10* as part of its QX/2400t modem. MNP Class 10 optimizes data transmission over poor lines, including cellular connections. According to Richard Sterry, vice president of marketing, "MNP 10 releases the land line terminal from the office and opens the door for a variety of exciting mobile applications in the news media, delivery, and public safety arenas." MNP 10 compensates

**Table 1. AT&T Modem Specifications**

Data Rate (bps)	AT&T Name	PSTN		Private 2-Wire		Private 4-Wire		Synchronization		Line Configuration Conditioning
		Hdx	Fdx	Hdx	Fdx	Hdx	Fdx	Async	Sync	
300 (1)	103 Series		•					•		P
300 (2)(3)	108			•	•	•	•	•		P
300	113		•					•		P
1200 (4)(5)	202 S, T	•		•			•	•	•	P
1200 (6)(7)	212, 212A		•					•	•	P
2400 (8)	201B			•			•		•	P
2400 (8)	201C	•							•	P
4800	208A			•	•		•		•	P, M
4800	208B	•							•	P
9600	209			•			•		•	P, M, D1

• = higher data rates now available from AT&T with Dataphone II modems  
 bps = bits per second  
 Hdx = half duplex  
 Fdx = full duplex  
 Async = Asynchronous  
 P = Point-to-point  
 M = Multipoint  
 D1 = D1 line conditioning  
 Sync = Synchronous

- (1) 103J is originate/answer with auto answer.
- (2) 108F, G have RS-232-C interface and two- or four-wire line connections.
- (3) 108H, J have 20 mA current loop interface.
- (4) 202S supports 1800 bps on private line with C2 conditioning. Auto answer and synchronous capability standard. Reverse channel optional.
- (5) 202T is the same as 202S, but with manual operation.
- (6) 212A adds scrambler-kicker to avoid occasional data lockup experienced with earlier 212 modems. Includes 300 bps operation in 103J-compatible mode.
- (7) Defines EIA interface to be similar (functionally compatible) with CCITT Recommendation V.24.
- (8) PSK modulation.

Courtesy of Concord Data Systems.

for signal fade and interruptions, and raises performance to levels approaching land line conditions.

The Adverse Channel Enhancements (ACE) feature of MNP 10 improves connections over low-quality lines and triggers certain performance-enhancing features when line quality deteriorates. ACE includes the Robust Auto Reliable feature, which enables the modem to make multiple attempts to overcome channel interference at linkup. This feature also supports backward compatibility with non-MNP modems. The Aggressive Adaptive Packet Assembly feature improves link performance in unfavorable channel conditions by changing adaptive packet sizes over the link to accommodate levels of interference. The Dynamic and Negotiated Speed Shifts feature enables the modem to increase speed as line conditions improve and to increase the chances of successful connection at the highest possible speed.

**LAP D:** The major rival to MNP is Link Access Protocol D (LAP D), a member of the High Level Data Link Control (HDLC) protocol family. As the error-control protocol in CCITT Recommendation

X.25, LAP D is slated for use in ISDN. LAP D offers the advantages of being HDLC based, logical, and reliable. Many DTE manufacturers already support LAP D, and many test instruments exist for it.

Proponents of MNP point out that MNP has an installed base of over 200,000 units and a large number of vendors supply it on their products. Initial problems with MNP on dial-up lines have been solved. Like SNA, MNP is on its way to becoming a de facto standard, despite LAP D's rise to prominence among vendors and users.

**Trellis Coding Algorithm:** The preferred error-correcting technique for private-line modems is currently the Trellis Coding Algorithm, which derives its name from the trellis-like signal constellation created by this type of signal modulation. Trellis encoding, part of the V.32 standard, is an extension of quadrature amplitude modulation, which allows a modem to tolerate more than double the amount of noise tolerated by a conventional unit at the same block error rate. Basically, this scheme compares redundantly transmitted data

and rejects distorted bits. At an equivalent signal-to-noise ratio, a Trellis-coded modem enhances throughput by reducing the error rate almost three decibels. The Trellis modem may require a retransmission only once in every 10,000 blocks, while another type of modem may require retransmission after every 10 blocks. Trellis coding is usually incorporated only on high speed, synchronous modems on private circuits or on CCITT V.32 dial-up modems.

### Compatibility

The term "handshaking" describes the exchange of control signals that establish a connection between two modems. Standards govern the signals required to set up, transmit, and terminate calls. For a handshake to occur, modems must be compatible.

Mixing modems from different suppliers in one network is a common practice because data communications networks are frequently implemented in stages, with ongoing equipment procurements over long periods of time. When organizational changes occur, suppliers that first provide network modems may not continue to do so. In addition, in organizations without central network management, several individuals may be purchasing equipment for one integrated network.

Since most equipment in a network is replaced as it begins to age or malfunction, users can easily switch suppliers. Data communications involves both geographical and corporate distance, which can lead to a division of responsibility and to different restrictions on the communications facilities.

Compatibility, therefore, becomes a critical issue.

### AT&T Compatibility

Just as IBM has traditionally set the standards for peripheral media, AT&T has set the standards for communications. Although this situation is changing in the postdivestiture environment, many older AT&T modems (often referred to as Bell System modems) are still well known, widely used, and frequently duplicated by other vendors. Modems compatible with a particular AT&T modem specification are likely to be compatible with one another, even if manufactured by different vendors. Manufacturers of AT&T-compatible modems,

however, tend to embellish original AT&T specifications with convenience features to distinguish their products from those of competitors.

Compatibility between modems depends greatly on the exactness with which their modulation techniques conform to the AT&T specification. A vendor who has benefited from refining an AT&T standard may alter a specification to such a degree that the unit is incompatible with the original AT&T product.

For the most part, manufacturers claiming AT&T compatibility need not be regarded with suspicion. Table 1 outlines standard AT&T modems and related specifications.

### CCITT Compatibility

Many dial-up and private-line modems conform to CCITT standards, the most popular being V.22 and V.22 bis for medium speed dial-up modems, and V.32 for 4800 bps and 9600 bps dial-up units. Other CCITT recommendations in North America are V.26, V.27, V.29, V.33, and their alternatives.

CCITT V.XX modem specifications call for newer, faster modems to be backward compatible with their earlier counterparts. For example, a 2400 bps V.22 bis modem will be compatible with its 1200 bps V.22 counterpart at the V.22 bis fallback operating speed of 1200 bps. It also will be operationally compatible with most AT&T 212A modems operating at 1200 bps since the standards are closely related.

CCITT V.XX recommendations are directed mostly toward European telephone facility specifications, but U.S. vendors are increasingly incorporating them into their products. Since signaling conventions and equipment differ from continent to continent, compatibility problems can arise when modems designed primarily for European facilities are used on North American networks. For example, a V.22 bis modem made for U.S. operation can generally initiate a call to a European-based V.22 bis modem because it will tolerate the minor differences in facilities encountered while establishing the call. The same call cannot be completed, however, if the European modem is the originator.

### Hayes Compatibility

Another type of compatibility, indigenous to microcomputer modems, involves the Hayes *AT* command structure. Primarily, Hayes compatibility

relates to modem commands, modem responses, and the ability to provide settings that are compatible with various communications programs. For example, modems compatible with the Hayes Smartmodem 1200 obey the 22 modem commands and 16 register settings stipulated for that device. Hayes compatibility also involves compatibility with the AT&T 103 operating standard at 0 to 300 bps and the AT&T 212 standard at 1200 bps. Hayes-compatible products have speakers for audibly following calls in progress; front-panel status lights on external units; and auto dial, auto answer, manual dial, and manual answer features for asynchronous operation.

### Standards Issues

New high speed modems use modulation schemes compatible with, or similar to, CCITT Recommendation V.32, which facilitates synchronous, full-duplex transmission over two-wire switched circuits at 9600 bps, with a fallback speed of 4800 bps for deteriorating line conditions. V.32 specifies the use of Trellis-coded modulation to overcome noise problems on dial-up lines. Because V.32 has been difficult to perfect, modems designed to V.32 standards were originally expensive. Production difficulties centered around effectively implementing echo-cancellation, which allows high-speed signals traveling in opposite directions to coexist on the same two-wire switched line in the same frequency band. V.32 is presently a growth area in the modem market, effectively handling microcomputer-to-host file transfers.

The V.33 recommendation for point-to-point transmission over leased lines is very similar to V.32. Transmission is synchronous, half duplex over two-wire, and full duplex over four-wire, leased, voice grade lines. The specification calls for primary transmission rates of 14.4K bps, with fallback to 12K bps. CCITT M.1020 line conditioning, equivalent to AT&T C1 specifications, is recommended. Modems using implementations of the V.33 scheme are now achieving 14.4K and 16.8K bps transmission rates.

In April 1988, the CCITT approved the V.42 recommendation for specifying error correction for asynchronous modems. V.42 error-correction protocol enables modems to conduct asynchronous-to-synchronous conversion between the DTE and DCE. Incorporated within the V.42 modem, Link Access Procedure for Modems (LAP M) handles

error correction. LAP M is an extension of LAP B, the error correction protocol specified as part of the X.25 packet switch network standard.

CCITT Study Group XVII approved V.42 bis on September 29, 1989. The V.42 bis recommendation specifies the data compression techniques required to increase the throughput of modems that feature LAP M error control protocol. Based on the Lempel-Ziv compression algorithm developed by AT&T Bell Laboratories, the V.42 bis standard also includes enhancements suggested by IBM, British Telecom, and Hayes Microcomputer Products.

### Diagnostics

Diagnostic capabilities range from basic functions, such as local and/or remote loopback, to sophisticated forms of testing that analyze the quality of the received signal.

The most common form of diagnostics is the *loopback test*, in which the user completely checks the data link from one site. The local modem, remote modem, and interconnecting telephone facilities are included. The test returns or loops back the output of the transmitting device to its input. This return occurs via the local modem interface (local digital loopback), the local modem itself (local analog loopback), the opposite end of the communications line (remote analog loopback), or the remote modem (remote digital loopback). Figure 7 illustrates the various types of loopback tests on modems.

Microprocessor-based modems frequently feature advanced capabilities for diagnosing communications failures. A self-test feature determines the operational status of the modem before connecting it into the network. Random pattern generation (511 test pattern) diagnoses errors resulting from random noise, harmonic distortion, and phase jitter—problems that influence the quality of the transmitted signal.

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### Selection Guidelines

The highly competitive nature of the modem market forces manufacturers to add new features to their products. A few years ago, modems with comprehensive diagnostics and microprocessor-based capabilities represented new advances in technology. Today, these capabilities are fairly common. Advancements in modulation, error-correction,

data compression, higher speed transmission, and fiber optics represent the most current trends in the industry at present.

### **Data Compression**

Introduced in the mid-1970s, data compression delivers higher data speeds at lower transmission costs. Modems with data compression use an algorithm that eliminates repetitious characters from high-speed data transmission and encodes regularly-recurring character groups. The words *the* and *it*, for example, would fit into a single character. The data is transmitted in this reduced form and reconstructed at the receiving end of the transmission line, resulting in a transmission rate 20 to 50 percent higher than the basic transmission rate.

Data compression enables data that would otherwise have to be transmitted over a high-speed line with D1 conditioning to be compressed and transmitted at a lower speed over an unconditioned line. In addition, compressed data has a built-in safeguard against eavesdropping and unauthorized system intrusion because individuals with such an inclination would need identical equipment to be successful.

### **Reverse and Secondary Channels**

Many modems support a reverse channel that relieves the primary channel on four-wire circuits of the burden of carrying acknowledgment data. This reverse channel operates simultaneously with the primary channel, but at a much slower speed. A secondary channel, used in a variety of applications, can serve as a path for high-speed and low-speed terminals at the same time, eliminating the need for an additional line. A secondary channel can also function as a reverse channel. Reverse channels operate on both two- and four-wire circuits, while secondary channels operate only on four-wire circuits.

### **Integrated Multiplexing (Multiport Modems)**

Units with this capability contain a limited-function, time-division multiplexer (TDM) that

allows the user to transmit more than one synchronous datastream over a single transmission line. The multiport modem's TDM uses the modem's clock for synchronization, thus eliminating the need for one of its own. Less complex than a standalone unit, the integral multiplexer is also less expensive; however, it handles only synchronous data.

### **Multiple Speed Selection (Dial Backup)**

Modems operating on leased lines must switch automatically to dial-up lines when the dedicated circuit fails or degrades. Since leased-line operation generally occurs at a higher speed, users can ensure backup by lowering the speed of the modem so that it can operate on the dial-up line until the leased line is restored.

### **Security Features**

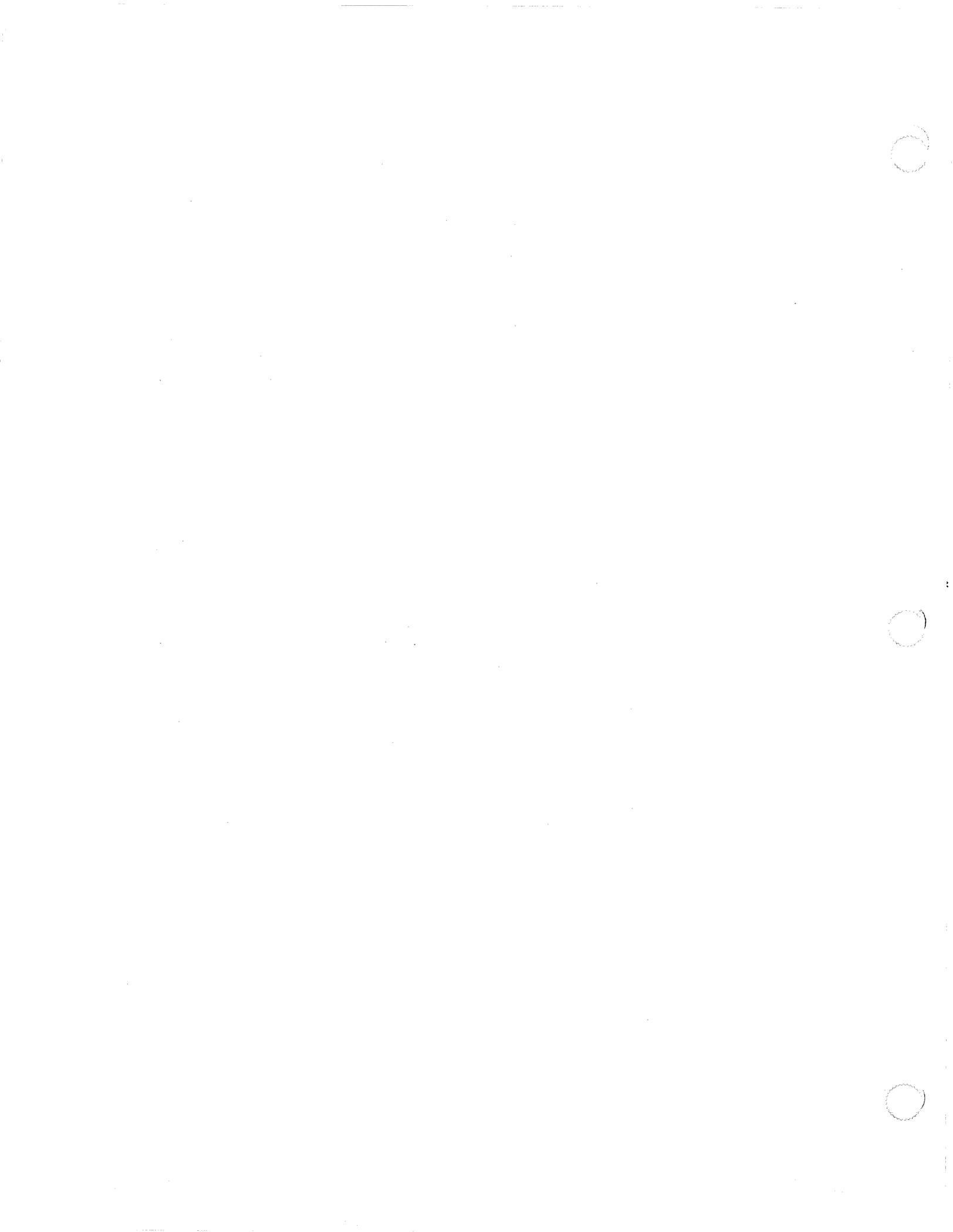
Modem security features include password protection in which the modem accepts or rejects user access codes; callback capabilities through which the modem returns a user call to verify access; and data encryption in which the datastream is coded.

### **Voice/Data Capability**

Modems equipped with this feature usually have an adapter to accommodate voice communications over the same line used for data transmission. Although vendors advertise this capability as simultaneous, on most units, the voice and data transmit alternately.

### **Network Management**

Many modems operate in conjunction with a network management system, through which large networks of modems are monitored from a central site. In this type of environment, the modem monitors its own status, as well as that of its received line signal, reporting conditions automatically to a central control panel. ■



# Microcomputer Modems: Comparison Columns



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**Synopsis**

**Editor's Note**

For information on the modem market, see Report 570-101; for information on modem technology, see Report 570-201. To assist readers in researching microcomputer modems, this report contains comparison columns listing the principal characteristics of approximately 500 modems offered by more than 60 vendors.

In the Comparison Column Entry Descriptions, we have briefly defined the row headings used in the columns. We suggest that the reader consult the key to become familiar with the information before reading through the columns.

Vendors furnished information for the columns during December 1989. When a vendor did not provide information for a specific entry and we could not locate that information in our files, we listed "Vendor did not specify" on the appropriate line. Datapro wishes to thank the vendors for their cooperation.

In addition to the lines allocated for vendors to indicate specified information for their models, we have added space at the bottom of the columns for vendor notations about options or special features.

The absence of any company or product from these columns means that the company either failed to respond to our repeated information requests or declined to be part of the survey.

## Product Categories

For your convenience in locating modems with a specific speed or function, we have divided the microcomputer modems listed in this report into three categories: low, medium, and high speed. Although we have grouped products according to generally accepted industry standards, you should note that modem speed classifications may vary elsewhere.

**Low Speed Modems (up to 2400 bps)**—operate on voice grade, dial-up, or private lines at essentially unlimited distances.

**Medium Speed Modems (2401 to 9600 bps)**—also operate over voice grade, dial-up, or private lines at unlimited distances. Their use is more widespread, and they are generally more expensive than low-speed devices.

**High Speed Modems (9600 bps and above)**—operate over voice grade, dial-up, and private lines or wideband facilities.

## Vendors

**Adaptive Computer Technologies**  
20111 Stevens Creek Boulevard, #100  
Cupertino, CA 95014-2345

**Amstrad, Inc.**  
1915 Westridge Drive  
Irving, TX 75038 (214) 518-0668

**Apple Computer, Inc.**  
20525 Mariani Avenue  
Cupertino, CA 95014 (408) 996-1010

**Applied Engineering**  
P.O. Box 5100  
Carrollton, TX 75011 (214) 241-6060

**ATI Technologies Inc.**  
3761 Victoria Park Avenue  
Scarborough, ON, Canada M1W 3S2 (416) 756-0718

**Barr Systems, Inc.**  
4131 NW 28 Lane  
Gainesville, FL 32606 (904) 371-3050

**BCH Equipment Corp.**  
2601 Ulmerton Road E., Suite 101  
Largo, FL 34641 (813) 530-9177

**BT Datacom, Inc.**  
3701 Concord Parkway, Suite 100  
Chantilly, VA 22021 (703) 818-1770

**CASE/Datatel, Inc.**  
Building 55, Carnegie Plaza  
Cherry Hill, NJ 08003 (609) 424-4451

**Cermetek Microelectronics, Inc.**  
1308 Borregas Avenue  
Sunnyvale, CA 94089 (408) 752-5000

**Chartered Electronics Inc.**  
21 Airport Boulevard, Suites G & H  
South San Francisco, CA 94080 (415) 875-3636

**Computer Peripherals, Inc.**  
667 Rancho Conejo Boulevard  
Newbury Park, CA 91320 (805) 499-5751

**Comspec Digital Products, Inc.**  
2313 W. Sam Houston Parkway, N., Suite 145  
Houston, TX 77043 (713) 461-4487

**CXR Telcom/Anderson Jacobson**  
521 Charcot Avenue  
San Jose, CA 95131 (408) 435-8520

**Data Race**  
12758 Cimarron Path, Suite 108  
San Antonio, TX 78249 (512) 692-3909

**Develcon Electronics Ltd.**  
515 Consumers Road  
Willowdale, ON, Canada M2J 4Z2 (416) 495-8666

**DFI, Inc.**  
2544 Port Street  
West Sacramento, CA 95691 (916) 373-1234

**E-Tech Research**  
2700 Augustine Drive, #275  
Santa Clara, CA 95054 (408) 982-0270

**Eicon Technology**  
2196 32nd Avenue  
Lachine, PQ, Canada H8T 3H7 (514) 631-2592

**Emerald Technology**  
18912 N. Creek Parkway  
Bothell, WA 98011 (206) 485-8200

**Everex Systems, Inc.**  
48431 Milmont Drive  
Fremont, CA 94538 (415) 498-1111

**Fastcomm Communications Corp.**  
12347 E. Sunrise Valley Drive  
Reston, VA 22091 (703) 620-3900

**Fujitsu America, Inc.**  
77 Rio Robles  
San Jose, CA 95134 (408) 434-6777

**Galacticomm**  
4101 SW 47th Avenue, Suite 101  
Ft. Lauderdale, FL 33314 (305) 583-5990

**Gandalf Data, Inc.**  
1020 S. Noel Avenue  
Wheeling, IL 60090 (312) 541-6060

**General DataComm, Inc.**  
5179 Straights Turnpike  
Middlebury, CT 06762-1299 (203) 574-1118

**Hayes Microcomputer Products, Inc.**  
P.O. Box 105203  
Atlanta, GA 30348 (404) 449-8791

**Henricks Technologies**  
3924 Green Industrial Way  
Atlanta, GA 30341 (404) 452-8420

**Holmes Microsystems**  
2620 S. 900 W.  
Salt Lake City, UT 84119 (801) 975-9929

**Inmac**  
2465 Augustine Road  
Santa Clara, CA 95052 (408) 727-1970

**International Business Machines Corp. (IBM)**  
Old Orchard Road  
Armonk, NY 10504  
Contact your local IBM representative.

**Longshine Technology**  
2013 N. Capitol Avenue  
San Jose, CA 95132 (408) 942-1746

**Memotec**  
600 McCaffrey Street  
Montreal, PQ, Canada H4T 1N1 (514) 738-4781

**Microcom**  
Software Div.  
55 Federal Road  
Danbury, CT 06810 (203) 798-3800

**MicroGate Corp.**  
9501 Capital of Texas Highway, Suite 105  
Austin, TX 78759 (512) 345-7791

**Mitsuba Corp.**  
650 Terrace Drive  
San Dimas, CA 91773 (714) 592-2866

**Multi-Tech Systems, Inc.**  
82 Second Avenue SE  
New Brighton, MN 55112 (617) 785-3500

**Mux Lab, Inc.**  
165 Graveline  
St. Laurent, PQ, Canada H4T 274 (514) 735-2741

**Natural Microsystems Corp.**  
8 Erie Drive  
Natick, MA 01760 (508) 650-1300

**NEC America, Inc.**  
Data/Video Communications Div.  
110 Rio Robles  
San Jose, CA 95134 (408) 433-1250

**Network Software Associates, Inc.**  
39 Argonaut  
Laguna Hills, CA 92656 (714) 768-4013

**Nu Data Corp.**  
32 Fairview Avenue  
Little Silver, NJ 07739 (201) 842-5757

**Octocom Systems, Inc.**  
225 Ballardvale Street  
Wilmington, MA 01887 (508) 658-6050

**Okidata Corp.**  
532 Fellowship Road  
Mount Laurel, NJ 08054 (609) 235-2600

**Omnitel, Inc.**  
3500 W. Warren Avenue  
Fremont, CA 94538 (415) 490-2202

**Patton Electronics, Inc.**  
7958 Cessna Avenue  
Gaithersburg, MD 20879 (301) 795-1000

**Penril DataCom**  
Data Communications Div.  
300 Quince Orchard Boulevard  
Gaithersburg, MD 20878 (301) 921-8600

**Practical Peripherals, Inc.**  
31245 LaBaya Drive  
Westlake Village, CA 91362 (818) 706-0333

**Racal-Milgo**  
1601 N. Harrison Parkway  
Sunrise, FL 33323-2899 (305) 846-1601

**Racal-Vadic, Inc.**  
1525 McCarthy Boulevard  
Milpitas, CA 95035 (408) 432-8008

**Rohm Corp.**  
8 Whatney  
Irvine, CA 92713 (714) 855-2131

**Scitec Communication Systems, Ltd.**  
26 Valley Road  
Middletown, RI 02840 (401) 849-4353

**Smarteam**  
19205 Parthencia Street, Suite J  
Northridge, CA 91324 (818) 886-9726

**Spectrum Cellular Corp.**  
2710 Stemmons Freeway, 800 N. Tower  
Dallas, TX 75207 (214) 630-9825

**Tek-Com Corp.**  
2343 Bering Drive  
San Jose, CA 95131 (408) 435-9515

**Telcor Systems Corp.**  
4 Strathmore Road  
Natick, MA 01760 (508) 653-3995

**Telebit Corp.**  
1310 Chesapeake Terrace  
Sunnyvale, CA 94089 (415) 940-4834

**Telenetics Corp.**  
5109 E. La Palma Avenue  
Anaheim, CA 92807 (714) 779-2766

**TIL Systems, Inc.**  
225 Stedman Street, Suite 27  
Lowell, MA 01851 (508) 970-1189

**Universal Data Systems**  
5000 Bradford Drive  
Huntsville, AL 35805 (205) 721-8000

**U.S. Robotics, Inc.**  
8100 N. McCormick Boulevard  
Skokie, IL 60076 (708) 982-5001

**Visionary Electronics, Inc.**  
141 Parker Street  
San Francisco, CA 94118 (415) 751-8811

**Western DataCom**  
P.O. Box 45113  
Westlake, OH 44145-0113 (216) 835-1510

**Xecom Inc.**  
374 Turquoise Street  
Milpitas, CA 95035 (408) 945-6640

**Zoom Telephonics, Inc.**  
207 South Street  
Boston, MA 02111 (617) 423-1072

# Low, Medium, and High Speed Microcomputer Modems

## Comparison Column Entry Descriptions

### Hardware Configuration

This entry indicates whether the model is housed in an enclosure and suitable for placement on a desktop (stand-alone), is a circuit board suitable for mounting in a standard equipment rack (rackmount) that holds many modem cards, or is a plug-in circuit board for mounting in a slot in a terminal or microcomputer (plug-in). Frequently, vendors offer models in standalone and rack-mount versions.

**Used with Microcomputers.** Vendors responded with a yes or no answer; those that answered no were eliminated from the survey. If yes, they checked if their models worked with the Apple II family, Apple Macintosh, IBM PC family, PS/2, or Other.

**Hayes AT Command Set Compatible.** Hayes AT Command Set compatibility relates primarily to modem commands, modem responses, and the provision of settings compatible with various communications programs.

**Compatibility.** Various choices on the questionnaire were AT&T 103/113, AT&T 108, AT&T 212/212A, CCITT V.21, CCITT V.22, CCITT V.22 bis, CCITT V.29, CCITT V.33, and Other.

### Communications Facility

This term refers to the communications path over which connections are made. Most data communications applications use the common telephone network (*dial-up*) or equivalent *leased lines*. Some devices included in the survey operate on both types of facilities.

**Maximum Data Rate (bps).** Under this entry, vendors expressed the *highest transmission rates* supported by their modems in bits per second (bps).

**Fallback Speed (bps).** Vendors also indicated *fallback speeds*, which refer to the capability of most medium and high speed modems to detect poor conditions on a telephone line and to lower transmission speed to prevent errors.

**Synchronization.** The time relationship that exists among the bits that make up messages can be *asynchronous* or *synchronous*, both of which are supported by modems. Asynchronous transmission, also called start/stop, refers to the occurrence of data transmission in an irregular fashion, or one character at a time, usually as it is being keyed. Synchronous transmission occurs in a continuous stream.

**Transmission Mode.** Modems operate in three transmission modes: *simplex*, *half-duplex*, or *full-duplex*. Simplex mode supports unidirectional data transmission; i.e., data can either be transmitted only or received only. Half-duplex mode supports data transmission in either direction, but not simultaneously. Full-duplex operation simultaneously transmits and receives data over a common communications facility. Some devices operate in half/full duplex mode.

**Configuration.** Modems generally operate in one or a combination of configurations, including *point-to-point* and *multi-point*. In a point-to-point configuration, a connection is permanently established between two specific points. A multi-point configuration consists of a circuit that connects three or more locations.

**Line Conditioning.** Since the telephone network is not a perfect electrical path, as the speed of data exchange increases, it becomes increasingly difficult for modems to manage the precise signaling for accurate information transfer. To minimize problems on leased circuits, users pay a premium for a specially conditioned line. The telephone company will either select a path that meets the more stringent requirements of the conditioning or service the path to meet the standards. On the questionnaire, vendors selected *D1*, *D2*, or *Other*.

**Modulation.** The various types of modulation techniques used by a modem to convert digital information into analog signals for transmission over the public telephone network are FSK—frequency shift key; PSK—phase shift key; DPSK—differential phase shift key; AM—amplitude modulation; and QAM—quadrature amplitude modulation.

**Terminal Interface.** Most modems provide standard electrical interfaces, such as those established by the Electronics Industries Association (EIA), the most common of these being *RS-232-C* and *RS-449*. Standards established by the Consultative Committee on International Telegraphy and Telephony (CCITT) include

V.24 and V.28. Other interfaces can include the PS/2 Micro Channel and PC Bus.

**Line Interface.** This entry describes the physical connection of the modem to the communications facility, usually by *two-wire*, *four-wire*, or *two/four wire* arrangements. Two-wire usually handles dial-up connections and four-wire, leased line connections.

**Setup.** Users set operating configurations through straps, thumbwheels, or DIP switches. Users of intelligent modems configure parameters via single keystrokes on a connected CRT terminal or from a network

control terminal keyboard. Vendors indicated if setup occurred via *hardware only*, *software only*, or *hardware/software*.

**Auto Answer/Dial.** *Automatic answering* is required for unattended operation of a terminal on the dial-up network. Most recent modems contain integral automatic dialers. Many *auto dial* modems have large memories for storing directories and commands.

**Alternate Voice/Data.** Many modems switch between voice and data transmission. Some newer products support data-over-voice capabilities in which the band is split, and data and voice

transmit at different frequencies over the same band.

**Equalization.** This feature neutralizes the undesirable characteristics of a communications line that distort transmission. It matches line conditions to achieve the full data rate capability of the line. Two common methods are *fixed compromise* and *automatic adaptive*.

**Protocol/Error Correction.** The two most popular error-correcting protocols are *Microcom Networking Protocols (MNP)* and *Link Access Procedure D (LAP D)*.

**Data Compression.** This technique increases the

effective transmission rate by eliminating gaps and redundancies in the datastream.

**Price/Availability**  
*Purchase* refers to the base price of the modem, excluding options. *Date of First Installation* indicates the first commercial availability of the product.

**Comments**  
In this section, vendors listed special characteristics of the devices or mentioned other products with which they can be used.

Vendor	Amstrad, Inc.	Apple Computer, Inc.	Apple Computer, Inc.	Apple Computer, Inc.
<b>Product</b>	<b>MC2400 PC</b>	<b>Apple Data Modem 2400</b>	<b>Apple Personal Modem</b>	<b>Macintosh Portable Data Modem 2400</b>
<b>Hardware Configuration Used With Microcomputers</b>	Plug in Yes, IBM PC family	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Plug in Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
<b>Hayes AT Command Set Compatible</b>	Yes AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
<b>Communications Facility</b>	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	2400 bps	2400	1200	2400
<b>Fallback Speed (bps)</b>	1200, 300	1200, 300	300	1200, 300
<b>Synchronization</b>	Asynchronous	Asynchronous	Asynchronous	Asynchronous
<b>Transmission Mode</b>	Full duplex	Full duplex	Full duplex	Full duplex
<b>Configuration</b>	Point-to-point	Multipoint	Multipoint	Multipoint
<b>Line Conditioning</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Modulation</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Terminal Interface</b>	RS-232-C	RS-232-C, RS-422	RS-232-C	RS-232-C, RS-422
<b>Line Interface Setup</b>	Vendor did not specify	Two-wire	Two-wire	Two-wire
<b>Auto Answer/Dial</b>	Software only	Hardware only	Hardware only	Hardware only
<b>Alternate Voice/Data Equalization</b>	Yes	Yes	Yes	Yes
	No	No	No	No
	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Protocol/Error Data Compression</b>	Vendor did not specify	MNP	Vendor did not specify	MNP
	Vendor did not specify	No	No	No
<b>Price/Availability Purchase (\$)</b>	99	499	279	449
<b>Date Of First Installation</b>	August 1988	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Comments</b>	—	Order #: COOO2LL1A; includes Apple Data Modem 2400; telephone cord with RJ-11 plug	Order #: A9MO334; includes Apple Personal modem; telephone cord with RJ-11 plug	Order # MO250

Vendor	Applied Engineering	Applied Engineering	Applied Engineering	Applied Engineering
<b>Product</b>	<b>Datalink 2400</b>	<b>Datalink Express</b>	<b>Datalink Express w/FAX Option</b>	<b>Datalink Express w/MNP Option</b>
<b>Hardware Configuration Used With Microcomputers</b>	Plug in Yes, Apple II family	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any with RS-232 port	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any with RS-232 port
<b>Hayes AT Command Set Compatible</b>	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, any with RS-232 port	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, any with RS-232 port
<b>Communications Facility</b>	Dial-up	Dial-up/leased	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	2400	2400	2400	2400
<b>Fallback Speed (bps)</b>	1200, 300	1200, 300	1200, 300	1200, 300
<b>Synchronization</b>	Asynchronous	Async/sync	Async/sync	Async/sync
<b>Transmission Mode</b>	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Modulation</b>	FSK, QAM, PSK, DPSK, QPSK, DCPSK	FSK, QAM, PSK, QPSK, DCPSK	FSK, QAM, PSK, QPSK, DCPSK	FSK, QAM, PSK, DPSK, QPSK, DCPSK
<b>Terminal Interface</b>	Apple II series	RS-232-C	RS-232-C	RS-232-C
<b>Line Interface Setup</b>	Two-wire	Two-wire	Two-wire	Two-wire
<b>Auto Answer/Dial</b>	Hardware/software	Hardware/software	Hardware/software	Hardware/software
<b>Alternate Voice/Data Equalization</b>	Yes	Yes	Yes	Yes
	Yes	Yes	Yes	Yes
	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error Data Compression</b>	CRC, xmodem	CRC, xmodem, Kermit	CRC, Xmodem, Kermit, group 3	CRC, xmodem, MNP, Kermit
	No	No	No	Yes
<b>Price/Availability Purchase (\$)</b>	239	249	349	348
<b>Date Of First Installation</b>	August 1988	October 1989	February 1990	November 1989
<b>Comments</b>	—	—	Also serves as 4800 bps Fax	—

Vendor	Applied Engineering	ATI Technologies Inc.	ATI Technologies Inc.	Barr Systems, Inc.
<b>Product</b>	<b>Datalink/Mac</b>	<b>2400 etc/e External Modem</b>	<b>2400 etc/e Internal Modem</b>	<b>PC-SYNC 201C</b>
<b>Hardware Configuration Used With Microcomputers</b>	Plug in Yes, Apple Macintosh	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any terminal with RS 2.32 port	Plug in Yes, IBM PC family	Plug in Yes, IBM PS/2, models 25 & 30
<b>Hayes AT Command Set Compatible Compatibility</b>	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.42	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.42	No Bell 201C
<b>Communications Facility</b>	Dial-up	Dial-up/leased	Dial-up/leased	Dial-up
<b>Maximum Data Rate (bps)</b>	2400	2400	2400	2400
<b>Fallback Speed (bps)</b>	1200, 300	1200, 300	1200, 300	Vendor did not specify
<b>Synchronization</b>	Asynchronous	Async/sync	Asynchronous	Synchronous
<b>Transmission Mode</b>	Half/full duplex	Half/full duplex	Half/full duplex	Half duplex
<b>Configuration</b>	Vendor did not specify	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	Vendor did not specify	None	Vendor did not specify	None
<b>Modulation</b>	FSK, QAM, PSK, QPSK, DCPSK	QAM	QAM	DPSK
<b>Terminal Interface</b>	NuBus	RS-232-C	PC Bus	PC Bus
<b>Line Interface Setup</b>	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Software only	Two-wire Hardware/software
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data Equalization</b>	Yes	Yes	Yes	Yes
<b>Equalization</b>	Automatic adaptive	Automatic adaptive	Automatic adaptive	Vendor did not specify
<b>Protocol/Error Data Compression</b>	CRC, xmodem, MNP, Kermit Yes	MNP, V.42 including LAP-M Vendor did not specify	MNP, V.42 including LAP-M Yes	CRC Yes
<b>Price/Availability Purchase (\$)</b>	Vendor did not specify	299	239	1,090
<b>Date Of First Installation</b>	February 1990	September 1989	August 1988	1986
<b>Comments</b>	Also serves as 4800 bps Fax	Features front panel push button commands for auto answer, re-dial; sync/async	Product is bundled with Mirror III communications systems	1,190 with RJE + 3270

Vendor	BT Datacom, Inc.	BT Datacom, Inc.	BT Datacom, Inc.	CASE/Datatel, Inc.
<b>Product</b>	<b>Datel 4122 ACX</b>	<b>Datel 4123X</b>	<b>Datel 4242X</b>	<b>DCM 2120</b>
<b>Hardware Configuration Used With Microcomputers</b>	Standalone, plug in, rack Yes	Standalone, plug in, rack Yes	Standalone, plug in, rack Yes	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
<b>Hayes AT Command Set Compatible Compatibility</b>	No V.22	No V.21, V.23	No V.22, V.22 bis	Yes AT&T 103/113, AT&T 212/212A
<b>Communications Facility</b>	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	1200	See comments	2400	1200
<b>Fallback Speed (bps)</b>	Not applicable	1200, 600, 300, 75	1200	0 to 300
<b>Synchronization</b>	Async/sync	Asynchronous	Async/sync	Async/sync
<b>Transmission Mode</b>	Vendor did not specify	Half/full duplex	Vendor did not specify	Vendor did not specify
<b>Configuration</b>	Point-to-point	Point-to-point, multipoint	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	DPSK	FSK	DPSK	FSK, DPSK
<b>Terminal Interface</b>	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	V.28, V.24	RS-232-C, V.28, V.24
<b>Line Interface Setup</b>	Two-wire Hardware only	Two-/four-wire Hardware only	Two-wire Hardware only	Two-wire Hardware/software
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data Equalization</b>	Yes	Yes	Yes	Yes
<b>Equalization</b>	Fixed compromise, automatic adaptive	Fixed compromise	Fixed compromise, automatic adaptive	Fixed compromise
<b>Protocol/Error Data Compression</b>	Vendor did not specify No	Vendor did not specify No	V.42 No	Vendor did not specify No
<b>Price/Availability Purchase (\$)</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Contact vendor
<b>Date Of First Installation</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Comments</b>	—	1200; 9600 using buffer; asymmetric mode option	X.25 PAD	—

Vendor	CASE/Datatel, Inc.	CASE/Datatel, Inc.	CASE/Datatel, Inc.	Cermetek Microelectronics, Inc.
Product	DCM 4212	DCM 4624	DCM 4648	Cermetek 1200
Hardware Configuration Used With Microcomputers	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, plug in, rack Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, plug in, rack Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	No V.22, V.22 bis, V.21, AT&T 202T	Yes AT&T 103/113, V.22, AT&T 108, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, AT&T 108, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, AT&T 212/212A
Communications Facility	Leased lines	Dial-up/leased	Dial-up/leased	Vendor did not specify
Maximum Data Rate (bps)	1800	2400	2400	2400
Fallback Speed (bps)	Vendor did not specify	1200, 300	1200, 300	300/110
Synchronization	Asynchronous	Async/sync	Async/sync	Async/sync
Transmission Mode	Vendor did not specify	Vendor did not specify	Vendor did not specify	Half/full duplex
Configuration	Point-to-point, multipoint	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK	FSK, QAM, DPSK	FSK, QAM, DPSK	PSK
Terminal Interface	RS-232-C	RS-232-C, V.28, V.24, PC Bus	RS-232-C, V.28, V.24, PC Bus	RS-232-C
Line Interface Setup	Two-/four-wire Hardware only	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Hardware/software
Auto Answer/Dial	No	Yes	Yes	Yes
Alternate Voice/Data Equalization	Vendor did not specify Fixed compromise	Yes Automatic adaptive	Yes Automatic adaptive	No Vendor did not specify
Protocol/Error	Vendor did not specify	MNP	MNP	Vendor did not specify
Data Compression	Vendor did not specify	No	Yes	No
Price/Availability				
Purchase (\$)	Contact vendor	Contact vendor	Contact vendor	295
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	1984
Comments	—	—	—	—

Vendor	Cermetek Microelectronics, Inc.	Cermetek Microelectronics, Inc.	Cermetek Microelectronics, Inc.	Chartered Electronics Inc.
Product	Cermetek 1200 SM	Cermetek 2400 R	CMI 2400 SPCU	CEI Link 1200I/2400I
Hardware Configuration Used With Microcomputers	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Plug in Yes, IBM PC family	Plug in Yes, IBM PC family
Hayes AT Command Set Compatible	Yes AT&T 103/113, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes V.22, V.22 bis, AT&T 212/212A, V.21
Communications Facility	Vendor did not specify	Dial-up	Vendor did not specify	Dial-up
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	300/110	1200/300/110	1200/300/110	Vendor did not specify
Synchronization	Async/sync	Async/sync	Async/sync	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	Vendor did not specify
Modulation	PSK	PSK	PSK	Vendor did not specify
Terminal Interface	RS-232-C	RS-232-C	PC Bus	RS-232-C, dual RJ11 jacks
Line Interface Setup	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Hardware/software	Four-wire Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data Equalization	No Vendor did not specify	No Vendor did not specify	No Vendor did not specify	Yes Vendor did not specify
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability				
Purchase (\$)	695	395	285	85; 125
Date Of First Installation	1985	1985	1986	Vendor did not specify
Comments	—	—	—	Half-size, internal modem

Vendor	Chartered Electronics Inc.	Computer Peripherals, Inc.	Computer Peripherals, Inc.	CXR Telcom/Anderson Jacobson
<b>Product</b>	CEI Link 1200S/2400S Miniature	Hook-Up 2400S	VIVA 24	AJ 1212-AD3H
<b>Hardware Configuration Used With Microcomputers</b>	Standalone Yes, IBM PC family	Plug in Yes, IBM PC family	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any RS-232 interface	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family
<b>Hayes AT Command Set Compatible</b>	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21	Yes AT&T 103/113, V.22, AT&T 212/212A
<b>Communications Facility</b>	Dial-up	Dial-up	Dial-up/leased	Dial-up
<b>Maximum Data Rate (bps)</b>	2400	2400	2400	1200
<b>Fallback Speed (bps)</b>	Vendor did not specify	1200, 300	1200, 300	0 to 300
<b>Synchronization</b>	Async/sync	Asynchronous	Async/sync	Async/sync
<b>Transmission Mode</b>	Half/full duplex	Full duplex	Full duplex	Half/full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	D1	D1	None
<b>Modulation</b>	Vendor did not specify	FSK, PSK	FSK, PSK	FSK, QAM, DPSK
<b>Terminal Interface</b>	RS-232-C, dual RJ11 jacks	PC Bus	RS-232-C	RS-232-C, V.24
<b>Line Interface Setup</b>	Four-wire Hardware/software	Two-wire Software only	Two-wire Software only	Two-wire Vendor did not specify
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	Yes	Yes	Yes	No
<b>Equalization</b>	Vendor did not specify	Fixed compromise, automatic adaptive, fixed Trans/Adapt	Fixed compromise, automatic adaptive, fixed Trans/Adapt	Automatic adaptive
<b>Protocol/Error</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Data Compression</b>	No	No	No	No
<b>Price/Availability</b>				
<b>Purchase (\$)</b>	195	245	299	495
<b>Date Of First Installation</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	1985
<b>Comments</b>	—	—	—	Setup features; switches and softstraps

Vendor	CXR Telcom/Anderson Jacobson	CXR Telcom/Anderson Jacobson	CXR Telcom/Anderson Jacobson	CXR Telcom/Anderson Jacobson
<b>Product</b>	AJ 1212-STH	AJ 2412-2H1	AJ 2412-3H1	AJ 2412-AD3H
<b>Hardware Configuration Used With Microcomputers</b>	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family	Plug in Yes, IBM PC family	Plug in Yes, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family
<b>Hayes AT Command Set Compatible</b>	Yes AT&T 103/113, V.22, AT&T 212/212A, V.21	Yes AT&T 103/113, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
<b>Communications Facility</b>	Dial-up	Dial-up	Dial-up	Dial-up
<b>Maximum Data Rate (bps)</b>	1200	2400	2400	2400
<b>Fallback Speed (bps)</b>	0 to 300	1200, 300	1200, 300	1200, 0 to 300
<b>Synchronization</b>	Async/sync	Asynchronous	Asynchronous	Async/sync
<b>Transmission Mode</b>	Half/full duplex	Full duplex	Full duplex	Half/full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	FSK, QAM, DPSK	FSK, QAM, DPSK	FSK, QAM, DPSK	FSK, QAM, DPSK
<b>Terminal Interface</b>	RS-232-C, V.28, V.24	V.24, PC Bus	PS/2 Micro Channel	RS-232-C, V.24
<b>Line Interface Setup</b>	Two-wire Vendor did not specify	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Vendor did not specify
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	No	Yes	Yes	No
<b>Equalization</b>	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Data Compression</b>	No	Vendor did not specify	Vendor did not specify	No
<b>Price/Availability</b>				
<b>Purchase (\$)</b>	295	399	449	695
<b>Date Of First Installation</b>	1986	1988	1988	1985
<b>Comments</b>	Setup features; switches and softstraps	—	—	Setup features; switches + softstraps

Vendor	CXR Telcom/Anderson Jacobson	CXR Telcom/Anderson Jacobson	CXR Telcom/Anderson Jacobson	CXR Telcom/Anderson Jacobson
Product	AJ 2412-STH	AJ 2441-1	AJ 2441-2	AJ 2441-3
Hardware Configuration Used With Microcomputers	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family
Hayes AT Command Set Compatible Compatibility	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21
Communications Facility	Dial-up	Dial-up/leased, with unatt. automatic dial back-up	Dial-up	Leased lines
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	1200, 0 to 300	1200, 0 to 300	1200, 0 to 300	1200, 0 to 300
Synchronization	Async/sync	Async/sync	Async/sync	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, DPSK	FSK, QAM, DPSK	FSK, QAM, DPSK	FSK, QAM, DPSK
Terminal Interface	RS-232-C, V.24	RS-232-C, V.24	RS-232-C, V.24	RS-232-C, V.24
Line Interface Setup	Two-wire Vendor did not specify	Two-/four-wire Vendor did not specify	Two-wire Vendor did not specify	Two-/four-wire Vendor did not specify
Auto Answer/Dial	Yes	Yes	Yes	No
Alternate Voice/Data	No	No	No	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error Data Compression	MNP Yes	MNP Yes	MNP Yes	MNP Yes
Price/Availability Purchase (\$)	495	695	495	495
Date Of First Installation	1986	1986	1988	1988
Comments	Setup features; switches and softstraps, data compression; MNP 5	Setup features; switches and softstraps, data compression; MNP 5	Setup features; switches and softstraps, data compression; MNP 5	Setup features; switches and softstraps, data compression; MNP 5
Vendor	Data Race	Data Race	DFI, Inc.	DFI, Inc.
Product	Action 24	PC Race 24	FaxModem-100	MD-2400
Hardware Configuration Used With Microcomputers	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Plug in Yes	Plug in Yes, IBM PC family	Plug in Yes, IBM PC family
Hayes AT Command Set Compatible Compatibility	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.23	Yes AT&T 103/113, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21
Communications Facility	Dial-up/leased	Dial-up	Dial-up	Dial-up
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	1200	1200, 300	1200	1200
Synchronization	Async/sync	Asynchronous	Asynchronous	Asynchronous
Transmission Mode	Full duplex	V.22bis	Half duplex	Vendor did not specify
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, PSK	FSK, PSK	Vendor did not specify	Vendor did not specify
Terminal Interface	RS-232-C	PC Bus	PC Bus	PC Bus
Line Interface Setup	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Fixed compromise	Fixed compromise
Protocol/Error Data Compression	MNP Vendor did not specify	Vendor did not specify Yes	CRC, xmodem, Kermit Vendor did not specify	CRC, xmodem, Kermit Vendor did not specify
Price/Availability Purchase (\$)	595 (30 days ARO)	595	Vendor did not specify	Vendor did not specify
Date Of First Installation	July 1988	October 1987	October 1989	Vendor did not specify
Comments	Unit has Hayes autosync for use with SNA and 3780 bisync remote packages	—	Includes 4800 bps fax and Bitpaint and Bitcom software	Includes Bitcom software

Vendor	Elcon Technology	Emerald Technology	Emerald Technology	Everex Systems, Inc.
<b>Product</b>	<b>Dial Network Adapter</b>	<b>201 B/C</b>	<b>V22</b>	<b>Evercom 12</b>
<b>Hardware Configuration Used With Microcomputers</b>	Plug in Yes, IBM PC family, IBM PS/2, model 30	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any	Plug in Yes, IBM PC family, IBM PC/XT/AT compatibles
<b>Hayes AT Command Set Compatible</b>	Yes V.22 bis	No 201 B/C	Yes V.22 bis, Bell 103,212A	Yes AT&T 103/113, V.22, AT&T 212/212A, V.21
<b>Communications Facility</b>	Dial-up, dial-up/leased, leased lines, switched	Dial-up/leased, 2-wire half-duplex, 4-wire full-duplex	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	2400	2400	2400	1200
<b>Fallback Speed (bps)</b>	1200	None	1200, 300, 120	Vendor did not specify
<b>Synchronization</b>	Synchronous	Synchronous	Async/sync	Asynchronous
<b>Transmission Mode</b>	Vendor did not specify	Half/full duplex	Full duplex	Half/full duplex
<b>Configuration</b>	Point-to-point	Point-to-point, multipoint	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	PSTN
<b>Modulation</b>	QAM	DPSK	See comments	FSK, PSK, DPSK
<b>Terminal Interface</b>	RS-232-C, V.24, X.21	RS-232-C	RS-232-C, V.28, V.24	PC Bus
<b>Line Interface Setup</b>	Two-wire Hardware/software	Two-/four-wire Hardware only	Two-wire Hardware only	Two-wire Hardware/software
<b>Auto Answer/Dial</b>	Yes	Vendor did not specify	Yes	Yes
<b>Alternate Voice/Data</b>	No	Yes	Yes	Yes
<b>Equalization</b>	Fixed compromise	Fixed compromise	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	X.25	Vendor did not specify	Vendor did not specify	CRC, X/Ymodem, Kermit
<b>Data Compression</b>	No	No	No	No
<b>Price/Availability</b>				
<b>Purchase (\$)</b>	1,295	685	575	99
<b>Date Of First Installation</b>	1984	1986	1988	February 1988
<b>Comments</b>	—	Has auto answer but not auto dial	Modulation; QAM(2400 bps), DPSK(1200 bps), FSK(300 bps)	—

Vendor	Everex Systems, Inc.	Everex Systems, Inc.	Everex Systems, Inc.	Everex Systems, Inc.
<b>Product</b>	<b>Evercom 24</b>	<b>Evercom 24</b>	<b>Evercom 24E</b>	<b>Evercom II 24</b>
<b>Hardware Configuration Used With Microcomputers</b>	Plug in Yes, IBM PC family, IBM PC/XT/AT compatibles	Plug in Yes, IBM PC family, IBM PS/2, IBM PC/XT/AT compatibles	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any with Rs-232 interface	Plug in Yes, IBM PC family, IBM PS/2
<b>Hayes AT Command Set Compatible</b>	Vendor did not specify AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Vendor did not specify AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, CCITT V.42 alt. procedure	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, CCITT V.42 alt. procedure	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, CCITT V.42 alt. procedure
<b>Communications Facility</b>	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	2400	4800	4800	2400
<b>Fallback Speed (bps)</b>	1200, 300	2400, 1200, 300	2400, 1200, 300	1200, 300
<b>Synchronization</b>	Asynchronous	Asynchronous	Asynchronous	Asynchronous
<b>Transmission Mode</b>	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	PSTN	PSTN	PSTN	PSTN
<b>Modulation</b>	FSK, QAM, PSK, DPSK	FSK, QAM, PSK, DPSK	FSK, QAM, PSK, DPSK	FSK, QAM, PSK, DPSK
<b>Terminal Interface</b>	PC Bus	PC Bus	RS-232-C	PS/2 Micro Channel
<b>Line Interface Setup</b>	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Hardware/software
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	Yes	Yes	Yes	Yes
<b>Equalization</b>	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	CRC, X/Ymodem, Kermit	CRC, X/Ymodem, MNP, Kermit	CRC, X/Ymodem, MNP, Kermit	CRC, X/Ymodem, Kermit
<b>Data Compression</b>	No	Yes	Yes	No
<b>Price/Availability</b>				
<b>Purchase (\$)</b>	199	249	299	299
<b>Date Of First Installation</b>	August 1986	March 1988	October 1989	December 1987
<b>Comments</b>	—	—	—	—

Vendor	Everex Systems, Inc.	Everex Systems, Inc.	Everex Systems, Inc.	Galacticomm
Product	Evercom II 24	EverFax 24/96	EverFax EF-12/48	2408
Hardware Configuration Used With Microcomputers	Plug in Yes, IBM PS/2	Plug in Yes, IBM PC family, IBM PC/XT/AT compatibles	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any with Rs-232 interface	Plug in Yes, IBM PC family
Hayes AT Command Set Compatible	Vendor did not specify AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, CCITT V.42 alt. procedure	Yes AT&T 103/113, V.22, AT&T 212/212A, V.21	No AT&T 103/113, V.22 bis, AT&T 212/212A, V.21
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up
Maximum Data Rate (bps)	2400	4800	1200	2400
Fallback Speed (bps)	1200, 300	2400, 1000, 300	300	Vendor did not specify
Synchronization	Asynchronous	Asynchronous	Asynchronous	Asynchronous
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	PSTN	PSTN	PSTN	Vendor did not specify
Modulation	FSK, QAM, PSK, DPSK	FSK, QAM, PSK, DPSK	FSK, PSK, DPSK	FSK, PSK
Terminal Interface	PS/2 Micro Channel	PC Bus	RS-232-C	PC Bus
Line Interface Setup	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	CRC, X/Ymodem, MNP, Kermit	CRC, X/Ymodem, MNP, Kermit	CRC, X/Ymodem, Kermit	Vendor did not specify
Data Compression	Vendor did not specify	Yes	Vendor did not specify	Vendor did not specify
Price/Availability				
Purchase (\$)	349	399	299	1,816 (2 modems) 3,772 (8 modems)
Date Of First Installation	September 1989	November 1989	February 1988	Vendor did not specify
Comments	—	This unit includes 9600 bps fax-sending and receiving capabilities	This unit includes 4800 bps fax-sending and receiving capabilities	Circuit card for the XT/AT/EISA bus
Vendor	Galacticomm	Galacticomm	Gandalf Data, Inc.	Gandalf Data, Inc.
Product	Model 16	Model 4	Access Series 24A	Access Series 24EC
Hardware Configuration Used With Microcomputers	Plug in Yes, IBM PC family	Plug in Yes, IBM PC family, IBM PS/2	Standalone Yes	Standalone Yes
Hayes AT Command Set Compatible	No AT&T 103/113, AT&T 212/212A	No AT&T 103/113, AT&T 212/212A	Yes AT&T 212/212A, AT&T 103, V.22 bis	Yes AT&T 212/212A, AT&T 103, V.22, V.22 bis
Communications Facility	Dial-up	Dial-up	Dial-up/leased, 2 wire	Dial-up/leased
Maximum Data Rate (bps)	1200	1200	2400	2400
Fallback Speed (bps)	300	Vendor did not specify	300, 1200	300, 1200
Synchronization	Asynchronous	Asynchronous	Asynchronous	Async/sync
Transmission Mode	Full duplex	Full duplex	Full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	Vendor did not specify	Vendor did not specify	Not required	Not required
Modulation	FSK, PSK	FSK, PSK	FSK, QAM, PSK	FSK, QAM, DPSK
Terminal Interface	PC Bus	PC Bus	RS-232-C, V.28/V.24	RS-232-C, V.28/V.24
Line Interface Setup	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Vendor did not specify	Two-wire Vendor did not specify
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	MNP
Data Compression	No	No	No	Yes
Price/Availability				
Purchase (\$)	2,942 (18 modems) 4,474 (16 modems)	922 (2 modems) 1,292 (4 modems)	350	495
Date Of First Installation	Vendor did not specify	Vendor did not specify	1987	1989
Comments	Circuit card with up to 16 modems	Circuit card with up to 4 modems	Setup; interface commands	Setup; interface commands

Vendor	Gandalf Data, Inc.	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.
Product	Access Series 24V	DataComm 108-3M	DataComm 201-7	DataComm 201C/L
Hardware Configuration Used With Microcomputers	Standalone, rackmount Yes	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount Yes, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	No AT&T 108, 103	No 201C/V.26	No 201
Communications Facility	Dial-up/leased	Vendor did not specify	Leased lines	Dial-up/leased
Maximum Data Rate (bps)	2400	Up to 300	2400	2400
Fallback Speed (bps)	1200, 300	Not applicable	1200	1200
Synchronization	Async/sync	Asynchronous	Synchronous	Synchronous
Transmission Mode	Full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point, multipoint/drop	Point-to-point, multipoint/drop	Point-to-point, multipoint/drop
Line Conditioning	Not required	Vendor did not specify	Vendor did not specify	Vendor did not specify
Modulation	FSK, QAM, DPSK	FSK	DPSK	DPSK
Terminal Interface	RS-232-C, V.28/V.24	RS-232-C	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
Line Interface Setup	Two-wire Vendor did not specify	Two-/four-wire Hardware only	Two-/four-wire Hardware only	Two-/four-wire Hardware only
Auto Answer/Dial	Yes	No	No	Yes
Alternate Voice/Data	Yes	No	No	Yes
Equalization	Automatic adaptive	Fixed compromise	Fixed compromise	Fixed compromise
Protocol/Error	MNP	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	Vendor did not specify	No	No	No
Price/Availability				
Purchase (\$)	495 - 500	375	695	785
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	Setup - screen menu, Straps	16 modems per rack	16 modems fit in a single rack	801 ACU support; 16 modems per rack

Vendor	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.
Product	DataComm 202ST	DataComm 202T	DataComm 212A/L	DataComm 224
Hardware Configuration Used With Microcomputers	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	No 202	No 202	No AT&T 103/113, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.25bis async/sync
Communications Facility	Leased lines	Leased lines	Dial-up/private lines	Dial-up/leased
Maximum Data Rate (bps)	Up to 1800	Up to 1800	1200	2400
Fallback Speed (bps)	Not applicable	Not applicable	300	1200, 0-300
Synchronization	Asynchronous	Asynchronous	Asynchronous	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Vendor did not specify	Vendor did not specify
Configuration	Point-to-point, multipoint/drop	Point-to-point, multipoint/drop	Point-to-point	Point-to-point
Line Conditioning	Vendor did not specify			
Modulation	FSK	FSK	FSK	FSK, QAM, PSK
Terminal Interface	RS-232-C	RS-232-C	RS-232-C	RS-232-C, V.28, V.24
Line Interface Setup	Two-/four-wire Hardware only	Two-/four-wire Hardware only	Two-wire Hardware only	Two-wire Hardware/software
Auto Answer/Dial	Yes	No	Yes	Yes
Alternate Voice/Data	Yes	No	Yes	Yes
Equalization	Fixed compromise	Fixed compromise	Fixed compromise	Fixed compromise
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	MNP, X.25, V.42, V.42bis
Data Compression	No	No	No	Yes
Price/Availability				
Purchase (\$)	535	480	675	580
Date Of First Installation	Vendor did not specify			
Comments	16 modems per rack	16 modems per rack	16 modems per rack	16 datasets per shelf

Vendor	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.
Product	DataComm 2400ASM	DeskTop 201	Desktop 202	DeskTop 224
<b>Hardware Configuration Used With Microcomputers</b>	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, IBM PC family, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	No 201/V.26	No 201/V.26	No 202	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
<b>Communications Facility</b>	Leased lines	Dial-up/leased	Leased lines	Dial-up
<b>Maximum Data Rate (bps)</b>	2400	2400	Up to 1800	2400
<b>Fallback Speed (bps)</b>	1800, 1200, 600, 300	1200, 300	Not applicable	1200, 300
<b>Synchronization</b>	Async/sync	Asynchronous	Asynchronous	Asynchronous
<b>Transmission Mode</b>	Full duplex	Vendor did not specify	Half/full duplex	Full duplex
<b>Configuration</b>	Point-to-point, multipoint/drop	Vendor did not specify	Point-to-point, multipoint/drop	Point-to-point, multipoint
<b>Line Conditioning</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Modulation</b>	DPSK	FSK, QAM, DPSK	FSK	Vendor did not specify
<b>Terminal Interface</b>	RS-232-C	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
<b>Line Interface Setup</b>	Four-wire Hardware only	Two-wire Hardware only	Two-/four-wire Hardware only	Two-wire Software only
<b>Auto Answer/Dial</b>	No	Yes	No	Yes
<b>Alternate Voice/Data</b>	No	Yes	No	Yes
<b>Equalization</b>	Fixed compromise	Fixed compromise	Fixed compromise	Automatic adaptive
<b>Protocol/Error</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Data Compression</b>	No	No	No	No
<b>Price/Availability</b>				
<b>Purchase (\$)</b>	825	645	400	375
<b>Date Of First Installation</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Comments</b>	16 modems per rack	Desktop enclosure; 511 bit pattern test generator	—	Extensive diagnostics; self test, digital/analog/remote digital loopback

Vendor	General DataComm, Inc.	General DataComm, Inc.	Hayes Microcomputer Products, Inc.	Hayes Microcomputer Products, Inc.
Product	Desktop 224E	Diagnostic Modem NMS 2418	Personal Modem 1200	Personal Modem 2400
<b>Hardware Configuration Used With Microcomputers</b>	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount Yes, NMC 30B laptop computer (MS/Dos based)	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.25bis async/sync	Vendor did not specify Bell 201/202; V.23/V.26	Yes AT&T 103/113, AT&T 212/212A	Yes AT&T 103/113, V.22 bis, AT&T 212/212A
<b>Communications Facility</b>	Dial-up	Leased lines	Dial-up	Dial-up
<b>Maximum Data Rate (bps)</b>	2400	2400	1200	2400
<b>Fallback Speed (bps)</b>	1200, 300	1200 to 0	300	1200, 300
<b>Synchronization</b>	Async/sync	Async/sync	Asynchronous	Asynchronous
<b>Transmission Mode</b>	Vendor did not specify	Full duplex	Full duplex	Full duplex
<b>Configuration</b>	Point-to-point	Point-to-point, multipoint	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	Vendor did not specify	None	None
<b>Modulation</b>	DPSK	FSK, DPSK, CCITT V.26, V.26bis	FSK, DPSK	FSK, QAM, DPSK
<b>Terminal Interface</b>	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.24	RS-232-C, V.24
<b>Line Interface Setup</b>	Two-wire Hardware/software	Four-wire Software only	Two-wire Software only	Two-wire Software only
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	Yes	No	Yes	Yes
<b>Equalization</b>	Fixed compromise	Automatic adaptive, adjustable compromise ACE	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	MNP, X.25, V.42, V.42bis	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Data Compression</b>	Yes	Vendor did not specify	No	No
<b>Price/Availability</b>				
<b>Purchase (\$)</b>	495	Vendor did not specify	199	199
<b>Date Of First Installation</b>	Vendor did not specify	April 1988	Vendor did not specify	Vendor did not specify
<b>Comments</b>	Stylish desktop enclosure; 10 min. test abort timer	Controlled/configured via GDC Netcon NMS; line & business int. measurements	Contains RS-232; telco cables	Contains RS-232; telco cables

Vendor	Hayes Microcomputer Products, Inc.	Hayes Microcomputer Products, Inc.	Hayes Microcomputer Products, Inc.	Hayes Microcomputer Products, Inc.
Product	Smartmodem 1200B	Smartmodem 2400	Smartmodem 2400B	Smartmodem 2400M
Hardware Configuration Used With Microcomputers	Plug in Yes, IBM PC family	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Plug in Yes, IBM PC family	Plug in Yes, Apple Macintosh
Hayes AT Command Set Compatible	Yes AT&T 103/113, V.22, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Vendor did not specify AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up	Dial-up	Dial-up	Dial-up
Maximum Data Rate (bps)	1200	2400	2400	2400
Fallback Speed (bps)	300	1200, 300	1200, 300	1200, 300
Synchronization	Asynchronous	Async/sync, Hayes AutoSync	Async/sync, Hayes AutoSync	Async/sync
Transmission Mode	Full duplex	Full duplex	Full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, DPSK	FSK, QAM, DPSK	FSK, QAM, DPSK	FSK, QAM, DPSK
Terminal Interface	PC Bus	RS-232-C, V.24	PC Bus	NuBus
Line Interface Setup	Two-wire Software only	Two-wire Software only	Two-wire Software only	Two-wire Software only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Fixed compromise, automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability				
Purchase (\$)	199	499	349	499
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	Bundled with Smartcom II V3.1 for IBM PCs & compatibles	AutoSync enables modems to call from an async terminal, then switch to sync	AutoSync switches from async to sync without a sync adapter	Includes Hayesconnect + Hayesconnect Server software

Vendor	Hayes Microcomputer Products, Inc.	Hayes Microcomputer Products, Inc.	Hayes Microcomputer Products, Inc.	Hayes Microcomputer Products, Inc.
Product	Smartmodem 2400P	Smartmodem 2400Q	V-Series Smartmodem 2400 X.25/V.42	V-Series Smartmodem 2400B X.25/V.42
Hardware Configuration Used With Microcomputers	Plug in Yes, IBM PS/2	Plug in Yes, Compaq Portable III	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Plug in Yes, IBM PC family
Hayes AT Command Set Compatible	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up	Dial-up	Dial-up	Dial-up
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	1200, 300	1200, 300	1200, 300	1200, 300
Synchronization	Async/sync, Hayes AutoSync	Async/sync, Hayes AutoSync	Async/sync, Hayes AutoSync	Async/sync, Hayes AutoSync
Transmission Mode	Full duplex	Half/full duplex	Full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point, multipt./session	Point-to-point, multipt./session
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, DPSK	FSK, QAM, DPSK	FSK, QAM, DPSK	FSK, QAM, DPSK
Terminal Interface	PS/2 Micro Channel	PC Bus	RS-232-C, V.24	PC Bus
Line Interface Setup	Two-wire Software only	Two-wire Software only	Two-wire Software only	Two-wire Software only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	MNP, V.42, LAPB	MNP, V.42, LAPB
Data Compression	No	No	No	No
Price/Availability				
Purchase (\$)	499	499	649	599
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	AutoSync switches from async to sync without a sync adapter	AutoSync switches from async to sync without a sync adapter	AutoSync switches from async to sync without a sync adapter	AutoSync switches from async to sync without a sync adapter

Vendor	Hayes Microcomputer Products, Inc.	Henricks Technologies	Holmes Microsystems	Holmes Microsystems
<b>Product</b>	<b>V-Series Smartmodem 2400M</b>	<b>HTI-2400</b>	<b>FAX'EM 96</b>	<b>FAX'EM T-96</b>
<b>Hardware Configuration Used With Microcomputers</b>	Plug in Yes, Apple Macintosh	Standalone Yes, IBM PC family, IBM PS/2	Plug in Yes, IBM PC family, also serves IBM compatibles	Plug in Yes, IBM PC family, also serves IBM compatibles
<b>Hayes AT Command Set Compatible</b>	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21
<b>Communications Facility</b>	Dial-up	Dial-up/leased	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	2400	2400	2400	2400
<b>Fallback Speed (bps)</b>	1200, 300	1200, 300	1200, 300	1200, 300
<b>Synchronization</b>	Async/sync	Async/sync	Asynchronous	Asynchronous
<b>Transmission Mode</b>	Full duplex	Half/full duplex	Half/full duplex	Half/full duplex
<b>Configuration</b>	Point-to-point, multipt./session	Point-to-point	Vendor did not specify	Vendor did not specify
<b>Line Conditioning</b>	None	None	Vendor did not specify	Vendor did not specify
<b>Modulation</b>	FSK, QAM, DPSK	Vendor did not specify	FSK, PSK, DPSK	FSK, PSK, DPSK
<b>Terminal Interface</b>	NuBus	RS-232-C	PC Bus	PC Bus
<b>Line Interface Setup</b>	Two-wire Software only	Two-wire Hardware only	Two-wire Hardware/software	Two-wire Hardware/software
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	Yes	Yes	Yes	Yes
<b>Equalization</b>	Automatic adaptive	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Protocol/Error</b>	MNP, V.42, LAPB	Vendor did not specify	CRC, xmodem, MNP, Kermit	CRC, xmodem, MNP, Kermit
<b>Data Compression</b>	No	No	Yes	Vendor did not specify
<b>Price/Availability</b>				
<b>Purchase (\$)</b>	699	159	499	699
<b>Date Of First Installation</b>	Vendor did not specify	September 1985	December 1990	December 1990
<b>Comments</b>	Supports CCITT X.32 (Dial X.25) & V.42bis data compression functionality	—	Also serves as a 9600bps Fax machine	Also serves as a 9600bps Fax machine

Vendor	Holmes Microsystems	Inmac	Inmac	Inmac
<b>Product</b>	<b>T-2400</b>	<b>PN801910</b>	<b>PN801920</b>	<b>PN801930</b>
<b>Hardware Configuration Used With Microcomputers</b>	Plug in Yes, IBM PC family, also serves IBM compatibles	Standalone Yes, Apple II family, Apple Macintosh, IBM PC XT/AT & compatibles	Plug in Yes, IBM PS/2, Model 30, PC XT/AT	Internal PS/2 card Yes, IBM PS/2, Procomm software
<b>Hayes AT Command Set Compatible</b>	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21	Yes AT&T 103/113, V.22, AT&T 212/212A	Yes AT&T 103/113, V.22, AT&T 212/212A	Yes AT&T 103/113, V.22, AT&T 212/212A
<b>Communications Facility</b>	Dial-up/leased	Dial-up	Dial-up, Procomm software	Dial-up
<b>Maximum Data Rate (bps)</b>	2400	1200	1200	1200
<b>Fallback Speed (bps)</b>	1200, 300	0-300	0-300	0-300
<b>Synchronization</b>	Asynchronous	Asynchronous	Asynchronous	Asynchronous
<b>Transmission Mode</b>	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
<b>Configuration</b>	Vendor did not specify	Multipoint	Multipoint	Multipoint
<b>Line Conditioning</b>	Vendor did not specify	None	None	None
<b>Modulation</b>	FSK, PSK, DPSK	DPSK	DPSK	DPSK
<b>Terminal Interface</b>	PC Bus	RS-232-C	RS-232-C	PS/2 Micro Channel
<b>Line Interface Setup</b>	Two-wire Hardware/software	Two-wire Hardware only	Two-wire Hardware/software	Two-wire Hardware/software
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	Yes	Yes	Yes	Yes
<b>Equalization</b>	Vendor did not specify	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	CRC, xmodem, MNP, Kermit	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Data Compression</b>	Yes	No	No	No
<b>Price/Availability</b>				
<b>Purchase (\$)</b>	279	105	105	199
<b>Date Of First Installation</b>	1987	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Comments</b>	—	—	—	—

Vendor	Inmac	Inmac	Inmac	Inmac
<b>Product</b>	<b>PN802010</b>	<b>PN802020</b>	<b>PN802030</b>	<b>PN802040</b>
<b>Hardware Configuration</b> Used With Microcomputers	Standalone Yes, Most PCs and IBM 3270	Plug in Yes, IBM PC and compatibles	Plug in Yes, IBM PS/2, Models 50, 60, 70, 80	Plug in Yes, IBM PC & compatibles
Hayes AT Command Set Compatible Compatibility	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A			
<b>Communications Facility</b>	Dial-up	Dial-up, Procomm software	Dial-up	Dial-up, Procomm software
<b>Maximum Data Rate (bps)</b>	2400	2400	2400	2400
<b>Fallback Speed (bps)</b>	0-300	0-300	0-300	0-300
<b>Synchronization</b>	Async/sync	Asynchronous	Asynchronous	Async/sync
<b>Transmission Mode</b>	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
<b>Configuration</b>	Multipoint	Multipoint	Multipoint	Multipoint
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	QAM	QAM	QAM	QAM
<b>Terminal Interface</b>	RS-232-C	RS-232-C	PS/2 Micro Channel	RS-232-C
<b>Line Interface</b>	Two-wire	Two-wire	Two-wire	Two-wire
<b>Setup</b>	Hardware only	Hardware/software	Hardware/software	Hardware/software
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	Yes	Yes	Yes	Yes
<b>Equalization</b>	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	MNP
<b>Data Compression</b>	No	No	No	Yes
<b>Price/Availability</b> Purchase (\$)	209	199	315	355
Date Of First Installation	Vendor did not specify			
<b>Comments</b>	—	—	—	—

Vendor	Inmac	International Business Machines Corp. (IBM)	Longshine Technology	Longshine Technology
<b>Product</b>	<b>PN802050</b>	<b>5853 Model 001</b>	<b>LCS-8824</b>	<b>LCS-8824B</b>
<b>Hardware Configuration</b> Used With Microcomputers	Standalone Yes, Apple II family, Apple Macintosh, IBM PC & compatibles	Standalone Yes, IBM PC family, IBM PS/2	Standalone Yes, IBM PC family	Rackmount Yes, IBM PC family
Hayes AT Command Set Compatible Compatibility	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22 bis, AT&T 212/212A, V.25bis, V.24/V.28	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
<b>Communications Facility</b>	Dial-up	Dial-up	Vendor did not specify	Dial-up
<b>Maximum Data Rate (bps)</b>	2400	2400	2400	2400
<b>Fallback Speed (bps)</b>	0-300	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Synchronization</b>	Async/sync	Async/sync	Async/sync	Asynchronous
<b>Transmission Mode</b>	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
<b>Configuration</b>	Multipoint	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	Vendor did not specify	Vendor did not specify
<b>Modulation</b>	QAM	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Terminal Interface</b>	RS-232-C	RS-232-C, RS-334	RS-232-C	PC Bus
<b>Line Interface</b>	Two-wire	Two-wire	Vendor did not specify	Vendor did not specify
<b>Setup</b>	Hardware only	Hardware only	Vendor did not specify	Vendor did not specify
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	Yes	Yes	Vendor did not specify	Vendor did not specify
<b>Equalization</b>	Automatic adaptive	Automatic adaptive	Vendor did not specify	Vendor did not specify
<b>Protocol/Error</b>	MNP	MNP	Vendor did not specify	Vendor did not specify
<b>Data Compression</b>	Yes	No	Vendor did not specify	Vendor did not specify
<b>Price/Availability</b> Purchase (\$)	355	760	99	79
Date Of First Installation	Vendor did not specify	February 1988	1986	1986
<b>Comments</b>	—	—	—	—

Vendor	Longshine Technology	Longshine Technology	Longshine Technology	Memotec
<b>Product</b>	<b>LCS-8824B/II</b>	<b>LCS-8824MNP</b>	<b>LCS-8824P</b>	<b>224 Series II</b>
<b>Hardware Configuration Used With Microcomputers</b>	Rackmount Yes, IBM PC family, IBM PS/2	Standalone Yes, IBM PC family	Standalone Yes, IBM PC family	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
<b>Hayes AT Command Set Compatible</b>	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32
<b>Communications Facility</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	2400	2400	2400	2400
<b>Fallback Speed (bps)</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	1200, 300
<b>Synchronization</b>	Asynchronous	Async/sync	Asynchronous	Async/sync
<b>Transmission Mode</b>	Half/full duplex	Half/full duplex	Half/full duplex	Full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	None
<b>Modulation</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	QAM
<b>Terminal Interface</b>	PS/2 Micro Channel	RS-232-C	RS-232-C	RS-232-C, V.28, V.24
<b>Line Interface Setup</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Two-/four-wire
<b>Auto Answer/Dial</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Software only
<b>Alternate Voice/Data Equalization</b>	Yes	Yes	Yes	Yes
	Vendor did not specify	Vendor did not specify	Vendor did not specify	Yes
	Vendor did not specify	Vendor did not specify	Vendor did not specify	Automatic adaptive
<b>Protocol/Error Data Compression</b>	Vendor did not specify	MNP Vendor did not specify	Vendor did not specify	MNP Yes
<b>Price/Availability Purchase (\$)</b>	109	129	109	695 (standalone) 645 (rackmount) 1985
<b>Date Of First Installation</b>	September 1989	May 1989	May 1989	
<b>Comments</b>	Internal 2400 modem for PS/2	MNP 5 Protocol; external 2400 modem	Pocket modem for laptops and portables	Off-the-shelf
Vendor	MicroGate Corp.	MicroGate Corp.	MicroGate Corp.	Mitsuba Corp.
<b>Product</b>	<b>SyncLink 2400</b>	<b>SyncLink 2400/2</b>	<b>SyncLink 2422</b>	<b>SM-12H</b>
<b>Hardware Configuration Used With Microcomputers</b>	Plug in Yes, IBM PC family	Plug in Yes, IBM PS/2, with Micro Channel Architecture	Plug in Yes, IBM PC family	Plug in Yes, IBM PC family
<b>Hayes AT Command Set Compatible</b>	No Bell AT&T 201	Vendor did not specify Bell AT&T 201	Yes V.22, V.22 bis, Bell AT&T 201,212A,103	Yes AT&T 103/113, AT&T 212/212A
<b>Communications Facility</b>	Dial-up, dial-up/leased, leased lines	Dial-up, dial-up/leased, leased lines	Dial-up, dial-up/leased, leased lines	Dial-up
<b>Maximum Data Rate (bps)</b>	2400	2400	2400	1200
<b>Fallback Speed (bps)</b>	Vendor did not specify	Vendor did not specify	1200, 300	300
<b>Synchronization</b>	Synchronous	Synchronous	Async/sync	Async/sync
<b>Transmission Mode</b>	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
<b>Configuration</b>	Point-to-point, multipoint	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Line Conditioning</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Modulation</b>	DPSK	Vendor did not specify	PSK, DPSK	FSK, PSK
<b>Terminal Interface</b>	PC Bus	PS/2 Micro Channel	PC Bus	PC Bus
<b>Line Interface Setup</b>	Two-/four-wire	Two-/four-wire	Two-/four-wire	Two-/four-wire
<b>Auto Answer/Dial</b>	Hardware/software	Hardware/software	Hardware/software	Hardware only
<b>Alternate Voice/Data Equalization</b>	Yes	Yes	Yes	Yes
	Vendor did not specify	Vendor did not specify	Vendor did not specify	Yes
	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error Data Compression</b>	CRC Vendor did not specify	CRC Vendor did not specify	CRC Vendor did not specify	Vendor did not specify No
<b>Price/Availability Purchase (\$)</b>	795	845	925	Contact vendor
<b>Date Of First Installation</b>	New product	New product	New product	Vendor did not specify
<b>Comments</b>	Runs Microgate sync software including 3870 and 3270 emulation	Runs Microgate sync. software including 3870 and 3270 emulation	Runs Microgate sync. software and 3rd party async. software.	—

Vendor	Mitsuba Corp.	Mitsuba Corp.	Mitsuba Corp.	Multi-Tech Systems, Inc.
<b>Product</b>	<b>SM-24</b>	<b>SM-24H</b>	<b>SM-24M</b>	<b>MT212AR2</b>
<b>Hardware Configuration</b> Used With Microcomputers	Standalone Yes, IBM PC family, IBM PS/2	Plug in Yes, IBM PC family	Standalone Yes, IBM PC family, IBM PS/2	Rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, AT&T 212/212A
<b>Communications Facility</b>	Dial-up	Dial-up	Dial-up	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	2400	2400	2400	1200
<b>Fallback Speed (bps)</b>	1200, 300	1200, 300	1200, 300	Not applicable
<b>Synchronization</b>	Async/sync	Async/sync	Async/sync	Async/sync
<b>Transmission Mode</b>	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
<b>Configuration</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Point-to-point
<b>Line Conditioning</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	None
<b>Modulation</b>	FSK, QAM, DPSK	FSK, QAM, DPSK	FSK, QAM, DPSK	FSK, PSK
<b>Terminal Interface</b>	RS-232-C	RS-232-C, PC Bus	RS-232-C	RS-232-C
<b>Line Interface Setup</b>	Two-/four-wire Software only	Two-/four-wire Hardware/software	Two-/four-wire Software only	Two-wire Hardware only
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	Yes	Yes	Yes	No
<b>Equalization</b>	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	Vendor did not specify	Vendor did not specify	MNP	Vendor did not specify
<b>Data Compression</b>	No	No	Yes	No
<b>Price/Availability</b> Purchase (\$)	Contact vendor	Vendor did not specify	Contact vendor	350
<b>Date Of First Installation</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	1983
<b>Comments</b>	—	—	—	—

Vendor	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.
<b>Product</b>	<b>MT212ER</b>	<b>MT224AR</b>	<b>MT224ER</b>	<b>MultiModem 212AH3</b>
<b>Hardware Configuration</b> Used With Microcomputers	Rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes AT&T 103/113, V.22, AT&T 212/212A	Yes AT&T 103/113, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, AT&T 212/212A, V.21
<b>Communications Facility</b>	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	1200	2400	2400	1200
<b>Fallback Speed (bps)</b>	Not applicable	Not applicable	Not applicable	Not applicable
<b>Synchronization</b>	Async/sync	Async/sync	Async/sync	Asynchronous
<b>Transmission Mode</b>	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	FSK, PSK	FSK, QAM, PSK	FSK, QAM, PSK	FSK, PSK
<b>Terminal Interface</b>	RS-232-C	RS-232-C	RS-232-C	RS-232-C
<b>Line Interface Setup</b>	Two-wire Hardware only	Two-wire Hardware only	Two-wire Hardware only	Two-wire Hardware only
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	No	No	No	No
<b>Equalization</b>	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	MNP	Vendor did not specify	MNP	Vendor did not specify
<b>Data Compression</b>	Yes	No	Yes	No
<b>Price/Availability</b> Purchase (\$)	400	480	530	349
<b>Date Of First Installation</b>	1987	1985	1985	1983
<b>Comments</b>	Data compression; MNP 5	—	Data compression; MNP 5	—

Vendor	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.
<b>Product</b>	<b>MultiModem 212E</b>	<b>MultiModem 212TL</b>	<b>MultiModem 224AH</b>	<b>MultiModem 224E</b>
<b>Hardware Configuration Used With Microcomputers</b>	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Plug in Yes, Toshiba, Laptop 1100 plus, T1200	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
<b>Hayes AT Command Set Compatible Compatibility</b>	Yes AT&T 103/113, V.22, AT&T 212/212A, V.21	Yes AT&T 103/113, V.22, AT&T 212/212A, V.21, V.32/V.23	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
<b>Communications Facility</b>	Dial-up/leased	Dial-up	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps) Fallback Speed (bps) Synchronization Transmission Mode Configuration Line Conditioning Modulation</b>	1200 Not applicable Asynchronous Half/full duplex Point-to-point None FSK, PSK	1200 Not applicable Asynchronous Half/full duplex Point-to-point None FSK, QAM, PSK	2400 Not applicable Async/sync Half/full duplex Point-to-point None FSK, QAM, PSK	2400 Not applicable Async/sync Half/full duplex Point-to-point None FSK, QAM, PSK
<b>Terminal Interface</b>	RS-232-C	Toshiba 60-pin bus	RS-232-C	RS-232-C
<b>Line Interface Setup Auto Answer/Dial Alternate Voice/Data Equalization</b>	Two-wire Hardware only Yes No Automatic adaptive	Two-wire Hardware/software Yes No Automatic adaptive	Two-wire Hardware only Yes Yes Automatic adaptive	Two-wire Hardware only Yes Yes Automatic adaptive
<b>Protocol/Error Data Compression</b>	MNP Yes	Vendor did not specify No	Vendor did not specify No	MNP Yes
<b>Price/Availability Purchase (\$)</b>	399	299	599	599
<b>Date Of First Installation</b>	1987	1987	1985	1985
<b>Comments</b>	Data compression; MNP 5	Includes Procomm software	—	Data compression; MNP 5
Vendor	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.
<b>Product</b>	<b>MultiModem 224EC</b>	<b>MultiModem 224ES</b>	<b>MultiModem 224PC</b>	<b>MultiModem 224PS</b>
<b>Hardware Configuration Used With Microcomputers</b>	Plug in Yes, IBM PC family	Plug in Yes, IBM PS/2	Plug in Yes, IBM PC family	Plug in Yes, IBM PS/2
<b>Hayes AT Command Set Compatible Compatibility</b>	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A			
<b>Communications Facility</b>	Dial-up	Dial-up	Dial-up	Dial-up
<b>Maximum Data Rate (bps) Fallback Speed (bps) Synchronization Transmission Mode Configuration Line Conditioning Modulation</b>	2400 Not applicable Asynchronous Half/full duplex Point-to-point None FSK, QAM, PSK			
<b>Terminal Interface</b>	PC Bus	PS/2 Micro Channel	PC Bus	PS/2 Micro Channel
<b>Line Interface Setup Auto Answer/Dial Alternate Voice/Data Equalization</b>	Two-wire Hardware/software Yes No Automatic adaptive	Two-wire Hardware/software Yes No Automatic adaptive	Two-wire Hardware/software Yes No Automatic adaptive	Two-wire Hardware/software Yes No Automatic adaptive
<b>Protocol/Error Data Compression</b>	MNP Yes	MNP Yes	Vendor did not specify No	Vendor did not specify No
<b>Price/Availability Purchase (\$)</b>	499	549	449	449
<b>Date Of First Installation</b>	1985	1988	1985	1988
<b>Comments</b>	Data compression; MNP 5	Data compression; MNP 5	Includes Procomm software	Includes Procomm software

Vendor	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.	Natural Microsystems Corp.	NEC America, Inc.
<b>Product</b>	<b>MultiModem 224TL</b>	<b>MultiModem PC5</b>	<b>Watson</b>	<b>I2432C</b>
<b>Hardware Configuration</b> Used With Microcomputers	Plug in Yes, Toshiba, T3100; T3100/20; T5100	Plug in Yes, IBM PC family	Plug in Yes, IBM PC family, IBM PS/2	Rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any serial device
Hayes AT Command Set Compatible Compatibility	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
<b>Communications Facility</b>	Dial-up	Dial-up	Dial-up, dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	2400	1200	2400	2400
<b>Fallback Speed (bps)</b>	Not applicable	Not applicable	1200, 300	300, 1200
<b>Synchronization</b>	Asynchronous	Asynchronous	Asynchronous	Async/sync
<b>Transmission Mode</b>	Half/full duplex	Half/full duplex	Half/full duplex	Vendor did not specify
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	FSK, QAM, PSK	FSK, PSK	FSK, QAM, PSK, DPSK	QAM
<b>Terminal Interface</b>	RS-232-C	PC Bus	RS-232-C, PC Bus, PS/2 Micro Channel	RS-232-C, V.28, V.24
<b>Line Interface</b>	Two-wire	Two-wire	Two-wire	Two-wire
<b>Setup</b>	Hardware/software	Hardware/software	Hardware/software	Software only
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	No	No	Yes	Yes
<b>Equalization</b>	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	Vendor did not specify	Vendor did not specify	CRC, prop., Xmodem, Kermit	MNP
<b>Data Compression</b>	No	No	No	Yes
<b>Price/Availability</b> Purchase (\$)	499	249	249 To 599	Contact vendor
Date Of First Installation	1987	1986	September 1984	Vendor did not specify
<b>Comments</b>	Includes Procomm software	Includes Procomm software	Also provides voice messaging capabilities	—

Vendor	NEC America, Inc.	NEC America, Inc.	NEC America, Inc.	NEC America, Inc.
<b>Product</b>	<b>N212AR</b>	<b>N212BR</b>	<b>N2432C</b>	<b>SPN2400</b>
<b>Hardware Configuration</b> Used With Microcomputers	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any serial device	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any serial device	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all serial ports	Standalone, rackmount Yes, IBM PC family
Hayes AT Command Set Compatible Compatibility	No AT&T 103/113, AT&T 212/212A	Vendor did not specify AT&T 103/113, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	No Vendor did not specify
<b>Communications Facility</b>	Dial-up/leased	Dial-up/leased	Dial-up/leased	Leased lines
<b>Maximum Data Rate (bps)</b>	1200	1800	2400	2400
<b>Fallback Speed (bps)</b>	300	300	300, 1200	1200
<b>Synchronization</b>	Async/sync	Async/sync	Async/sync	Synchronous
<b>Transmission Mode</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Half/full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point, multipoint
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	DPSK	DPSK	QAM	DPSK
<b>Terminal Interface</b>	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
<b>Line Interface</b>	Two-wire	Two-wire	Two-wire	Four-wire
<b>Setup</b>	Software only	Software only	Hardware/software	Software only
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	No
<b>Alternate Voice/Data</b>	No	No	Yes	No
<b>Equalization</b>	Automatic adaptive	Automatic adaptive	Automatic adaptive	Fixed compromise
<b>Protocol/Error</b>	Vendor did not specify	Vendor did not specify	MNP	Vendor did not specify
<b>Data Compression</b>	No	No	Yes	No
<b>Price/Availability</b> Purchase (\$)	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Comments</b>	—	—	—	—

Vendor	Network Software Associates, Inc.	Network Software Associates, Inc.	Network Software Associates, Inc.	Network Software Associates, Inc.
<b>Product</b>	<b>AdaptModem 201/212</b>	<b>AdaptModem 2400</b>	<b>AdaptModem V.22 bis</b>	<b>AdaptModem2 2400</b>
<b>Hardware Configuration Used With Microcomputers</b>	Plug in Yes, IBM PC family, IBM PS/2	Plug in Yes, IBM PC family, IBM PS/2	Plug in Yes, IBM PC family, IBM PS/2	Plug in Yes, IBM PC family, IBM PS/2
<b>Hayes AT Command Set Compatible</b>	Yes AT&T 212/212A, Bell 201C	No Bell 201C	Yes V.22 bis	No Bell 201C
<b>Communications Facility</b>	Dial-up	Dial-up	Dial-up	Dial-up
<b>Maximum Data Rate (bps)</b>	2400	2400	2400	2400
<b>Fallback Speed (bps)</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Synchronization</b>	Async/sync	Synchronous	Async/sync	Synchronous
<b>Transmission Mode</b>	Half duplex	Half duplex	Full duplex	Half duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	FSK, DPSK	DPSK	FSK, DPSK	DPSK
<b>Terminal Interface</b>	PC Bus	PC Bus, PS/2 Micro Channel	PC Bus	PC Bus, PS/2 Micro Channel
<b>Line Interface Setup</b>	Two-wire Hardware only	Two-wire Hardware only	Two-wire Hardware only	Two-wire Hardware only
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	No	No	No	No
<b>Equalization</b>	Fixed compromise	Fixed compromise	Automatic adaptive	Fixed compromise
<b>Protocol/Error Data Compression</b>	Vendor did not specify No	Vendor did not specify No	Vendor did not specify No	Vendor did not specify No
<b>Price/Availability Purchase (\$)</b>	845	625	575	625
<b>Date Of First Installation</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Comments</b>	—	—	—	Network software Associates
Vendor	Nu Data, Inc.	Optocom Systems, Inc.	Optocom Systems, Inc.	Optocom Systems, Inc.
<b>Product</b>	<b>5108</b>	<b>OSI8224A</b>	<b>OSI8224APC</b>	<b>OSI8224APS</b>
<b>Hardware Configuration Used With Microcomputers</b>	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, IBM PC family, IBM PS/2	Plug in Yes, IBM PC family	Plug in Yes, IBM PS/2
<b>Hayes AT Command Set Compatible</b>	No AT&T 108	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, AT&T 202S, CCITT V.23	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, AT&T 202S, CCITT V.23	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, CCITT V.23 AT&T 202S
<b>Communications Facility</b>	Leased lines	Dial-up/leased	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	300	2400	2400	2400
<b>Fallback Speed (bps)</b>	Not applicable	1200	1200	1200
<b>Synchronization</b>	Asynchronous	Async/sync	Asynchronous	Asynchronous
<b>Transmission Mode</b>	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	FSK	FSK, QAM, PSK, DPSK	FSK, QAM, PSK, DPSK	FSK, QAM, PSK, DPSK
<b>Terminal Interface</b>	RS-232-C, V.24, current loop	RS-232-C, V.28, V.24	PC Bus	PS/2 Micro Channel
<b>Line Interface Setup</b>	Two-/four-wire Hardware only	Two-wire Software only	Two-wire Software only	Two-wire Software only
<b>Auto Answer/Dial</b>	No	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	No	Yes	Yes	Yes
<b>Equalization</b>	Vendor did not specify	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error Data Compression</b>	Vendor did not specify No	MNP No	MNP No	Proprietary, MNP No
<b>Price/Availability Purchase (\$)</b>	298	Contact vendor	Contact vendor	Contact vendor
<b>Date Of First Installation</b>	1978	March 1986	June 1986	Vendor did not specify
<b>Comments</b>	—	Remote configuration supported	—	—

Vendor	Octocom Systems, Inc.	Optocom Systems, Inc.	Optocom Systems, Inc.	Okidata Corp.
<b>Product</b>	OSI8224B	OSI8226A	OSI8242A	CLD 2400
<b>Hardware Configuration Used With Microcomputers</b>	Standalone, rackmount Yes, IBM PC family, IBM PS/2	Standalone, rackmount Yes, IBM PC family, IBM PS/2	Standalone, rackmount Yes, IBM PC family, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
<b>Hayes AT Command Set Compatible</b>	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.23, 202S	Yes V.22, V.22 bis, AT&T 212/212A, V.21, AT&T 202S, CCITT V.23	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.23 Bell 202S	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
<b>Communications Facility</b>	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	2400	2400	2400	2400, (4800 w/compression)
<b>Fallback Speed (bps)</b>	1200	1200	1200	1200
<b>Synchronization</b>	Async/sync	Async/sync	Async/sync	Async/sync
<b>Transmission Mode</b>	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	FSK, QAM, PSK, DPSK	QAM, PSK, DPSK	FSK, QAM, PSK, DPSK	FSK, QAM, PSK
<b>Terminal Interface</b>	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
<b>Line Interface Setup</b>	Two-/four-wire Software only	Two-wire Software only	Two-wire Software only	Two-wire Hardware/software
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	Yes	Yes	Yes	Yes
<b>Equalization</b>	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	MNP, V.42	MNP	Proprietary, MNP	MNP
<b>Data Compression</b>	Yes	No	Yes	Yes
<b>Price/Availability</b>				
<b>Purchase (\$)</b>	Contact vendor	Contact vendor	Contact vendor	549
<b>Date Of First Installation</b>	December 1988	December 1987	December 1988	Vendor did not specify
<b>Comments</b>	Automatic dial restored; automatic mode detection	AT&T 201C and CCITT V.26 bis compatible	Auto detection of rate and sync	Front panel dialing option; -1dBm transmit option for leased line

Vendor	Okidata Corp.	Okidata Corp.	Okidata Corp.	Okidata Corp.
<b>Product</b>	CLD 4800 A/B	Okitel 1200	Okitel 1200B	Okitel 2400
<b>Hardware Configuration Used With Microcomputers</b>	Standalone Yes, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Plug in Yes, IBM PC family	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
<b>Hayes AT Command Set Compatible</b>	No Bell 208 A/B	Yes AT&T 103/113, AT&T 212/212A	Yes AT&T 103/113, V.22, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
<b>Communications Facility</b>	Dial-up/leased	Dial-up	Dial-up	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	4800	1200	1200	2400
<b>Fallback Speed (bps)</b>	None	0-300	300	1200, 0-300
<b>Synchronization</b>	Synchronous	Async/sync	Asynchronous	Async/sync
<b>Transmission Mode</b>	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
<b>Configuration</b>	Point-to-point, multipoint	Vendor did not specify	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	PSK	FSK, PSK	FSK	FSK, QAM, PSK
<b>Terminal Interface</b>	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	PC Bus	RS-232-C, V.28, V.24
<b>Line Interface Setup</b>	Two-/four-wire Hardware/software	Two-wire Hardware/software	Two-wire Software only	Two-wire Hardware/software
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	Yes	No	No	No
<b>Equalization</b>	Automatic adaptive	No	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Data Compression</b>	No	No	No	No
<b>Price/Availability</b>				
<b>Purchase (\$)</b>	895	259	219	399
<b>Date Of First Installation</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Comments</b>	Remote configuration; front panel dialing of 2 telephone numbers; SADL compatible	5 year warranty	5 year warranty	5 year warranty, manual & software speaker volume settings

Vendor	Okidata Corp.	Okidata Corp.	Okidata Corp.	Omnitel, Inc.
<b>Product</b>	<b>Okitel 2400 Plus</b>	<b>Okitel 2400B</b>	<b>Okitel 2400B Plus</b>	<b>Encore 1200HB</b>
<b>Hardware Configuration Used With Microcomputers</b>	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Plug in Yes, IBM PC family	Plug in Yes, IBM PC family	Plug in Yes, IBM PC family
<b>Hayes AT Command Set Compatible Compatibility</b>	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes V.22, AT&T 212/212A, V.21
<b>Communications Facility</b>	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up
<b>Maximum Data Rate (bps)</b>	2400, 4800 with compression	2400	2400, 4800 with compression	1200
<b>Fallback Speed (bps)</b>	1200	1200, 0-300	1200	300
<b>Synchronization</b>	Async/sync	Async/sync	Asynchronous	Asynchronous
<b>Transmission Mode</b>	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK	FSK, PSK
<b>Terminal Interface</b>	RS-232-C, V.28, V.24	PC Bus	PC Bus	PC Bus
<b>Line Interface Setup</b>	Two-wire Software only	Two-wire Software only	Two-wire Software only	Two-wire Hardware/software
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data Equalization</b>	No	No	No	Yes
<b>Equalization</b>	Automatic adaptive	Automatic adaptive	Automatic adaptive	Vendor did not specify
<b>Protocol/Error Data Compression</b>	MNP Yes	Vendor did not specify No	MNP Yes	Vendor did not specify No
<b>Price/Availability Purchase (\$)</b>	549	349	499	139
<b>Date Of First Installation</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	October 1984
<b>Comments</b>	Manual/software speaker volume settings	5 year warranty	5 year warranty, com 1,2,3 & 4 supported	—
Vendor	Omnitel, Inc.	Omnitel, Inc.	Omnitel, Inc.	Omnitel, Inc.
<b>Product</b>	<b>Encore 1200SD</b>	<b>Encore 2400HB</b>	<b>Encore 2400PS</b>	<b>Encore 2400SD</b>
<b>Hardware Configuration Used With Microcomputers</b>	Standalone Yes, IBM PC family	Plug in Yes, IBM PC family	Plug in Yes, IBM PS/2	Standalone Yes, IBM PC family
<b>Hayes AT Command Set Compatible Compatibility</b>	Yes V.22, AT&T 212/212A, V.21	Yes V.22, V.22 bis, AT&T 212/212A, V.21	Vendor did not specify V.22, V.22 bis, AT&T 212/212A, V.21	Yes V.22, V.22 bis, AT&T 212/212A, V.21
<b>Communications Facility</b>	Dial-up	Dial-up	Dial-up	Dial-up
<b>Maximum Data Rate (bps)</b>	1200	2400	2400	2400
<b>Fallback Speed (bps)</b>	300	1200, 300	Vendor did not specify	1200, 300
<b>Synchronization</b>	Async/sync	Asynchronous	Asynchronous	Async/sync
<b>Transmission Mode</b>	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	FSK, PSK	DPSK	QAM, DPSK	DPSK
<b>Terminal Interface</b>	PC Bus	PC Bus	PC Bus, PS/2 Micro Channel	PC Bus
<b>Line Interface Setup</b>	Two-wire Hardware only	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Hardware only
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data Equalization</b>	Yes	Yes	Yes	Yes
<b>Equalization</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Protocol/Error Data Compression</b>	Vendor did not specify No	MNP Yes	MNP Yes	MNP Yes
<b>Price/Availability Purchase (\$)</b>	255	349; 499 (MNP 5)	399	449; 599 (MNP 5)
<b>Date Of First Installation</b>	July 1985	November 1986	November 1987	February 1987
<b>Comments</b>	—	4800 bps with data compression	4800 bps with data compression; price is \$499 with MNP	—

Vendor	Patton Electronics, Inc.	Patton Electronics, Inc.	Patton Electronics, Inc.	Penril DataCom
Product	612 Hayes-Compatible Modem	624 Hayes-Compatible Modem	6245 Miniature Passthru Modem	Cadet 1200
Hardware Configuration Used With Microcomputers	Standalone, plug in Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, plug in Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Port-connected Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount Yes, IBM PC family, IBM PS/2, all with RS-232-C interface
Hayes AT Command Set Compatible	Yes AT&T 103/113, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, CCITT V.32	Yes AT&T 103/113, AT&T 212/212A
Communications Facility	Dial-up	Dial-up/leased	Dial-up	Dial-up/leased
Maximum Data Rate (bps)	1200	2400	2400	1200
Fallback Speed (bps)	Vendor did not specify	Vendor did not specify	Vendor did not specify	0-300
Synchronization	Asynchronous	Async/sync	Async/sync	Asynchronous
Transmission Mode	Half/full duplex	Half/full duplex	Full duplex	Vendor did not specify
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	Vendor did not specify	None	None
Modulation	PSK	QAM, PSK	QAM, PSK	FSK, PSK
Terminal Interface	RS-232-C, PC Bus	RS-232-C, PC Bus	RS-232-C	RS-232-C, V.28, V.24
Line Interface Setup	Two-wire Hardware/software	Vendor did not specify Software only	Vendor did not specify Software only	Two-wire Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	Yes	Yes	Yes
Equalization	Fixed compromise	Vendor did not specify	Fixed compromise, automatic adaptive	Fixed compromise
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability Purchase (\$)	175 (standalone) 145 (half card)	295 (standalone) 275 (half card)	349	289 stand alone/269 rackmount
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	—	Designed for portable PCs and port sharing (built-in switch)	—

Vendor	Penril DataCom	Penril DataCom	Penril DataCom	Practical Peripherals, Inc.
Product	Cadet 2400	Datalink 2400	Pacer 2400	PM1200SA Mini
Hardware Configuration Used With Microcomputers	Standalone Yes, IBM PC family, IBM PS/2, all with RS-232-C interface	Standalone, rackmount Yes, IBM PC family, IBM PS/2, all with RS-232-C interface	Plug in Yes, IBM PC family	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes AT&T 103/113, V.22, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, AT&T 212/212A	Yes AT&T 103/113, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	2400	2400	2400	1200
Fallback Speed (bps)	1200, 0-300	1200, 0-300	1200, 0-300	300
Synchronization	Asynchronous	Async/sync	Asynchronous	Asynchronous
Transmission Mode	Vendor did not specify	Vendor did not specify	Vendor did not specify	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK	PSK
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	PC Bus	RS-232-C
Line Interface Setup	Two-wire Hardware only	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Fixed compromise	Fixed compromise	Fixed compromise	Automatic adaptive
Protocol/Error	MNP, option	MNP	Vendor did not specify	Vendor did not specify
Data Compression	No	Yes	No	No
Price/Availability Purchase (\$)	535	695 stand alone/675 rackmount	475	Vendor did not specify
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	—	—	—

Vendor	Practical Peripherals, Inc.	Practical Peripherals, Inc.	Practical Peripherals, Inc.	Practical Peripherals, Inc.
Product	PM2400 Half Card w/ProComm	PM1200 Half Card w/ProComm	PM2400 MNP	PM2400 PS/2 Full Card w/ProComm
Hardware Configuration Used With Microcomputers	Plug in Yes, IBM PC family	Plug in Yes, IBM PC family	Plug in Yes, IBM PC family	Plug in Yes, any Micro-channel PC
Hayes AT Command Set Compatible Compatibility	Yes AT&T 103/113, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, AT&T 212/212A	Yes AT&T 103/113, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up	Dial-up/leased
Maximum Data Rate (bps)	2400	1200	2400	2400
Fallback Speed (bps)	1200, 300	1200, 300	1200, 300	1200, 300
Synchronization	Asynchronous	Asynchronous	Asynchronous	Asynchronous
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	QAM	PSK	QAM	QAM
Terminal Interface	PC Bus	PC Bus	PC Bus	PS/2 Micro Channel
Line Interface Setup	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Software only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	MNP	Vendor did not specify
Data Compression	No	No	Vendor did not specify	No
Price/Availability				
Purchase (\$)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	—	—	—

Vendor	Practical Peripherals, Inc.	Practical Peripherals, Inc.	Racal-Milgo	Racal-Milgo
Product	PM2400SA MNP	PM2400SA Standalone	RM-24	RM-4492E
Hardware Configuration Used With Microcomputers	Standalone Yes, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, plug in, rack Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all	Rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible Compatibility	Yes AT&T 103/113, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22 bis, AT&T 212/212A	No V.26 B 201 B/C	Yes AT&T 103/113, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	1200, 300	1200, 300	Not applicable	1200, 300
Synchronization	Asynchronous	Asynchronous	Async/sync	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point, multipoint	Point-to-point
Line Conditioning	None	None	None	None
Modulation	QAM	QAM	DPSK	FSK, QAM
Terminal Interface	RS-232-C	RS-232-C	RS-232-C, V.24	RS-232-C
Line Interface Setup	Two-wire Software only	Two-wire Software only	Two-/four-wire Hardware only	Two-wire Hardware only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	No	Yes
Equalization	Automatic adaptive	Automatic adaptive	Vendor did not specify	Automatic adaptive
Protocol/Error	MNP	Vendor did not specify	Vendor did not specify	MNP
Data Compression	Vendor did not specify	No	No	No
Price/Availability				
Purchase (\$)	Vendor did not specify	Vendor did not specify	685	1,395
Date Of First Installation	Vendor did not specify	Vendor did not specify	1985	Vendor did not specify
Comments	—	—	—	—

Vendor	Racal-Milgo	Racal-Milgo	Racal-Vadic, Inc.	Racal-Vadic, Inc.
<b>Product</b>	<b>RMD 2412</b>	<b>RMD 2412/2</b>	<b>1200PA</b>	<b>1200VP</b>
<b>Hardware Configuration</b> Used With Microcomputers	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port
Hayes AT Command Set Compatible Compatibility	Yes AT&T 103/113, V.22, AT&T 212/212A	Yes AT&T 103/113, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
<b>Communications Facility</b>	Dial-up/leased	Dial-up	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps)</b> <b>Fallback Speed (bps)</b> <b>Synchronization</b> <b>Transmission Mode</b> <b>Configuration</b> <b>Line Conditioning</b> <b>Modulation</b>	2400 1200, 300 Async/sync Vendor did not specify Point-to-point None FSK, QAM, DPSK	2400 1200, 300 Async/sync Vendor did not specify Point-to-point None FSK, QAM, DPSK	1200 300 Async/sync Full duplex Point-to-point None FSK, PSK	1200 300 Asynchronous Full duplex Point-to-point None FSK, PSK
<b>Terminal Interface</b>	RS-232-C	RS-232-C	RS-232-D	RS-232-D
<b>Line Interface</b> <b>Setup</b> <b>Auto Answer/Dial</b> <b>Alternate Voice/Data</b> <b>Equalization</b>	Two-wire Hardware/software Yes Yes Automatic adaptive	Two-wire Hardware/software Yes Yes Automatic adaptive	Two-wire Hardware/software Yes Yes Automatic adaptive	Two-wire Hardware/software Yes Yes Automatic adaptive
<b>Protocol/Error</b> <b>Data Compression</b>	MNP Vendor did not specify	MNP Vendor did not specify	MNP No	Vendor did not specify No
<b>Price/Availability</b> <b>Purchase (\$)</b>	795	595	495	295
<b>Date Of First Installation</b>	Vendor did not specify	Vendor did not specify	March 1986	July 1986
<b>Comments</b>	—	—	—	—

Vendor	Racal-Vadic, Inc.	Racal-Vadic, Inc.	Racal-Vadic, Inc.	Racal-Vadic, Inc.
<b>Product</b>	<b>2400PAM2</b>	<b>2400PS/2</b>	<b>2400VP</b>	<b>2422PA-SC</b>
<b>Hardware Configuration</b> Used With Microcomputers	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with serial port	Plug in Yes, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port
Hayes AT Command Set Compatible Compatibility	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21
<b>Communications Facility</b>	Dial-up/leased	Dial-up	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps)</b> <b>Fallback Speed (bps)</b> <b>Synchronization</b> <b>Transmission Mode</b> <b>Configuration</b> <b>Line Conditioning</b> <b>Modulation</b>	2400 1200, 300 Async/sync Full duplex Point-to-point None FSK, QAM, PSK	2400 1200, 0-300 Asynchronous Full duplex Point-to-point None FSK, QAM, PSK	2400 1200, 300 Async/sync Full duplex Point-to-point None FSK, QAM, PSK	2400 1200, 0-300 Asynchronous Full duplex Point-to-point None FSK, QAM, PSK
<b>Terminal Interface</b>	RS-232-D	RS-232-D	RS-232-D	V.24
<b>Line Interface</b> <b>Setup</b> <b>Auto Answer/Dial</b> <b>Alternate Voice/Data</b> <b>Equalization</b>	Two-wire Hardware/software Yes Yes Automatic adaptive	Two-wire Software only Yes Yes Automatic adaptive	Two-wire Hardware/software Yes Yes Automatic adaptive	Two-wire Hardware/software Yes Yes Automatic adaptive
<b>Protocol/Error</b> <b>Data Compression</b>	MNP Yes	MNP Yes	MNP Yes	MNP Yes
<b>Price/Availability</b> <b>Purchase (\$)</b>	795	395	595	795
<b>Date Of First Installation</b>	March 1987	May 1989	September 1986	May 1989
<b>Comments</b>	—	—	—	Also has V.25bis autodial compatibility

Vendor	Racal-Vadic, Inc.	Racal-Vadic, Inc.	Racal-Vadic, Inc.	Racal-Vadic, Inc.
Product	2440PX	4224E	4492E	LC2400PC
Hardware Configuration Used With Microcomputers	Rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port	Rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port	Rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port	Plug in Yes, IBM PC family
Hayes AT Command Set Compatible Compatibility	Vendor did not specify Bell 201 B/C	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	1200, 0-300	1200, 300	1200, 300	1200, 0-300
Synchronization	Synchronous	Async/sync	Async/sync	Asynchronous
Transmission Mode	Half duplex	Full duplex	Full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	PSK	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK
Terminal Interface	RS-232-D	RS-232-D	RS-232-D	RS-232-D
Line Interface Setup	Two-/four-wire Hardware only	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data Equalization	No Coherent detection	No Automatic adaptive	Yes Automatic adaptive	Yes Automatic adaptive
Protocol/Error Data Compression	Vendor did not specify No	MNP Yes	MNP Yes	MNP Yes
Price/Availability Purchase (\$)	575	595	1,295	395
Date Of First Installation	November 1982	July 1985	May 1986	May 1982
Comments	Auto answer but no auto dial	—	—	Service available at Flat Rate or Emergency exchange

Vendor	Racal-Vadic, Inc.	Racal-Vadic, Inc.	Racal-Vadic, Inc.	Rohm Corp.
Product	VA1244	VA1250PX	VA1251KX	BP 4501
Hardware Configuration Used With Microcomputers	Rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port	Plug in Yes, IBM PC family
Hayes AT Command Set Compatible Compatibility	No Bell 202	No Bell 202	No V.26, Bell 202	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up/leased	Dial-up	Leased lines	Dial-up/leased
Maximum Data Rate (bps)	1200	1200	1200	Vendor did not specify
Fallback Speed (bps)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Synchronization	Asynchronous	Asynchronous	Asynchronous	Async/sync
Transmission Mode	Half duplex	Half duplex	Half duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK	FSK	FSK	FSK, QAM, PSK, DPSK
Terminal Interface	RS-232-D	RS-232-D	RS-232-D	RS-232-C, RS-232C on TTL Levels
Line Interface Setup	Two-wire Hardware only	Two-wire Hardware only	Two-/four-wire Hardware only	Two-wire Hardware/software
Auto Answer/Dial	Yes	Yes	No	Yes
Alternate Voice/Data Equalization	Vendor did not specify Coherent detection	No Coherent detection	No Coherent detection	No Automatic adaptive, p
Protocol/Error Data Compression	Vendor did not specify No	Vendor did not specify No	Vendor did not specify No	Vendor did not specify Yes
Price/Availability Purchase (\$)	400	425	425	89-quantity discounts available June 1989
Date Of First Installation	August 1982	January 1979	August 1988	June 1989
Comments	—	Auto answer but no auto dial	—	No DAA on board, EEPROM for phone # & customer configuration on board

Vendor	Smarteam	Smarteam	Tek-Com Corp.	Tek-Com Corp.
Product	1200 ST	2400 AT	202T	P-202T
Hardware Configuration Used With Microcomputers	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family	Rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, plug in, rack Yes, IBM PC family, IBM PS/2	Standalone, rackmount Yes, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible Compatibility	Yes AT&T 103/113, V.22, AT&T 212/212A	Vendor did not specify AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	No Bell 202T	No AT&T 202T
Communications Facility	Leased lines	Leased lines	Leased lines	Leased lines
Maximum Data Rate (bps) Fallback Speed (bps) Synchronization Transmission Mode Configuration Line Conditioning Modulation	1200 Vendor did not specify Asynchronous Half/full duplex Multipoint Vendor did not specify FSK, PSK	2400 1200, 300 Async/sync Half/full duplex Multipoint Vendor did not specify FSK, QAM, PSK	1800 Vendor did not specify Asynchronous Half/full duplex Point-to-point, multipoint None FSK	1800 Vendor did not specify Asynchronous Half/full duplex Point-to-point, multipoint None FSK
Terminal Interface	RS-232-C	RS-232-C	RS-232-C	RS-232-C
Line Interface Setup Auto Answer/Dial Alternate Voice/Data Equalization	Four-wire Vendor did not specify Yes Yes Fixed compromise	Four-wire Vendor did not specify Yes Yes Fixed compromise, automatic adaptive	Two-/four-wire Hardware only No No Fixed compromise	Two-/four-wire Hardware only No No Fixed compromise
Protocol/Error Data Compression	Vendor did not specify No	Vendor did not specify No	Vendor did not specify Vendor did not specify	Vendor did not specify No
Price/Availability Purchase (\$)	67	99	Vendor did not specify	425
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	—	—	—

Vendor	Tek-Com Corp.	Tek-Com Corp.	Tek-Com Corp.	Tek-Com Corp.
Product	P-212/V.22	P-212AD	P-212ZX	P2424
Hardware Configuration Used With Microcomputers	Standalone, rackmount Yes, IBM PC family, IBM PS/2	Standalone, rackmount Yes, IBM PC family, IBM PS/2	Standalone Yes, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount Yes, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible Compatibility	No AT&T 103/113, V.22, AT&T 212/212A, V.21	Vendor did not specify AT&T 103/113, AT&T 212/212A	Yes AT&T 103/113, AT&T 212/212A	Yes Vendor did not specify
Communications Facility	Dial-up/leased	Dial-up	Dial-up	Dial-up/leased
Maximum Data Rate (bps) Fallback Speed (bps) Synchronization Transmission Mode Configuration Line Conditioning Modulation	1200 600, 300 Async/sync Full duplex Point-to-point None FSK, DPSK	1200 300 Asynchronous Full duplex Point-to-point None FSK, DPSK	1200 300 Asynchronous Half/full duplex Multipoint None FSK, DPSK	2400 1200, 300 Async/sync Vendor did not specify Multipoint None FSK, QAM, DPSK
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C	RS-232-C	RS-232-C, V.24
Line Interface Setup Auto Answer/Dial Alternate Voice/Data Equalization	Two-wire Hardware only Yes Yes Fixed compromise	Two-wire Hardware/software Yes Yes Fixed compromise	Two-wire Hardware only Yes No Automatic adaptive	Two-wire, two-/four-wire Hardware only Yes No Automatic adaptive
Protocol/Error Data Compression	Vendor did not specify No	Vendor did not specify No	Vendor did not specify No	Vendor did not specify No
Price/Availability Purchase (\$)	495	395	295	495
Date Of First Installation	Vendor did not specify	Vendor did not specify	1985	1983
Comments	Product does not feature auto-dial	—	—	—

Vendor	Tek-Com Corp.	Telcor Systems Corp.	Telenetics Corp.	Telenetics Corp.
<b>Product</b>	TC202S	2424	24 1/2	TC1200
<b>Hardware Configuration Used With Microcomputers</b>	Standalone, rackmount Yes, IBM PC family, IBM PS/2	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Plug in Yes, IBM PC family	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family
<b>Hayes AT Command Set Compatible</b>	No AT&T 202S	Yes AT&T 103/113, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22 bis, AT&T 212/212A
<b>Communications Facility</b>	Dial-up	Dial-up/leased	Dial-up	Dial-up
<b>Maximum Data Rate (bps)</b>	1200	2400	2400	1200
<b>Fallback Speed (bps)</b>	Vendor did not specify	1200, 300	1200 to 300	300
<b>Synchronization</b>	Asynchronous	Asynchronous	Asynchronous	Asynchronous
<b>Transmission Mode</b>	Half duplex	Full duplex	Half/full duplex	Half/full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	FSK	Vendor did not specify	FSK, QAM, PSK	FSK
<b>Terminal Interface</b>	RS-232-C	RS-232-C	PC Bus	RS-232-C
<b>Line Interface Setup</b>	Two-wire Hardware only	Two-wire Hardware/software	Two-wire Software only	Two-wire Hardware/software
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	No	Yes	No	Yes
<b>Equalization</b>	Fixed compromise	Automatic adaptive	Automatic adaptive	Fixed compromise
<b>Protocol/Error</b>	Vendor did not specify	Proprietary, MNP	Vendor did not specify	Vendor did not specify
<b>Data Compression</b>	No	No	Vendor did not specify	Vendor did not specify
<b>Price/Availability</b>				
<b>Purchase (\$)</b>	345	695	190 (2 weeks ARO)	139 (2 weeks ARO)
<b>Date Of First Installation</b>	Vendor did not specify	1986	1987	May 1988
<b>Comments</b>	Modem does not feature auto-dial	3 year warranty; DES encryption option - \$100	5-year warranty; return to factory	5-year warranty; return to factory
Vendor	Telenetics Corp.	Telenetics Corp.	Telenetics Corp.	TIL Systems, Inc.
<b>Product</b>	TC2400	TC2400S	TC921-24	EM2400
<b>Hardware Configuration Used With Microcomputers</b>	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, plug in, rack Yes, IBM PC family, IBM PS/2
<b>Hayes AT Command Set Compatible</b>	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
<b>Communications Facility</b>	Dial-up	Dial-up	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	2400	2400	2400	2400
<b>Fallback Speed (bps)</b>	1200 to 300	1200 to 300	1200 to 300	1200, 300
<b>Synchronization</b>	Asynchronous	Asynchronous	Async/sync	Async/sync
<b>Transmission Mode</b>	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	Vendor did not specify
<b>Modulation</b>	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK	FSK
<b>Terminal Interface</b>	RS-232-C	RS-232-C	RS-232-C	PC Bus
<b>Line Interface Setup</b>	Two-wire Software only	Two-wire Software only	Two-wire Hardware/software	Two-/four-wire Hardware/software
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	No	Yes	Yes	Yes
<b>Equalization</b>	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	Vendor did not specify	MNP	MNP	X.25
<b>Data Compression</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	No
<b>Price/Availability</b>				
<b>Purchase (\$)</b>	239 (2 weeks ARO)	395 (2 weeks ARO)	545 (995 - X.25 pad - optional) June 1988	795
<b>Date Of First Installation</b>	October 1988	June 1989	June 1988	1987
<b>Comments</b>	5-year warranty; return to factory	5-year warranty; return to factory	X.25 internal PAD is optional; 2 weeks ARO; 5-year warranty	—

Vendor	TIL Systems, Inc.	Universal Data Systems	Universal Data Systems	Universal Data Systems
<b>Product</b>	<b>EM2410</b>	<b>103J LP</b>	<b>212A LP</b>	<b>FasTalk 1200E</b>
<b>Hardware Configuration Used With Microcomputers</b>	Standalone, plug in, rack Yes, IBM PC family, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family	Standalone, plug in, rack Yes, IBM PC family, IBM PS/2
<b>Hayes AT Command Set Compatible</b>	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	No AT&T 103/113	No AT&T 212/212A	Yes Vendor did not specify
<b>Communications Facility</b>	Dial-up/leased	Dial-up, leased lines	Dial-up, leased lines	Dial-up
<b>Maximum Data Rate (bps)</b>	2400	300	1200	1200
<b>Fallback Speed (bps)</b>	1200, 300	Vendor did not specify	Vendor did not specify	300, 1200
<b>Synchronization</b>	Async/sync	Asynchronous	Asynchronous	Asynchronous
<b>Transmission Mode</b>	Half/full duplex	Half/full duplex	Vendor did not specify	Full duplex
<b>Configuration</b>	Point-to-point	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Line Conditioning</b>	Vendor did not specify	None	None	Vendor did not specify
<b>Modulation</b>	FSK	FSK	PSK	DPSK
<b>Terminal Interface</b>	PC Bus	RS-232-C	RS-232-C	Vendor did not specify
<b>Line Interface Setup</b>	Two-/four-wire Hardware/software	Two-wire Hardware only	Two-wire Hardware only	Two-wire Hardware only
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data Equalization</b>	Yes Automatic adaptive	Yes Fixed compromise	Yes Fixed compromise	Yes Vendor did not specify Automatic adaptive
<b>Protocol/Error Data Compression</b>	X.25 No	Vendor did not specify No	Vendor did not specify No	Vendor did not specify No
<b>Price/Availability Purchase (\$)</b>	895	185	195	400
<b>Date Of First Installation</b>	1987	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Comments</b>	—	Telephone line powered	Telephone line powered	—

Vendor	Universal Data Systems	Universal Data Systems	Universal Data Systems	Universal Data Systems
<b>Product</b>	<b>FasTalk 1200E PC</b>	<b>FasTalk 2/1200</b>	<b>FasTalk 2/2400</b>	<b>FasTalk 2/2400/5</b>
<b>Hardware Configuration Used With Microcomputers</b>	Plug in Yes, IBM PC family, IBM PS/2	Plug in Yes, IBM PC family, IBM PS/2	Plug in Yes, IBM PC family, IBM PS/2	Plug in Yes, IBM PC family, IBM PS/2
<b>Hayes AT Command Set Compatible</b>	Yes Vendor did not specify	Yes Vendor did not specify	Yes Vendor did not specify	Yes Vendor did not specify
<b>Communications Facility</b>	Dial-up	Dial-up/leased	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	1200	1200	2400	2400
<b>Fallback Speed (bps)</b>	300, 1200	300, 1200	300 - 2400	300 - 2400
<b>Synchronization</b>	Asynchronous	Asynchronous	Asynchronous	Asynchronous
<b>Transmission Mode</b>	Vendor did not specify	Full duplex	Full duplex	Full duplex
<b>Configuration</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Line Conditioning</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Modulation</b>	DPSK	DPSK	QAM	QAM
<b>Terminal Interface</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Line Interface Setup</b>	Vendor did not specify Hardware only	Two-wire Hardware only	Two-wire Hardware only	Two-wire Hardware only
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data Equalization</b>	Vendor did not specify Automatic adaptive	No Automatic adaptive	No Automatic adaptive	No Automatic adaptive
<b>Protocol/Error Data Compression</b>	Vendor did not specify No	Vendor did not specify No	Vendor did not specify No	Vendor did not specify No
<b>Price/Availability Purchase (\$)</b>	400	400	495	550
<b>Date Of First Installation</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Comments</b>	—	—	—	—

Vendor	Universal Data Systems	Universal Data Systems	Universal Data Systems	Universal Data Systems
Product	FasTalk 2400 PC	FasTalk 2400/5	FasTalk 2400/5 PC	FasTalk V.22/42 bis
Hardware Configuration Used With Microcomputers	Plug in Yes, IBM PC family, IBM PS/2	Standalone Yes, IBM PC family, IBM PS/2	Plug in Yes, IBM PC family, IBM PS/2	Standalone, plug in, rack Yes, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes Vendor did not specify	Yes Vendor did not specify	Yes Vendor did not specify	Yes V.22 bis, V.42bis
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	300 - 2400	300 - 2400	Vendor did not specify	300 to 2400
Synchronization	Asynchronous	Async/sync	Async/sync	Async/sync
Transmission Mode	Full duplex	Full duplex	Full duplex	Half/full duplex
Configuration	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Line Conditioning	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Modulation	QAM	QAM	QAM	QAM
Terminal Interface	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Line Interface Setup	Two-wire Hardware only	Two-wire Hardware only	Two-wire Hardware only	Two-wire Hardware only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data Equalization	No Automatic adaptive	No Automatic adaptive	No Automatic adaptive	Vendor did not specify Automatic adaptive
Protocol/Error Data Compression	Vendor did not specify No	MNP No	MNP No	MNP Yes
Price/Availability Purchase (\$)	495	550	550	550
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	—	—	Begin shipping 1st quarter 1990

Vendor	Universal Data Systems	Universal Data Systems	Universal Data Systems	Universal Data Systems
Product	Sync-Up 2/201	Sync-Up 2/201/212	Sync-Up 2/V.22 bis	Sync-Up 201C
Hardware Configuration Used With Microcomputers	Plug in Yes, IBM PS/2	Plug in Yes, IBM PS/2	Plug in, IBM Micro Channel Yes, IBM PS/2	Plug in Yes, IBM PC family
Hayes AT Command Set Compatible	No AT&T 201C	Yes AT&T 212/212A, AT&T 201C	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	No AT&T 201C
Communications Facility	Dial-up	Dial-up	Dial-up, dial-up/leased, leased lines	Dial-up
Maximum Data Rate (bps)	2400	2400, 1200	2400	2400
Fallback Speed (bps)	Vendor did not specify	300	1200, 600, 300	Vendor did not specify
Synchronization	Synchronous	Async/sync	Async/sync	Synchronous
Transmission Mode	Vendor did not specify	Half/full duplex	Vendor did not specify	Vendor did not specify
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	DPSK	FSK, DPSK	FSK, QAM, DPSK	DPSK
Terminal Interface	PS/2 Micro Channel	PS/2 Micro Channel	PS/2 Micro Channel	RS-232-C, V.28, V.24, PC Bus
Line Interface Setup	Two-wire Software only	Two-wire Software only	Two-wire Software only	Two-wire Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data Equalization	Yes Fixed compromise	Yes Fixed compromise	Yes Fixed compromise	Yes Fixed compromise
Protocol/Error Data Compression	Provided in sync protocol No	CRC, Xmodem, Kermit No	CRC, xmodem, Kermit No	Provided in sync protocol No
Price/Availability Purchase (\$)	625	840	575	625
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	—	—	—

Vendor	Universal Data Systems	Universal Data Systems	Universal Data Systems	U.S. Robotics, Inc.
Product	Sync-Up 201C/212A	Sync-Up V.22 bis	Sync-Up V.26	Courier 1200
Hardware Configuration Used With Microcomputers	Plug in Yes, IBM PC family	Plug in Yes, IBM PC family	Plug in Yes, IBM PC family	Standalone Yes, all with RS-232-C interface
Hayes AT Command Set Compatible	Yes AT&T 212/212A, AT&T 201C	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	No CCITT V.26 bis	Yes AT&T 103/113, AT&T 212/212A
Communications Facility	Dial-up	Dial-up, dial-up/leased, leased lines	Dial-up	Dial-up
Maximum Data Rate (bps)	2400, 1200	2400	2400	1200
Fallback Speed (bps)	300	1200, 600, 300	Vendor did not specify	300
Synchronization	Async/sync	Async/sync	Synchronous	Asynchronous
Transmission Mode	Half/full duplex	Vendor did not specify	Vendor did not specify	Vendor did not specify
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, DPSK	FSK, QAM, DPSK	DPSK	FSK, PSK, DPSK
Terminal Interface	PC Bus	PC Bus	RS-232-C, V.28, V.24, PC Bus	RS-232-C
Line Interface Setup	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Hardware only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	No
Equalization	Fixed compromise	Fixed compromise	Fixed compromise	Fixed compromise
Protocol/Error	CRC, Xmodem, Kermit,	CRC, xmodem, Kermit	Provided in sync protocol	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability Purchase (\$)	840	575	625	349
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	January 1986
Comments	—	—	—	—

Vendor	U.S. Robotics, Inc.	U.S. Robotics, Inc.	U.S. Robotics, Inc.	U.S. Robotics, Inc.
Product	Courier 2400	Courier 2400e	Sportster 1200	Sportster 2400
Hardware Configuration Used With Microcomputers	Standalone, Internal Yes, IBM PS/2, all with external RS-232-C interface	Standalone, Internal Yes, Apple Macintosh, IBM PC family, IBM PS/2, all with external RS-232-C interface	Standalone, Internal Yes, IBM PC family, all with external RS-232-C interface	Standalone, Internal Yes, IBM PC family, external-any RS-232-C interface
Hayes AT Command Set Compatible	Yes AT&T 103/113, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, AT&T 212/212A	Yes AT&T 103/113, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up	Dial-up
Maximum Data Rate (bps)	2400	2400	1200	2400
Fallback Speed (bps)	1200, 300	300, 1200	300	1200, 300
Synchronization	Asynchronous	Asynchronous	Asynchronous	Asynchronous
Transmission Mode	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, PSK, DPSK	FSK, QAM, PSK, DPSK	FSK, PSK, DPSK	FSK, QAM, PSK, DPSK
Terminal Interface	RS-232-C, PS/2 Micro Channel, USR Rackmount 30	RS-232-C, PC Bus, PS/2 Micro Channel, USR Rack 30	RS-232-C, PC Bus	RS-232-C, PC Bus
Line Interface Setup	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Hardware only	Two-wire Hardware only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	No	No	No
Equalization	Automatic adaptive	Automatic adaptive	Fixed compromise	Automatic adaptive
Protocol/Error	Vendor did not specify	MNP	Vendor did not specify	Vendor did not specify
Data Compression	No	Yes	No	No
Price/Availability Purchase (\$)	449	699-549	139(internal)-149(external)	239 (internal)-(external) 249
Date Of First Installation	January 1985	January 1986	January 1987	January 1988
Comments	—	—	—	—

Vendor	Visionary Electronics, Inc.	Visionary Electronics, Inc.	Western DataCom	Western DataCom
Product	1200B	2400 XT	424 Autodial	424 Class 5
Hardware Configuration Used With Microcomputers	Plug in Yes, IBM PC family	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface
Hayes AT Command Set Compatible	Yes AT&T 103/113, V.22, AT&T 212/212A, V.21	Yes AT&T 103/113, AT&T 212/212A, CCITT V.21, V.22 & V.22bis	Yes AT&T 103/113, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up	Dial-up	Dial-up, dial-up/leased, leased lines	Dial-up, dial-up/leased, leased lines
Maximum Data Rate (bps)	1200	2400	2400	2400
Fallback Speed (bps)	300	300	1200, 0-300	1200, 300
Synchronization	Asynchronous	Asynchronous	Async/sync	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	FDX	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	Vendor did not specify	D2	None	None
Modulation	FSK, PSK	FSK, PSK	FSK, QAM, DPSK	FSK, QAM, DPSK
Terminal Interface	RS-232-C	RS-232-C	RS-232-C, V.24	RS-232-C, V.24
Line Interface Setup	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Vendor did not specify	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Xmodem	Xmodem	Vendor did not specify	MNP
Data Compression	No	No	No	Yes
Price/Availability				
Purchase (\$)	395 w/8K RAM	495 w/8K RAM	495	595
Date Of First Installation	1988	1989	1984	1987
Comments	Modem sends/receives files independent of composer	Modem sends/receives files independent of composer	16 modems/chassis; extended warranty available	Speed conversion and remote configuration supported
Vendor	Western DataCom	Western DataCom	Western DataCom	Western DataCom
Product	424 Crypto Card	424 Error Free	424 Line Backer	424 MNP
Hardware Configuration Used With Microcomputers	Rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface
Hayes AT Command Set Compatible	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up, dial-up/leased, leased lines	Dial-up	Dial-up, dial-up/leased, leased lines	Dial-up, dial-up/leased, leased lines
Maximum Data Rate (bps)	2400	2400	2400	2400
Fallback Speed (bps)	1200, 0-300	1200, 0-300	1200, 300	1200, 300
Synchronization	Async/sync	Async/sync	Async/sync	Async/sync
Transmission Mode	FDX	FDX	FDX	FDX
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, DPSK	FSK, QAM, DPSK	FSK, QAM, DPSK	FSK, QAM, DPSK
Terminal Interface	RS-232-C, V.24	RS-232-C, V.24	RS-232-C, V.24	RS-232-C, V.24
Line Interface Setup	Two-/four-wire Hardware/software	Two-wire Hardware/software	2-wire, 2-/4-wire, 4-wire Hardware/software	Two-wire Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP	MNP	MNP	MNP
Data Compression	Yes	No	Yes	No
Price/Availability				
Purchase (\$)	895	545	695	545
Date Of First Installation	1987	1985	1986	1986
Comments	NBS DES encryption	—	Remote configuration, call back security, and leased line dial back up supported	Speed conversion supported

Vendor	Western DataCom	Western DataCom	Western DataCom	Western DataCom
Product	424 Network Node	MESA 424	USA 212A	USA 224A
Hardware Configuration Used With Microcomputers	Rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface
Hayes AT Command Set Compatible	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, AT&T 212/212A	Vendor did not specify AT&T 103/113, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up, dial-up/leased, leased lines	Dial-up, dial-up/leased, leased lines	Dial-up	Dial-up
Maximum Data Rate (bps)	2400	2400	1200	2400
Fallback Speed (bps)	1200, 0-300	1200	0-300	0-300, 1200
Synchronization	Async/sync	Asynchronous	Asynchronous	Asynchronous
Transmission Mode	FDX	FDX	FDX	FDX
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, DPSK	FSK, QAM, DPSK	FSK, DPSK	FSK, QAM, DPSK
Terminal Interface	RS-232-C, V.24	RS-232-C, V.24	RS-232-C, V.24	RS-232-C, V.24
Line Interface Setup	2-wire, 2-1/4-wire, 4-wire	2-wire, 2-1/4-wire, 4-wire	Two-wire	Two-wire
Auto Answer/Dial	Hardware/software	Hardware/software	Hardware/software	Hardware/software
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Yes	Yes	Yes	Yes
	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP	MNP	Vendor did not specify	Vendor did not specify
Data Compression	Yes	Yes	No	No
Price/Availability				
Purchase (\$)	645	995	295	395
Date Of First Installation	1987	1986	1988	1988
Comments	Extensive diagnostics, remote configuration	NBS DES compatibility	—	—

Vendor	Western DataCom	Western DataCom	Western DataCom	Western DataCom
Product	USA 224AR	Worldcom 200V	Worldcom 202	Worldcom 223
Hardware Configuration Used With Microcomputers	Rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface
Hayes AT Command Set Compatible	Yes AT&T 103/113, V.22 bis, AT&T 212/212A	Yes V.23/Videotex	Yes AT&T 103/113, V.23/Bell 202	Vendor did not specify AT&T 103/113, V.22, V.21, V.23/Bell 202
Communications Facility	Dial-up	Dial-up	Dial-up	Dial-up
Maximum Data Rate (bps)	2400	1200 (75/150 reverse)	1200	1200
Fallback Speed (bps)	0-300, 1200	Vendor did not specify	None	0-300
Synchronization	Asynchronous	Asynchronous	Asynchronous	Asynchronous
Transmission Mode	FDX	Half/full duplex	HDX	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, DPSK	DPSK	DPSK	FSK, DPSK
Terminal Interface	RS-232-C, V.24	RS-232-C, V.24	RS-232-C, V.24	RS-232-C, V.24
Line Interface Setup	Two-wire	Two-wire	Two-wire	Two-wire
Auto Answer/Dial	Hardware/software	Hardware/software	Hardware/software	Hardware/software
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Yes	Yes	Yes	Yes
	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability				
Purchase (\$)	395	545	445	495
Date Of First Installation	1988	1986	1984	1987
Comments	—	Videotex compatible with integral autodialer	202/V.23 modem with integral "AT" auto-dialer	—

Vendor	Xecom Inc.	Xecom Inc.	Xecom Inc.	Xecom Inc.
Product	XE1201	XE1203	XE1212	XE1212E
Hardware Configuration Used With Microcomputers	Component modem Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Component modem Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Component modem Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Component modem Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible Compatibility	No Bell 103,212A	No Bell 103,212A	Yes V.22, V.21, Bell 103, 212A	Yes V.22, V.21, Bell 103, 212A
Communications Facility	Dial-up	Dial-up	Dial-up	Dial-up
Maximum Data Rate (bps)	1200	1200	1200	1200
Fallback Speed (bps)	300	300	300	300
Synchronization	Async/sync	Async/sync	Asynchronous	Asynchronous
Transmission Mode	Full duplex	Full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, DPSK	FSK, DPSK	FSK, PSK	FSK, PSK
Terminal Interface	Parallel-8251A USART	Parallel-8251A USART	PC Bus, 8250 UART	PC Bus, 8250 UART
Line Interface Setup	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Hardware/software
Auto Answer/Dial	No	No	Yes	Yes
Alternate Voice/Data	Yes	Yes	No	No
Equalization	Fixed compromise	Fixed compromise	Fixed compromise	Fixed compromise
Protocol/Error Data Compression	Vendor did not specify No			
Price/Availability Purchase (\$)	165	199	116	82
Date Of First Installation	January 1985	January 1985	January 1987	January 1987
Comments	Basic component; diag.; phone line analysis; freq- uency error, signal/noise	Enhanced component that includes voice synthesis; diagnostics	—	—

Vendor	Xecom Inc.	Xecom Inc.	Xecom Inc.	Xecom Inc.
Product	XE1212L	XE1214	XE1214E	XE2400
Hardware Configuration Used With Microcomputers	Component modem Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Component modem Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Component modem Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Component modem Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible Compatibility	Yes V.22, V.21, Bell 103, 212A	Yes V.22, V.21, Bell 103,212A	Yes V.22, V.21, Bell 103,212A	Yes V.22, V.22 bis, V.21, Bell 103, 212A
Communications Facility	Dial-up	Dial-up	Dial-up	Dial-up
Maximum Data Rate (bps)	1200	1200	1200	2400
Fallback Speed (bps)	300	300	300	1200, 300
Synchronization	Asynchronous	Asynchronous	Asynchronous	Asynchronous
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, PSK	FSK, PSK	FSK, PSK	FSK, QAM, PSK
Terminal Interface	PC Bus, 8250 UART	Serial - TTL	Serial - TTL	Serial TTL
Line Interface Setup	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	No	No	No
Equalization	Fixed compromise	Fixed compromise	Fixed compromise	Automatic adaptive
Protocol/Error Data Compression	Vendor did not specify No			
Price/Availability Purchase (\$)	116	116	82	269
Date Of First Installation	January 1987	January 1987	January 1987	January 1988
Comments	Low power version without telephone handset interface circuitry	—	—	—

Vendor	Xecom Inc.	Xecom Inc.	Xecom Inc.	Xecom Inc.
<b>Product</b>	<b>XE2400A</b>	<b>XE2400AE</b>	<b>XE2400DT</b>	<b>XE2400DT5</b>
<b>Hardware Configuration Used With Microcomputers</b>	Component modem Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Component modem Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Plug in Yes, IBM PC family, IBM compatibles	Plug in Yes, IBM PC family, IBM compatibles
Hayes AT Command Set Compatible	Yes V.22, V.22 bis, V.21, Bell 103, 212A	Yes V.22, V.22 bis, V.21, Bell 103, 212A	Yes V.22, V.22 bis, V.21, AT&T 103, 212A	Yes V.22, V.22 bis, V.21, AT&T 103, 212A
<b>Communications Facility</b>	Dial-up	Dial-up	Dial-up	Dial-up
<b>Maximum Data Rate (bps)</b>	2400	2400	2400	2400
<b>Fallback Speed (bps)</b>	1200, 300	1200, 300	1200, 300	1200, 300
<b>Synchronization</b>	Asynchronous	Asynchronous	Asynchronous	Asynchronous
<b>Transmission Mode</b>	Full duplex	Full duplex	Full duplex	Full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK
<b>Terminal Interface</b>	Serial TTL	Serial TTL	PC Bus	PC Bus
<b>Line Interface Setup</b>	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Software only	Two-wire Software only
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	No	No	No	No
<b>Equalization</b>	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	MNP
<b>Data Compression</b>	No	No	No	Yes
<b>Price/Availability</b>				
<b>Purchase (\$)</b>	165	135	225	275
<b>Date Of First Installation</b>	January 1988	January 1988	January 1990	January 1990
<b>Comments</b>	—	—	Incorporates Xecom technology on IBM PC half card	Desktop; incorporates technology on IBM PC half card.
Vendor	Xecom Inc.	Xecom Inc.	Xecom Inc.	Xecom Inc.
<b>Product</b>	<b>XE2400MNP</b>	<b>XE2400MNP/E</b>	<b>XE24C05</b>	<b>XE24C0</b>
<b>Hardware Configuration Used With Microcomputers</b>	Component modem Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Component modem Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Plug in Yes, Compaq 286/SLT laptop	Plug in Yes, Compaq 286/SLT laptop
Hayes AT Command Set Compatible	Yes V.22, V.22 bis, V.21, Bell 103, 212A	Yes V.22, V.22 bis, V.21, Bell 103, 212A	Yes V.22, V.22 bis, V.21, Bell 103, 212A	Yes V.22, V.22 bis, V.21, Bell 103, 212A
<b>Communications Facility</b>	Dial-up	Dial-up	Dial-up	Dial-up
<b>Maximum Data Rate (bps)</b>	2400	2400	2400	2400
<b>Fallback Speed (bps)</b>	1200, 300	1200, 300	1200, 300	1200, 300
<b>Synchronization</b>	Async/sync	Async/sync	Asynchronous	Asynchronous
<b>Transmission Mode</b>	Full duplex	Full duplex	Full duplex	Full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	FSK, QSM, PAK	FSK, QSM, PAK	FSK, QAM, PSK	FSK, QAM, PSK
<b>Terminal Interface</b>	Serial - TTL	Serial - TTL	Special	Special
<b>Line Interface Setup</b>	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Software only	Two-wire Software only
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	No	No	No	No
<b>Equalization</b>	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	MNP	MNP	MNP	Vendor did not specify
<b>Data Compression</b>	Yes	Yes	Yes	No
<b>Price/Availability</b>				
<b>Purchase (\$)</b>	269	235	449	379
<b>Date Of First Installation</b>	November 1988	November 1988	November 1989	November 1989
<b>Comments</b>	—	Same as XE2400MNP without D.A.A.	Implements CMOS integrated circuits & power-down circuitry.	Implements CMOS integrated circuits & power-down circuitry

Vendor	Xecom Inc.	Xecom Inc.	Xecom Inc.	Xecom Inc.
<b>Product</b>	<b>XE24FT</b>	<b>XE24MP</b>	<b>XE24MP5</b>	<b>XE24MT</b>
<b>Hardware Configuration Used With Microcomputers</b>	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Plug in Yes, Apple Macintosh Portable	Plug in Yes, Apple Macintosh Portable	Plug in Yes, Apple Macintosh II
<b>Hayes AT Command Set Compatible</b>	Yes V.22, V.22 bis, V.21, Bell 103, 212A	Yes V.22, V.22 bis, V.21, AT&T 103, 212A	Yes V.22, V.22 bis, V.21, AT&T 103, 212A	Yes V.22, V.22 bis, V.21, AT&T 103, 212A
<b>Communications Facility</b>	Dial-up	Dial-up	Dial-up	Dial-up
<b>Maximum Data Rate (bps)</b>	2400	2400	2400	2400
<b>Fallback Speed (bps)</b>	1200, 300	1200, 300	1200, 300	1200, 300
<b>Synchronization</b>	Asynchronous	Asynchronous	Asynchronous	Asynchronous
<b>Transmission Mode</b>	Full duplex	Full duplex	Full duplex	Full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK
<b>Terminal Interface</b>	RS-232-C	Modem slot	Modem slot	NuBus
<b>Line Interface Setup</b>	2-wire Hardware/software	Two-wire Software only	Two-wire Software only	Two-wire Software only
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	No	No	No	No
<b>Equalization</b>	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	Vendor did not specify	Vendor did not specify	MNP	Vendor did not specify
<b>Data Compression</b>	No	No	Yes	No
<b>Price/Availability</b>				
<b>Purchase (\$)</b>	249	349	419	349
<b>Date Of First Installation</b>	November 1988	November 1989	November 1989	November 1989
<b>Comments</b>	—	CMOS integrated circuits to conserve batteries of portable MAC	Implements CMOS integrated circuits to conserve Macintosh battery	Contains a 68008 co-processor and three serial ports (RS-422)
Vendor	Xecom Inc.	Xecom Inc.	Xecom Inc.	Xecom Inc.
<b>Product</b>	<b>XE24MTS</b>	<b>XE24NE</b>	<b>XE24NE5</b>	<b>XE24NP</b>
<b>Hardware Configuration Used With Microcomputers</b>	Plug in Yes, Apple Macintosh II	Plug in Yes, NEC ProSpeed 286 laptop	Plug in Yes, NEC ProSpeed 286 laptop	Plug in, (half card) Yes, IBM PC family
<b>Hayes AT Command Set Compatible</b>	Yes V.22, V.22 bis, V.21, AT&T 103, 212A	Yes V.22, V.22 bis, V.21, Bell 103, 212A	Yes V.22, V.22 bis, V.21, Bell 103, 212A	Yes V.22, V.22 bis, V.21, Bell 103,212A
<b>Communications Facility</b>	Dial-up	Dial-up	Dial-up	Dial-up
<b>Maximum Data Rate (bps)</b>	2400	2400	2400	2400
<b>Fallback Speed (bps)</b>	1200, 300	1200, 300	1200, 300	1200, 300
<b>Synchronization</b>	Asynchronous	Asynchronous	Asynchronous	Asynchronous
<b>Transmission Mode</b>	Full duplex	Full duplex	Full duplex	Full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK
<b>Terminal Interface</b>	NuBus	Special	Special	PC Bus
<b>Line Interface Setup</b>	Two-wire Software only	Two-wire Software only	Two-wire Software only	Two-wire Hardware/software
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	No	No	No	No
<b>Equalization</b>	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	MNP	Vendor did not specify	MNP	Vendor did not specify
<b>Data Compression</b>	Yes	No	Yes	No
<b>Price/Availability</b>				
<b>Purchase (\$)</b>	419	349	419	Vendor did not specify
<b>Date Of First Installation</b>	November 1989	November 1989	November 1989	November 1988
<b>Comments</b>	Has 68008 co-processor & 3 serial ports	Implements CMOS integrated circuits to conserve batteries	Implements CMOS integrated circuits to conserve batteries	The XE24NP is identical to the XE24NP5 but lacks MNP

Vendor	Xecom Inc.	Xecom Inc.	Xecom Inc.	Xecom Inc.
<b>Product</b>	<b>XE24NP5</b>	<b>XE24QP</b>	<b>XE24QP5</b>	<b>XE24SE</b>
<b>Hardware Configuration Used With Microcomputers</b>	Plug in Yes, IBM PC family	Plug in Yes, Apple Macintosh II	Plug in Yes, Apple Macintosh II	Plug in Yes, Apple Macintosh SE
<b>Hayes AT Command Set Compatible</b>	Yes V.22, V.22 bis, V.21, AT&T 103, 212	Yes V.22, V.22 bis, V.21, AT&T 103,212A	Yes V.22, V.22 bis, V.21, AT&T 103,212A	Yes V.22, V.22 bis, V.21, AT&T 103, 212A
<b>Communications Facility</b>	Dial-up	Dial-up	Dial-up	Dial-up
<b>Maximum Data Rate (bps)</b>	2400	2400	2400	2400
<b>Fallback Speed (bps)</b>	1200, 300	1200, 300	1200, 300	1200, 300
<b>Synchronization</b>	Asynchronous	Asynchronous	Asynchronous	Asynchronous
<b>Transmission Mode</b>	Full duplex	Full duplex	Full duplex	Full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK
<b>Terminal Interface</b>	PC Bus	NuBus	NuBus	68000 PDS Bus
<b>Line Interface Setup</b>	Two-wire Hardware/software	Two-wire Software only	Two-wire Software only	Two-wire Software only
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	No	No	No	No
<b>Equalization</b>	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	MNP	MNP	MNP	Vendor did not specify
<b>Data Compression</b>	Yes	Yes	Yes	No
<b>Price/Availability</b>				
<b>Purchase (\$)</b>	349	1,499	1,799	329
<b>Date Of First Installation</b>	November 1989	November 1989	November 1989	November 1989
<b>Comments</b>	When not in use as modem, can be RS-232C-D89 port	Contains four modems and one 68008 co-processor	Contains four modems and one 68008 co-processor	Part of of Xecom's NewPort family for Apple Macintosh SE.

Vendor	Xecom Inc.	Xecom Inc.	Xecom Inc.	Xecom Inc.
<b>Product</b>	<b>XE24SE5</b>	<b>XE24ST</b>	<b>XE24ST5</b>	<b>XE24TO</b>
<b>Hardware Configuration Used With Microcomputers</b>	Plug in Yes, Apple Macintosh SE	Plug in Yes, Apple Macintosh SE30	Plug in Yes, Apple Macintosh SE30	Plug in Yes, Toshiba T1600 laptop
<b>Hayes AT Command Set Compatible</b>	Yes V.22, V.22 bis, V.21, AT&T 103, 212A	Yes V.22, V.22 bis, V.21, AT&T 103,212A	Yes V.22, V.22 bis, V.21, AT&T 103, 212A	Yes V.22, V.22 bis, V.21, Bell 103, 212A
<b>Communications Facility</b>	Dial-up	Dial-up	Dial-up	Dial-up
<b>Maximum Data Rate (bps)</b>	2400	2400	2400	2400
<b>Fallback Speed (bps)</b>	1200, 300	1200, 300	1200, 300	1200, 300
<b>Synchronization</b>	Asynchronous	Asynchronous	Asynchronous	Asynchronous
<b>Transmission Mode</b>	Full duplex	Full duplex	Full duplex	Full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK
<b>Terminal Interface</b>	68000 PDS Bus	68030 PDS Bus	68030 PDS Bus	Special
<b>Line Interface Setup</b>	Two-wire Software only	Two-wire Software only	Two-wire Software only	Two-wire Software only
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	No	No	No	No
<b>Equalization</b>	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	MNP	Vendor did not specify	MNP	Vendor did not specify
<b>Data Compression</b>	Yes	No	Yes	No
<b>Price/Availability</b>				
<b>Purchase (\$)</b>	399	349	419	379
<b>Date Of First Installation</b>	November 1989	November 1989	November 1989	November 1989
<b>Comments</b>	For the Apple Macintosh SE; includes one (RS-422) port	Part of of Xecom's Newport family for Apple Macintosh SE30	3 RS-422 ports; built-in 68008 co-processor	Implements CMOS integrated circuits & power-down circuitry.

Vendor	Xecom Inc.	Xecom Inc.	Xecom Inc.	Xecom Inc.
<b>Product</b>	<b>XE24T05</b>	<b>XE24ZE</b>	<b>XE24ZE5</b>	<b>XE9624CO</b>
<b>Hardware Configuration Used With Microcomputers</b>	Plug in Yes, Toshiba T1600 laptop	Plug in Yes, Zenith SuperSport 286 laptop	Plug in Yes, Zenith SuperSport 286 laptop	Plug in Yes, Compaq 286/SLT laptop
<b>Hayes AT Command Set Compatible Compatibility</b>	Yes V.22, V.22 bis, V.21, Bell 103, 212A	Yes V.22, V.22 bis, V.21, Bell 103, 212A	Yes V.22, V.22 bis, V.21, Bell 103, 212A	Yes V.22, V.22 bis, V.29, V.21, V.27ter, Bell 103, 212A
<b>Communications Facility</b>	Dial-up	Dial-up	Dial-up	Dial-up
<b>Maximum Data Rate (bps)</b>	2400	2400	2400	2400
<b>Fallback Speed (bps)</b>	1200, 300	1200, 300	1200, 300	1200, 300
<b>Synchronization</b>	Asynchronous	Asynchronous	Asynchronous	Asynchronous, synchronous
<b>Transmission Mode</b>	Full duplex	Full duplex	Full duplex	Half duplex, full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK
<b>Terminal Interface</b>	Special	Special	Special	Special
<b>Line Interface Setup</b>	Two-wire Software only	Two-wire Software only	Two-wire Software only	Two-wire Software only
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data Equalization</b>	No Automatic adaptive	No Automatic adaptive	No Automatic adaptive	No Automatic adaptive
<b>Protocol/Error Data Compression</b>	MNP Yes	Vendor did not specify No	MNP Yes	MNP Yes
<b>Price/Availability Purchase (\$)</b>	449	349	419	625
<b>Date Of First Installation</b>	November 1989	November 1989	November 1989	January 1990
<b>Comments</b>	Implements CMOS integrated circuits & power-down circuitry	Implements CMOS integrated circuits & power-down circuitry	Implements CMOS integrated circuits & power-down circuitry	Also supports 9600 bps Group 3 fax
Vendor	Xecom Inc.	Xecom Inc.	Xecom Inc.	Xecom Inc.
<b>Product</b>	<b>XE9624DT</b>	<b>XE9624NE</b>	<b>XE9624TO</b>	<b>XE9624ZE</b>
<b>Hardware Configuration Used With Microcomputers</b>	Plug in Yes, IBM PC family, IBM compatibles	Plug in Yes, NEC Prospeed 286 laptop	Plug in Yes, Toshiba T1600 laptop	Plug in Yes, Zenith SuperSport 286 laptop
<b>Hayes AT Command Set Compatible Compatibility</b>	Yes V.22, V.22 bis, V.29, V.21, V.27ter, Bell 103, 212A	Yes V.22, V.22 bis, V.29, V.21, V.27ter, AT&T 103,212A	Yes V.22, V.22 bis, V.29, V.21, V.27ter, Bell 103, 212A	Yes V.22, V.22 bis, V.29, V.21, V.27ter, AT&T 103,212A
<b>Communications Facility</b>	Dial-up	Dial-up	Dial-up	Dial-up
<b>Maximum Data Rate (bps)</b>	2400	2400	2400	2400
<b>Fallback Speed (bps)</b>	1200, 300	1200, 300	1200, 300	1200, 300
<b>Synchronization</b>	Asynchronous, synchronous	Asynchronous, synchronous	Asynchronous, synchronous	Asynchronous, synchronous
<b>Transmission Mode</b>	Half duplex, full duplex	Half duplex, full duplex	Half duplex, full duplex	Half duplex, full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK
<b>Terminal Interface</b>	PC Bus	Special	Special	Special
<b>Line Interface Setup</b>	Two-wire Software only	Two-wire Software only	Two-wire Software only	Two-wire Software only
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data Equalization</b>	No Automatic adaptive	No Automatic adaptive	No Automatic adaptive	No Automatic adaptive
<b>Protocol/Error Data Compression</b>	MNP Yes	MNP Yes	MNP Yes	MNP Yes
<b>Price/Availability Purchase (\$)</b>	525	625	625	625
<b>Date Of First Installation</b>	January 1990	January 1990	January 1990	January 1990
<b>Comments</b>	Also supports 9600 bps Group 3 fax	Also supports 9600 Bps Group III fax	Also supports 9600 bps Group 3 fax	Also supports 9600 Bps Group III fax

Vendor	Xecom Inc.	Xecom Inc.	Xecom Inc.	Xecom Inc.
<b>Product</b>	<b>XEFDMP</b>	<b>XEFDMT</b>	<b>XEFDQP</b>	<b>XEFDSE</b>
<b>Hardware Configuration Used With Microcomputers</b>	Plug in Yes, Apple Macintosh Portable	Plug in Yes, Apple Macintosh II	Plug in Yes, Apple Macintosh II	Plug in Yes, Apple Macintosh SE
<b>Hayes AT Command Set Compatible</b>	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.29, V.21, V.27ter	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.29, V.21, V.27ter	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.29, V.21, V.27ter	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.29, V.21, V.27ter
<b>Communications Facility</b>	Dial-up	Dial-up	Dial-up	Dial-up
<b>Maximum Data Rate (bps)</b>	2400	2400	2400	2400
<b>Fallback Speed (bps)</b>	1200, 300	1200, 300	1200, 300	1200, 300
<b>Synchronization</b>	Asynchronous, async/sync	Asynchronous, synchronous	Asynchronous, async/sync	Asynchronous, async/sync
<b>Transmission Mode</b>	Half duplex, full duplex			
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK
<b>Terminal Interface</b>	Modem slot	NuBus	NuBus	68000 PDS-Bus
<b>Line Interface Setup</b>	Two-wire Software only	Two-wire Software only	Two-wire Software only	Two-wire Software only
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	No	No	No	No
<b>Equalization</b>	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	MNP	MNP	MNP	MNP
<b>Data Compression</b>	Yes	Yes	Yes	Yes
<b>Price/Availability</b>				
<b>Purchase (\$)</b>	699	899	2,999	799
<b>Date Of First Installation</b>	December 1989	December 1989	December 1989	December 1989
<b>Comments</b>	Also supports 9600 bps Group 3 fax			

Vendor	Xecom Inc.	Zoom Telephonics, Inc.	Zoom Telephonics, Inc.	Zoom Telephonics, Inc.
<b>Product</b>	<b>XEFDST</b>	<b>Zoom/Modem HC2400R</b>	<b>Zoom/Modem HC2400S with Sendfax</b>	<b>Zoom/Modem MX2400R</b>
<b>Hardware Configuration Used With Microcomputers</b>	Plug in Yes, Apple Macintosh SE30	Plug in Yes, IBM PC family	Plug in Yes, IBM PC family	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, Amiga, any computer with serial port
<b>Hayes AT Command Set Compatible</b>	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.29, V.21, V.27ter	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, Group 3 facsimile transmission	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
<b>Communications Facility</b>	Dial-up	Dial-up	Dial-up	Dial-up
<b>Maximum Data Rate (bps)</b>	2400	2400	2400	2400
<b>Fallback Speed (bps)</b>	1200, 300	1200, 300	1200, 300	1200, 300
<b>Synchronization</b>	Asynchronous, async/sync	Asynchronous	Asynchronous	Asynchronous
<b>Transmission Mode</b>	Half duplex, full duplex	Half/full duplex	Half/full duplex	Half/full duplex
<b>Configuration</b>	Point-to-point	Multipoint	Multipoint	Multipoint
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	FSK, QAM, PSK	FSK, QAM, PSK, DPSK	FSK, QAM, PSK, DPSK	FSK, QAM, PSK, DPSK
<b>Terminal Interface</b>	68030 PDS bus	PC Bus	PC Bus	RS-232-C
<b>Line Interface Setup</b>	Two-wire Software only	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Hardware/software
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	No	No	No	No
<b>Equalization</b>	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	MNP	CRC, xmodem, MNP, Kermit	CRC, xmodem, MNP, Kermit	CRC, xmodem, MNP, Kermit
<b>Data Compression</b>	Yes	No	No	No
<b>Price/Availability</b>				
<b>Purchase (\$)</b>	899	199	199	199
<b>Date Of First Installation</b>	December 1989	1987	January 1990	1988
<b>Comments</b>	Also supports 9600 Bps Group III fax	Rockwell-based modem with non-volatile RAM; seven-year warranty	Hayes-compatible; can send files to a Group 3 facsimile at 4800 bps	Rockwell-based modem with non-volatile RAM; seven-year warranty.

Vendor	Adaptive Computer Technologies	ATI Technologies Inc.	Barr Systems, Inc.	Barr Systems, Inc.
Product	ACT 154	9600 etc/e External Modem	PC-SYNC 208AB	PC-SYNC 9600
Hardware Configuration Used With Microcomputers	Standalone Yes, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Plug in Yes, IBM PC family, IBM PS/2, models 25 & 30	Plug in Yes, IBM PC family, IBM PS/2, models 25 & 30
Hayes AT Command Set Compatible	Yes AT&T 103/113, V.22 bis, AT&T 212/212A	Vendor did not specify AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32, V.42 with LAP-M	No Bell 208AB	No V.29, UDS 9600B
Communications Facility	Dial-up	Dial-up/leased	Dial-up	Dial-up
Maximum Data Rate (bps)	9600	9600	4800	9600
Fallback Speed (bps)	2400, 1200, 300	2400, 1200, 300	Vendor did not specify	Vendor did not specify
Synchronization	Vendor did not specify	Async/sync	Synchronous	Synchronous
Transmission Mode Configuration	Vendor did not specify	Half/full duplex	Half/full duplex	Half duplex
Line Conditioning	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Modulation	None	None	None	None
	FSK, QAM, PSK, DPSK	QAM	DPSK	QAM
Terminal Interface	RS-232-C	RS-232-C	PC Bus	PC Bus
Line Interface Setup	Two-wire Software only	Two-wire Hardware/software	Two-/four-wire Hardware/software	Two-wire Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data Equalization	Yes	Yes	Yes	Yes
	Fixed compromise	Automatic adaptive	Vendor did not specify	Vendor did not specify
Protocol/Error Data Compression	Proprietary Yes	MNP, V.42 including LAP-M Yes	CRC Yes	CRC Yes
Price/Availability Purchase (\$)	695	799	1,990	2,490
Date Of First Installation	Vendor did not specify	March 1990	1986	1986
Comments	—	Features front panel push button commands for auto answer, redial, sync/async	2,190 with RJE + 3270	2,790 with RJE + 3270
Vendor	Barr Systems, Inc.	Barr Systems, Inc.	Barr Systems, Inc.	BCH Equipment Corp.
Product	PC-SYNC V.32	PC-SYNC/2 208/201	PC-SYNC/2 V.32	48/208 AB Model 1
Hardware Configuration Used With Microcomputers	Plug in Yes, IBM PC family, IBM PS/2, models 25 & 30	Plug in Yes, IBM PS/2, MCA	Plug in Yes, IBM PS/2, MCA	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	No V.22, V.32	No Bell 208B; 201C	No V.22, V.32	No AT&T 208
Communications Facility	Dial-up/leased	Dial-up	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	9600	4800	9600	4800
Fallback Speed (bps)	4800, 2400	Vendor did not specify	4800, 2400	2400
Synchronization	Async/sync	Synchronous	Async/sync	Synchronous
Transmission Mode Configuration	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Line Conditioning	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Modulation	None	None	None	None
	QAM	DPSK	QAM	DPSK
Terminal Interface	PC Bus	PS/2 Micro Channel	PS/2 Micro Channel	RS-232-C
Line Interface Setup	Two-/four-wire Hardware/software	Two-/four-wire Software only	Two-/four-wire Software only	Two-/four-wire Hardware only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data Equalization	Yes	Yes	Yes	Yes
	Automatic adaptive	Vendor did not specify	Vendor did not specify	Automatic adaptive
Protocol/Error Data Compression	CRC Yes	CRC Yes	CRC Yes	Vendor did not specify No
Price/Availability Purchase (\$)	2,490	1,990	2,490	795
Date Of First Installation	1986	1989	1989	1985
Comments	2,790 with RJE + 3270	2,190 with RJE + 3270	2,790 with RJE + 3270	—

Vendor	BCH Equipment Corp.	BCH Equipment Corp.	BCH Equipment Corp.	BCH Equipment Corp.
Product	48/208A Model 3	48/V.27 Model 4	9600 FP	9600/V.29
Hardware Configuration Used With Microcomputers	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount Yes, IBM PC family, IBM PS/2	Standalone, rackmount Yes, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible Compatibility	No AT&T 208 and 201C	No V.27	No V.29	No V.29
Communications Facility	Dial-up/leased	Leased lines	Leased lines	Leased lines
Maximum Data Rate (bps) Fallback Speed (bps) Synchronization Transmission Mode Configuration Line Conditioning Modulation	4800 2400 Synchronous Half/full duplex Point-to-point None DPSK	4800 2400 Synchronous Half/full duplex Point-to-point, multipoint None DPSK	9600 7200, 4800 Synchronous Half/full duplex Multipoint None QAM	9600 7200, 4800 Synchronous Half/full duplex Point-to-point None QAM
Terminal Interface	RS-232-C	RS-232-C	RS-232-C	RS-232-C
Line Interface Setup Auto Answer/Dial Alternate Voice/Data Equalization	Two-/four-wire Hardware only Yes Yes Automatic adaptive	Four-wire Hardware only No Yes Automatic adaptive	Four-wire Hardware only No No Automatic adaptive	Four-wire Hardware only No Yes Automatic adaptive
Protocol/Error Data Compression	Vendor did not specify No	Vendor did not specify No	Vendor did not specify No	Vendor did not specify No
Price/Availability Purchase (\$)	950	895	1,250-FPM; 1,095-FPS	995
Date Of First Installation	1985	1985	1985	1985
Comments	—	—	—	—

Vendor	BT Datacom, Inc.	Cermetek Microelectronics, Inc.	Comspec Digital Products, Inc.	CXR Telcom/Anderson Jacobson
Product	Datel 4962TCX	Spectrum 9600	9600 C	AJ 9641-1
Hardware Configuration Used With Microcomputers	Standalone, plug in, rack Yes	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount Yes, IBM PC family	Standalone, rackmount Yes, IBM PC family
Hayes AT Command Set Compatible Compatibility	No V.29, V.29, V.32	Yes V.22 bis, V.32	No V.29	No V.29
Communications Facility	Dial-up/leased, two-wire leased lines 9.6K	Dial-up, dial-up/leased, leased lines 9600 (full duplex) 4800	Dial-up, dial-up/leased, leased lines 9600 7200, 4800, 2400	Leased lines 9600 7200, 4800
Maximum Data Rate (bps) Fallback Speed (bps) Synchronization Transmission Mode Configuration Line Conditioning Modulation	Async/sync Vendor did not specify Point-to-point None QAM, Trellis coding	Async/sync Vendor did not specify Point-to-point D2 QAM, DPSK	Synchronous Half/full duplex Point-to-point None QAM, DPSK	Async/sync Full duplex Point-to-point, multipoint None QAM
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C, V.24	RS-232-C	RS-232-C, V.24
Line Interface Setup Auto Answer/Dial Alternate Voice/Data Equalization	Two-/four-wire Hardware/software Yes Yes Fixed compromise, automatic adaptive	Two-/four-wire Hardware/software Yes Yes Automatic adaptive	Two-/four-wire Software only Yes Yes Automatic adaptive	Four-wire Vendor did not specify No No Automatic adaptive
Protocol/Error Data Compression	Not applicable No	MNP Yes	Vendor did not specify No	Vendor did not specify No
Price/Availability Purchase (\$)	Vendor did not specify	995	3,495	1,295
Date Of First Installation	April 1986	No	1984	1987
Comments	Parallel dial 801C option available; TDM, STDM, PAD	—	Additional diagnostics; end to end BERT line loss, round trip delay	—

Vendor	CXR Telcom/Anderson Jacobson	CXR Telcom/Anderson Jacobson	CXR Telcom/Anderson Jacobson	CXR Telcom/Anderson Jacobson
<b>Product</b>	AJ 9641-1D	AJ 9641-1F	AJ 9641-1FD	AJ 9651-1MV
<b>Hardware Configuration Used With Microcomputers</b>	Standalone, rackmount Yes, IBM PC family	Standalone, rackmount Yes, IBM PC family	Standalone, rackmount Yes, IBM PC family	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family
<b>Hayes AT Command Set Compatible Compatibility</b>	No V.29	No V.29	No V.29	Yes V.22, V.22 bis, AT&T 212/212A, V.32
<b>Communications Facility</b>	Dial-up/leased, w/unatt- ended automatic dial back-up	Leased lines	Dial-up/leased, w/unatt- ended automatic dial back-up	Dial-up/leased, w/unatt- ended automatic dial back-up
<b>Maximum Data Rate (bps)</b>	9600	9600	9600	9600
<b>Fallback Speed (bps)</b>	7200, 4800	7200, 4800	7200, 4800	4800
<b>Synchronization</b>	Async/sync	Async/sync	Async/sync	Async/sync
<b>Transmission Mode</b>	Full duplex	Full duplex	Full duplex	Half/full duplex
<b>Configuration</b>	Point-to-point, multipoint	Point-to-point, multipoint	Point-to-point, multipoint	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	QAM	QAM	QAM	QAM, Trellis coding, DPSK
<b>Terminal Interface</b>	RS-232-C, V.24	RS-232-C, V.24	RS-232-C, V.24	RS-232-C, V.24
<b>Line Interface Setup</b>	Two-/four-wire	Four-wire	Two-/four-wire	Two-/four-wire
<b>Auto Answer/Dial</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Alternate Voice/Data</b>	Yes	No	Yes	Yes
<b>Equalization</b>	No	No	No	Yes
<b>Protocol/Error Data Compression</b>	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error Data Compression</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	MNP Yes
<b>Price/Availability Purchase (\$)</b>	No	No	No	No
<b>Price/Availability Purchase (\$)</b>	1,595	1,595	1,895	1,545
<b>Date Of First Installation</b>	1987	1987	1987	1988
<b>Comments</b>	Setup features; switches and softstraps	Multipoint fast poll; 23ms operation, setup features; switches and softstraps	—	Clock/calendar control of dial back-up/setup fea- tures; data compression
Vendor	CXR Telcom/Anderson Jacobson	Data Race	Data Race	Develcon Electronics Ltd.
<b>Product</b>	AJ 9651-2MV	Action 32	PC Race 24/48	Alliance V.32 - 9600
<b>Hardware Configuration Used With Microcomputers</b>	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Plug in Yes, IBM PC family	Standalone, rackmount Yes, all
<b>Hayes AT Command Set Compatible Compatibility</b>	Yes V.22, V.22 bis, AT&T 212/212A, V.32	Yes V.22, V.22 bis, AT&T 212/212A, CCITT V.32	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, AT&T 201C, AT&T 208B	Yes V.22, V.22 bis, CCITT V.32, Bell 212A, 103
<b>Communications Facility</b>	Dial-up	Dial-up/leased	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	9600	9600	4800	9600
<b>Fallback Speed (bps)</b>	4800	7200/4800/2400/1200	2400, 1200	4800/2400/1200/300
<b>Synchronization</b>	Async/sync	Async/sync, Hayes AutoSync	Async/sync, Hayes AutoSync	Async/sync
<b>Transmission Mode</b>	Half/full duplex	Full duplex	Half/full duplex	Full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point, multipoint
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	FSK, QAM, Trellis coding	FSK, PSK, Trellis coding	FSK, PSK	FSK, QAM, Trellis coding, DPSK
<b>Terminal Interface</b>	RS-232-C, V.24	RS-232-C	PC Bus	RS-232-C, V.28, V.24
<b>Line Interface Setup</b>	Two-wire	Two-/four-wire	Two-wire	Two-/four-wire
<b>Auto Answer/Dial</b>	Vendor did not specify	Hardware/software	Hardware/software	Hardware only
<b>Alternate Voice/Data</b>	Yes	Yes	Vendor did not specify	Yes
<b>Equalization</b>	Yes	No	No	Yes
<b>Protocol/Error Data Compression</b>	Automatic adaptive	Automatic adaptive	Automatic adaptive	Fixed compromise, automatic adaptive
<b>Protocol/Error Data Compression</b>	MNP	MNP	MNP	MNP
<b>Protocol/Error Data Compression</b>	No	Vendor did not specify	Vendor did not specify	Yes
<b>Price/Availability Purchase (\$)</b>	1,395	1,295	1,195	Contact vendor
<b>Date Of First Installation</b>	1988	July 1989	November 1988	Vendor did not specify
<b>Comments</b>	Setup features; switches + softstraps, data compression; MNP 5	—	Unit has Hayes autosync for use with SNA and bisync remote packages	—

Vendor	Develcon Electronics Ltd.	Develcon Electronics Ltd.	Develcon Electronics Ltd.	Develcon Electronics Ltd.
<b>Product</b>	M1915EZ	M1915L	M1921EZ	M1921L
<b>Hardware Configuration</b> Used With Microcomputers	Standalone, rackmount Yes, all	Standalone, rackmount Yes, all	Standalone, rackmount Yes, all	Standalone, rackmount Yes, all
Hayes AT Command Set Compatible Compatibility	No CCITT V.27 bis	No CCITT V.27	No V.29	No V.29
<b>Communications Facility</b>	Leased lines	Leased lines	Leased lines	Leased lines
<b>Maximum Data Rate (bps)</b> <b>Fallback Speed (bps)</b> <b>Synchronization</b> <b>Transmission Mode</b> <b>Configuration</b> <b>Line Conditioning</b> <b>Modulation</b>	4800 2400 Synchronous Full duplex Point-to-point, multipoint None PSK	4800 2400 Synchronous Full duplex Point-to-point, multipoint None PSK	9600 7200, 4800 Synchronous Full duplex Point-to-point None QAM	9600 7200, 4800 Synchronous Full duplex Point-to-point None QAM
<b>Terminal Interface</b>	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
<b>Line Interface</b> <b>Setup</b> <b>Auto Answer/Dial</b> <b>Alternate Voice/Data</b> <b>Equalization</b>	Four-wire Hardware only No No Fixed compromise, automatic adaptive, fixed line	Four-wire Hardware only No No Automatic adaptive	Four-wire Hardware only No No Fixed compromise, automatic adaptive, fixed line	Four-wire Hardware only No No Automatic adaptive
<b>Protocol/Error</b> <b>Data Compression</b>	ARQ No	ARQ No	ARQ No	ARQ No
<b>Price/Availability</b> Purchase (\$)	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Comments</b>	—	—	—	Optional 4-port internal TDM multiplexer

Vendor	Develcon Electronics Ltd.	Develcon Electronics Ltd.	E-Tech Research	E-Tech Research
<b>Product</b>	M1923L	M1924EZ	BulletModem E2400M	BulletModem PC2400MH
<b>Hardware Configuration</b> Used With Microcomputers	Standalone, rackmount Yes, all	Standalone, rackmount Yes, all	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all computers	Plug in Yes, IBM PC family
Hayes AT Command Set Compatible Compatibility	No V.29	No V.29	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.23	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21
<b>Communications Facility</b>	Leased lines	Leased lines	Dial-up/leased	Dial-up
<b>Maximum Data Rate (bps)</b> <b>Fallback Speed (bps)</b> <b>Synchronization</b> <b>Transmission Mode</b> <b>Configuration</b> <b>Line Conditioning</b> <b>Modulation</b>	9600 7200, 4800 Synchronous Full duplex Point-to-point None QAM	9600 7200, 4800 Synchronous Full duplex Point-to-point, multipoint None QAM	9000 2400, 1200, 300 Async/sync Full duplex Point-to-point None FSK, QAM, PSK	9000 2400, 1200, 300 Async/sync Full duplex Point-to-point None FSK, QAM, PSK, Trellis coding
<b>Terminal Interface</b>	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C	PC Bus
<b>Line Interface</b> <b>Setup</b> <b>Auto Answer/Dial</b> <b>Alternate Voice/Data</b> <b>Equalization</b>	Four-wire Hardware only No No Automatic adaptive	Four-wire Hardware only No No Automatic adaptive, fixed line	Two-/four-wire Software only Yes Yes Automatic adaptive	Vendor did not specify Software only Yes Yes Automatic adaptive
<b>Protocol/Error</b> <b>Data Compression</b>	ARQ No	ARQ No	MNP Yes	MNP Yes
<b>Price/Availability</b> Purchase (\$)	Contact vendor	Contact vendor	395	295
Date Of First Installation	Vendor did not specify	Vendor did not specify	December 1987	January 1988
<b>Comments</b>	—	—	Remote configuration	—

Vendor	Emerald Technology	Fastcomm Data Corporation	Fastcomm Data Corporation	Fastcomm Data Corporation
Product	208 A/B	FDX 2448	FDX 9624	FDX 9696
Hardware Configuration Used With Microcomputers	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any	Standalone, rack, leased lines Yes, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount Yes, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, plug in, rack Yes, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible Compatibility	No Bell system 208 A/B	Yes V.22, V.22 bis, AT&T 212/212A, V.21, AT&T 103	Yes AT&T 103/113, V.22, V.22 bis, CCITT V.32, AT&T 212A	Yes CCITT V.32, AT&T 103, 212A
Communications Facility	Dial-up/leased, 2 wire half duplex, 2-4-wire full 4800	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	4800	4800	9600	9600
Fallback Speed (bps)	None	2400, 1200, 300	4800/2400/1200/300	7200/4800/2400/1200/300
Synchronization	Synchronous	Async/sync	Asynchronous	Async/sync (card); async
Transmission Mode	Half/full duplex	Full duplex	Full duplex	Full duplex
Configuration	Point-to-point, multipoint	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	Eight Phase DPSK	FSK, QAM, PSK, DPSK	FSK, QAM, PSK, Trellis coding, DPSK	FSK, QAM, PSK, Trellis coding, DPSK
Terminal Interface	RS-232-C, V.24	RS-232-C	RS-232-C	RS-232-C
Line Interface Setup	Two-/four-wire Hardware only Vendor did not specify	Two-/four-wire Hardware/software Yes	Two-/four-wire Hardware/software Yes	Two-/four-wire Hardware/software Yes
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Automatic adaptive	Automatic adaptive	Fixed compromise, automatic adaptive	Fixed compromise, automatic adaptive
Equalization	Vendor did not specify	MNP	MNP	MNP
Protocol/Error	No	Yes	Yes	Yes
Data Compression				
Price/Availability				
Purchase (\$)	1,295	649	899	999; RMV 1,299
Date Of First Installation	1986	November 1985	May 1988	December 1988
Comments	Has auto answer but no auto dial	Compatibility, MNP 4 & 5, password security	—	—
Vendor	Gandalf Data, Inc.	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.
Product	Access Series V.32 ENH	DataComm 14433	DataComm 208B+ /SD	DataComm 208B/A
Hardware Configuration Used With Microcomputers	Standalone, rackmount Yes	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount Yes, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible Compatibility	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32	No V.29, V.33	No 208, V.25bis	No 208
Communications Facility	Dial-up/leased	Leased lines	Dial-up	Dial-up/leased
Maximum Data Rate (bps)	9600	14.4K	4800	4800
Fallback Speed (bps)	300, 1200, 2400, 4800	12K, 9600	Not applicable	Vendor did not specify
Synchronization	Async/sync	Synchronous	Synchronous	Synchronous
Transmission Mode	Per international specs.	Half/full duplex	Vendor did not specify	Half/full duplex
Configuration	Point-to-point	Vendor did not specify	Point-to-point	Point-to-point, multipoint/drop
Line Conditioning	Not required	D1, or M1020	None	None
Modulation	QAM	QAM	DPSK	DPSK
Terminal Interface	RS-232-C, V.28/V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
Line Interface Setup	Two-wire, four-wire Vendor did not specify	Four-wire Hardware only	Two-wire Hardware/software	Two-/four-wire Hardware only
Auto Answer/Dial	Yes	No	Yes	Yes
Alternate Voice/Data	Yes	No	Yes	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP	Trellis	Vendor did not specify	Vendor did not specify
Data Compression	Vendor did not specify	No	No	No
Price/Availability				
Purchase (\$)	1,145	2,295	1,295	1,345
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	Setup; Command driver	—	—	—

Vendor	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.
<b>Product</b>	DataComm 296B	DataComm 4800	DataComm 4827	DataComm 596
<b>Hardware Configuration</b> Used With Microcomputers	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Yes V.32	No 208	No V.27	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32, V.25bis async/sync
<b>Communications Facility</b>	Dial network and leased lines	Leased lines	Leased lines	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	9600	4800	4800	9600
<b>Fallback Speed (bps)</b>	4800	2400	2400	4800, 2400, 1200, 300
<b>Synchronization</b>	Async/sync	Async/sync	Async/sync	Async/sync
<b>Transmission Mode</b>	Vendor did not specify	Half/full duplex	Half/full duplex	Full duplex
<b>Configuration</b>	Point-to-point	Point-to-point, multipoint/drop,	Point-to-point, multipoint/drop	Point-to-point
<b>Line Conditioning</b>	D1	None	None	D1
<b>Modulation</b>	QAM, Trellis coding	DPSK, (8-level)	DPSK, (8-level)	Vendor did not specify
<b>Terminal Interface</b>	RS-232-C, V.28, V.24	RS-232-C	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
<b>Line Interface</b>	Two-/four-wire	Two-/four-wire	Two-/four-wire	Two-/four-wire
<b>Setup</b>	Hardware/software	Hardware only	Hardware only	Hardware/software
<b>Auto Answer/Dial</b>	Yes	No	No	Yes
<b>Alternate Voice/Data</b>	Yes	No	No	Yes
<b>Equalization</b>	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	MNP, Trellis, X.25, V.42bis	Vendor did not specify	Vendor did not specify	MNP, V.42, V.42bis, Trellis
<b>Data Compression</b>	Yes	No	No	Yes
<b>Price/Availability</b>				
Purchase (\$)	1,495	1,145	1,145	1,395
Date Of First Installation	Vendor did not specify			
<b>Comments</b>	Password, callback, automatic dial back-up and leased line loopback	16 datasets mount in a 10 1/2 shelf	DATA commonality - 16 datasets to shelf	Extensive diagnostics; self test, digital/analog/remote digital loopback

Vendor	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.
<b>Product</b>	DataComm 9600RP	DataComm 9600RPA	DataComm 9600SP	DataComm 9600SPA
<b>Hardware Configuration</b> Used With Microcomputers	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	No V.29	No V.29	No V.29	No V.29
<b>Communications Facility</b>	Leased lines	Leased lines	Leased lines	Leased lines
<b>Maximum Data Rate (bps)</b>	9600	9600	9600	9600
<b>Fallback Speed (bps)</b>	7200, 4800	7200, 4800	7200, 4800	7200, 4800
<b>Synchronization</b>	Synchronous	Async/sync	Synchronous	Async/sync
<b>Transmission Mode</b>	Vendor did not specify			
<b>Configuration</b>	Point-to-point, multipoint	Point-to-point, multipoint/drop	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	QAM	QAM	QAM	QAM
<b>Terminal Interface</b>	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
<b>Line Interface</b>	Four-wire	Four-wire	Four-wire	Four-wire
<b>Setup</b>	Hardware only	Hardware only	Hardware only	Hardware only
<b>Auto Answer/Dial</b>	No	No	No	No
<b>Alternate Voice/Data</b>	No	No	No	No
<b>Equalization</b>	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	Vendor did not specify			
<b>Data Compression</b>	No	No	No	No
<b>Price/Availability</b>				
Purchase (\$)	1,745	1,995	1,465	1,575
Date Of First Installation	Vendor did not specify			
<b>Comments</b>	Up to 16 datasets in a single 10 1/2" rack	19.5 ms rapid poll; up to 16 datasets in a single 10 1/2 rack	16 units per rack	16 units per rack

Vendor	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.
<b>Product</b>	<b>DeskTop 208</b>	<b>DeskTop 596</b>	<b>DeskTop 9600</b>	<b>Desktop 9600RPA</b>
<b>Hardware Configuration Used With Microcomputers</b>	Standalone Yes, IBM PC family, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
<b>Hayes AT Command Set Compatible Compatibility</b>	No 208	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32, V.25bis async/sync	No V.29	No V.29
<b>Communications Facility</b>	Leased lines	Dial-up/leased	Leased lines	Leased lines
<b>Maximum Data Rate (bps) Fallback Speed (bps) Synchronization Transmission Mode Configuration Line Conditioning Modulation</b>	4800 Vendor did not specify Synchronous Half/full duplex Point-to-point, multipoint/drop None DPSK	9600 4800, 2400, 1200, 300 Async/sync Full duplex Point-to-point D1 Vendor did not specify	9600 7200, 4800 Async/sync Half/full duplex Point-to-point None QAM	9600 7200, 4800 Async/sync Vendor did not specify Point-to-point, multipoint None QAM
<b>Terminal Interface</b>	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
<b>Line Interface Setup Auto Answer/Dial Alternate Voice/Data Equalization</b>	Two-/four-wire Hardware only Yes Yes Automatic adaptive	Two-wire Hardware/software Yes Yes Automatic adaptive	Four-wire Hardware only No No Automatic adaptive	Four-wire Hardware only No No Automatic adaptive
<b>Protocol/Error Data Compression</b>	Vendor did not specify No	MNP, V.42, V.42bis, Trellis Yes	Vendor did not specify No	Vendor did not specify No
<b>Price/Availability Purchase (\$)</b>	1,095	1,075	1,095	1,595
<b>Date Of First Installation</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Comments</b>	Extensive diagnostics; simplified configuration; office enclosure	Extensive diagnostics; self test, digital/analog/remote digital loopback	Small desktop case	19.5m Sec. rapid poll
Vendor	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.
<b>Product</b>	<b>Diagnostic Modem NMS 4800</b>	<b>Diagnostic Modem NMS 9600</b>	<b>Diagnostic Modem NMS 9604A</b>	<b>Diagnostic Modem NMS 9644</b>
<b>Hardware Configuration Used With Microcomputers</b>	Standalone, rackmount Yes, NMC 30B laptop computer (MS/Dos based)	Standalone, rackmount Yes, NMC 30B laptop computer (MS/Dos based)	Standalone, rackmount Yes, NMC 30B laptop computer (MS/DOS-based)	Standalone, rackmount Yes, NMC 30B laptop computer (MS/DOS-based)
<b>Hayes AT Command Set Compatible Compatibility</b>	Vendor did not specify Bell 208	Vendor did not specify V.29	Vendor did not specify V.29	Vendor did not specify V.29
<b>Communications Facility</b>	Leased lines	Leased lines	Leased lines	Leased lines
<b>Maximum Data Rate (bps) Fallback Speed (bps) Synchronization Transmission Mode Configuration Line Conditioning Modulation</b>	4800 2400 Async/sync Full duplex Point-to-point, multipoint Vendor did not specify V.27 at 2400 bps	9600 7200, 4800 Async/sync Full duplex Point-to-point, multipoint None QAM	9600 7200, 4800 Async/sync Full duplex Point-to-point None QAM	9600 Vendor did not specify Async/sync Half/full duplex Point-to-point, multipoint None QAM
<b>Terminal Interface</b>	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
<b>Line Interface Setup Auto Answer/Dial Alternate Voice/Data Equalization</b>	Four-wire Software only Yes No Automatic adaptive, adjustable compromise ACE	Four-wire Software only Yes No Automatic adaptive, adjustable compromise ACE	Four-wire Software only Yes No Automatic adaptive, adjustable compromise ACE	Four-wire Software only Yes No Automatic adaptive, adjustable compromise ACE
<b>Protocol/Error Data Compression</b>	Vendor did not specify Vendor did not specify	Vendor did not specify Vendor did not specify	Vendor did not specify Vendor did not specify	Vendor did not specify Vendor did not specify
<b>Price/Availability Purchase (\$)</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Date Of First Installation</b>	March 1986	January 1986	April 1988	September 1988
<b>Comments</b>	Controlled/configured via GDC Netcon NMS; line & business int. measurements	Controlled/configured via GDC Netcon NMS; line & business int. measurements	Controlled/configured via GDC Netcon NMS; line & business int. measurements	Controlled/configured via GDC Netcon NMS; line & business int. measurements

Vendor	General DataComm, Inc.	Hayes Microcomputer Products, Inc.	Hayes Microcomputer Products, Inc.	Hayes Microcomputer Products, Inc.
<b>Product</b>	<b>Multiport 9600</b>	<b>Smartmodem 9600</b>	<b>V-Series Smartmodem 9600 X.25 or V.42</b>	<b>V-Series Smartmodem 9600B V.42/X.25</b>
<b>Hardware Configuration Used With Microcomputers</b>	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Plug in Yes, IBM PC family
<b>Hayes AT Command Set Compatible</b>	No V.29	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, Hayes 9600 *Ping Pong
<b>Communications Facility</b>	Leased lines	Dial-up/leased	Dial-up	Dial-up
<b>Maximum Data Rate (bps)</b>	9600	9600	9600	9600
<b>Fallback Speed (bps)</b>	7200, 4800	4800/2400/1200/300	4800/2400/1200/300	4800/2400/1200/300
<b>Synchronization</b>	Async/sync	Async/sync, Hayes AutoSync	Async/sync, Hgates AutoSync	Async/sync, Hayes AutoSync
<b>Transmission Mode</b>	Vendor did not specify	Full duplex	Half/full duplex	Half/full duplex
<b>Configuration</b>	Vendor did not specify	Point-to-point	Point-to-point, multipoint	Point-to-point, multipoint
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	QAM	FSK, QAM, Trellis coding, DPSK	FSK, QAM, Trellis coding, DPSK	FSK, QAM, Trellis coding, DPSK
<b>Terminal Interface</b>	RS-232-C, V.28, V.24	RS-232-C, V.24, PC Bus	RS-232-C, V.24	PC Bus
<b>Line Interface Setup</b>	Four-wire Hardware/software	Two-/four-wire Hardware/software	Two-wire Software only	Two-wire Software only
<b>Auto Answer/Dial</b>	No	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	No	Yes	Yes	Yes
<b>Equalization</b>	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	Vendor did not specify	Vendor did not specify	MNP, V.42, LAPB	MNP, V.42, LAPB
<b>Data Compression</b>	No	No	No	No
<b>Price/Availability</b>				
<b>Purchase (\$)</b>	2,495	1,999	999	779
<b>Date Of First Installation</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Comments</b>	Integral 4 channel mux	AutoSync switches from async to sync without a sync adapter	AutoSync switches from async to sync without a sync adapter	AutoSync switches from async to sync without a sync adapter

Vendor	Hayes Microcomputer Products, Inc.	Inmac	Inmac	Inmac
<b>Product</b>	<b>V-Series Ultra Smartmodem 9600</b>	<b>Clear Signal V.32 Modem 8042-8</b>	<b>Clear Signal V.32 Modem 8042-9</b>	<b>Standard V.32 Modem 804210</b>
<b>Hardware Configuration Used With Microcomputers</b>	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, IBM PC family, IBM PS/2	Rackmount Yes, IBM PC family, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
<b>Hayes AT Command Set Compatible</b>	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.32/23, Hayes 9600	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, CCITT V.32 2400 bps	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Vendor did not specify V.22, V.22 bis, AT&T 212/212A, V.32, V.34 test mode
<b>Communications Facility</b>	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	9600	9600	9600	9600
<b>Fallback Speed (bps)</b>	4800/2400/1200/300	4800, 2400, 1200, 300	300	1200
<b>Synchronization</b>	Async/sync, Hayes AutoSync	Async/sync	Async/sync	Async/sync
<b>Transmission Mode</b>	Full duplex	Half/full duplex	Half/full duplex	Full duplex
<b>Configuration</b>	Point-to-point, multipoint	Point-to-point	Point-to-point	Vendor did not specify
<b>Line Conditioning</b>	None	None	None	Vendor did not specify
<b>Modulation</b>	FSK, QAM, Trellis coding, DPSK	FSK, QAM, PSK	FSK, QAM, PSK	QAM, QPSK
<b>Terminal Interface</b>	RS-232-C, V.24	RS-232-C	RS-232-C	RS-232-C, V.24
<b>Line Interface Setup</b>	Two-wire Software only	Two-/four-wire Hardware/software	Two-/four-wire Hardware/software	Two-wire Software only
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	Yes	Yes	Yes	Yes
<b>Equalization</b>	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	MNP, V.24bis, LAPB	MNP	MNP	MNP
<b>Data Compression</b>	No	Yes	Yes	Yes
<b>Price/Availability</b>				
<b>Purchase (\$)</b>	1,199	1,295	1,265	795
<b>Date Of First Installation</b>	Vendor did not specify	January 1989	January 1989	January 1990
<b>Comments</b>	AutoSync switches from async to sync without a sync adapter	—	—	—

Vendor	Inmac	Memotec	Memotec	Microcom
<b>Product</b>	<b>Standard V.32 Modem 804220</b>	<b>DialAccess 296</b>	<b>V.32 Trellis</b>	<b>2400c</b>
<b>Hardware Configuration Used With Microcomputers</b>	Plug in Yes, IBM PC family	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
<b>Hayes AT Command Set Compatible Compatibility</b>	Yes V.22, AT&T 212/212A, V.32, V.34 test mode	Yes V.22, V.22 bis, AT&T 212/212A, V.32	Yes V.32	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
<b>Communications Facility</b>	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	9600	9600	9600	4800
<b>Fallback Speed (bps)</b>	1200	4800, 2400, 1200	4800	2400, 1200, 300
<b>Synchronization</b>	Async/sync	Async/sync	Async/sync	Asynchronous
<b>Transmission Mode</b>	Full duplex	Full duplex	Full duplex	Full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	QAM, QPSK	QAM, Trellis coding	QAM, Trellis coding	FSK, QAM, PSK, DPSK
<b>Terminal Interface</b>	RS-232-C, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C
<b>Line Interface Setup</b>	Two-wire Software only	Two-/four-wire Software only	Two-/four-wire Software only	Two-wire Hardware/software
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data Equalization</b>	Yes Automatic adaptive	Yes Automatic adaptive	Yes Automatic adaptive	Yes Automatic adaptive
<b>Protocol/Error Data Compression</b>	MNP Yes	MNP Yes	Vendor did not specify No	MNP Yes
<b>Price/Availability Purchase (\$)</b>	795	1,195	695 standalone/rackmount	599
<b>Date Of First Installation</b>	January 1990	1986	1986	Vendor did not specify
<b>Comments</b>	—	Off-the-shelf	Off-the-shelf	RJ45 - MI/MIC support; data compression; MNP 5; HP ENQ/ACK hardware support

Vendor	Microcom	MicroGate Corp.	MicroGate Corp.	MicroGate Corp.
<b>Product</b>	<b>24Ltc</b>	<b>SLAM/32</b>	<b>SyncLink 4822</b>	<b>SyncLink 4824</b>
<b>Hardware Configuration Used With Microcomputers</b>	Plug in Yes, Zenith, Compaq, NEC, Toshiba laptops	Plug in Yes, IBM PS/2	Plug in Yes, IBM PC family	Plug in Yes, IBM PC family
<b>Hayes AT Command Set Compatible Compatibility</b>	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Vendor did not specify CCITT V.32	Vendor did not specify V.22, V.22 bis, Bell 201,208,212A,103	No Bell AT&T 201 & 208
<b>Communications Facility</b>	Dial-up/leased	Dial-up, dial-up/leased, leased lines	Dial-up, dial-up/leased, leased lines	Dial-up, dial-up/leased, leased lines
<b>Maximum Data Rate (bps)</b>	4800	9600	4800	4800
<b>Fallback Speed (bps)</b>	2400, 1200, 300	Vendor did not specify	2400, 1200, 300	2400
<b>Synchronization</b>	Asynchronous	Synchronous	Async/sync	Synchronous
<b>Transmission Mode</b>	Full duplex	Full duplex	Half/full duplex	Half/full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Vendor did not specify	Vendor did not specify
<b>Line Conditioning</b>	None	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Modulation</b>	FSK, QAM, PSK, DPSK	Trellis coding	PSK, DPSK	DPSK
<b>Terminal Interface</b>	PC Bus	PS/2 Micro Channel	PC Bus	PC Bus
<b>Line Interface Setup</b>	Two-wire Software only	Two-wire Software only	Two-/four-wire Vendor did not specify	Two-/four-wire Hardware/software
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data Equalization</b>	No Automatic adaptive	Yes Automatic adaptive	Vendor did not specify Automatic adaptive	Vendor did not specify Automatic adaptive
<b>Protocol/Error Data Compression</b>	MNP Yes	CRC Vendor did not specify	CRC Vendor did not specify	CRC Vendor did not specify
<b>Price/Availability Purchase (\$)</b>	599	1,595	1,175	1,040
<b>Date Of First Installation</b>	Vendor did not specify	New product	New product	New product
<b>Comments</b>	Data compression; MNP 5	Card; half-size compatible with IBM multiprotocol adapter/A	Runs Microgate sync. software and 3rd party async. software.	Runs Microgate sync software, including 3780 and 3270 emulation

Vendor	MicroGate Corp.	Mitsuba Corp.	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.
<b>Product</b>	SyncLink 4824/2	SM-96M	MT224EH7	MT224EM7
<b>Hardware Configuration Used With Microcomputers</b>	Plug in Yes, IBM PS/2, with Micro Channel Architecture	Standalone Yes, IBM PC family, IBM PS/2	Standalone Yes, Apple Macintosh, IBM PC family, IBM PS/2, any computer with RS-232 interface	Standalone Yes, Apple Macintosh
<b>Hayes AT Command Set Compatible Compatibility</b>	Vendor did not specify Vendor did not specify	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.25bis, V.42	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.42
<b>Communications Facility</b>	Dial-up, dial-up/leased, leased lines	Dial-up	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	4800	9600	7200 with data compression	7200 with data compression
<b>Fallback Speed (bps)</b>	2400	4800, 2400, 1200, 300	2400	2400
<b>Synchronization</b>	Synchronous	Async/sync	Async/sync	Async/sync
<b>Transmission Mode</b>	Half/full duplex	Half/full duplex	Full duplex	Half/full duplex
<b>Configuration</b>	Vendor did not specify	Vendor did not specify	Point-to-point	Point-to-point
<b>Line Conditioning</b>	Vendor did not specify	Vendor did not specify	None	None
<b>Modulation</b>	Vendor did not specify	FSK, QAM, Trellis coding, DPSK	FSK, QAM, PSK	FSK, QAM, PSK
<b>Terminal Interface</b>	PS/2 Micro Channel	RS-232-C	RS-232-C	RS-232-C, & RS-422
<b>Line Interface Setup</b>	Two-/four-wire Hardware/software	Two-/four-wire Software only	Two-wire Hardware/software	Two-wire Hardware/software
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data Equalization</b>	Vendor did not specify Automatic adaptive	Yes Automatic adaptive	Yes Automatic adaptive	Yes Automatic adaptive
<b>Protocol/Error Data Compression</b>	CRC Vendor did not specify	MNP Yes	X/Ymodem, MNP, Kermit Yes	X/Ymodem, MNP, Kermit Yes
<b>Price/Availability Purchase (\$)</b>	1,085	Contact vendor	649	649
<b>Date Of First Installation</b>	New product	Vendor did not specify	May 1989	Vendor did not specify
<b>Comments</b>	Runs Microgate sync software including 3760 and 3270 emulation	—	Also supports remote configuration	MNP levels 5 and 7; V.25bis dialing and remote configuration

Vendor	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.
<b>Product</b>	MT932ER	MultiModem 696E	MultiModem V.29	MultiModem V.32
<b>Hardware Configuration Used With Microcomputers</b>	Rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
<b>Hayes AT Command Set Compatible Compatibility</b>	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.32/V.23	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes V.29, V.27	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.32/V.23
<b>Communications Facility</b>	Dial-up/leased	Dial-up/leased	Leased lines	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	9600	9600	9600	9600
<b>Fallback Speed (bps)</b>	4800	Not applicable	Not applicable	4800
<b>Synchronization</b>	Async/sync	Async/sync	Async/sync	Async/sync
<b>Transmission Mode</b>	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	FSK, QAM, PSK, TCM	FSK, QAM, PSK	FSK, QAM, PSK	FSK, QAM, PSK, TCM
<b>Terminal Interface</b>	RS-232-C	RS-232-C	RS-232-C	RS-232-C
<b>Line Interface Setup</b>	Two-wire Hardware only	Two-wire Hardware only	Four-wire Hardware only	Two-wire Hardware only
<b>Auto Answer/Dial</b>	Yes	Yes	No	Yes
<b>Alternate Voice/Data Equalization</b>	No Automatic adaptive	No Automatic adaptive	No Automatic adaptive	No Automatic adaptive
<b>Protocol/Error Data Compression</b>	MNP Yes	MNP Yes	Vendor did not specify No	MNP Yes
<b>Price/Availability Purchase (\$)</b>	1,050	795	1,395	1,195
<b>Date Of First Installation</b>	January 1989	1988	1987	1988
<b>Comments</b>	—	Data compression; MNP 6	—	Data compression; MNP Class 5

Vendor	NEC America, Inc.	NEC America, Inc.	NEC America, Inc.	NEC America, Inc.
Product	DSP4800III	DSP4800RIII	DSP9600 MII	DSP9600III
Hardware Configuration Used With Microcomputers	Standalone, rackmount Yes, IBM PC family	Standalone, rackmount Yes, IBM PC family	Standalone Yes, IBM PC family	Standalone, rackmount Yes, IBM PC family
Hayes AT Command Set Compatible Compatibility	No V.27	No Vendor did not specify	No V.29	No V.29
Communications Facility	Leased lines	Leased lines	Leased lines	Leased lines
Maximum Data Rate (bps)	4800	4800	9600	9600
Fallback Speed (bps)	2400	2400	4800, 7200	4800, 7200
Synchronization	Synchronous	Synchronous	Synchronous	Synchronous
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point, multipoint	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	PSK	PSK	QAM	QAM
Terminal Interface	RS-232-C, V.28	RS-232-C, V.28, V.24	RS-232-C, V.28	RS-232-C, V.28
Line Interface Setup	Two-/four-wire Hardware only	Two-/four-wire Hardware only	Two-/four-wire Hardware only	Two-/four-wire Hardware only
Auto Answer/Dial	No	No	No	No
Alternate Voice/Data	No	No	No	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability Purchase (\$)	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	—	—	—
Vendor	NEC America, Inc.	NEC America, Inc.	NEC America, Inc.	NEC America, Inc.
Product	DSP9600RC	DSP9600RIII	DSP9601	DSP9630
Hardware Configuration Used With Microcomputers	Standalone, rackmount Yes, IBM PC family	Standalone Yes, IBM PC family	Rackmount Yes, IBM PC family	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all serial ports
Hayes AT Command Set Compatible Compatibility	Vendor did not specify Vendor did not specify	No Vendor did not specify	No V.29	Yes V.32
Communications Facility	Leased lines	Leased lines	Leased lines	Dial-up/leased
Maximum Data Rate (bps)	9600	9600	9600	9600
Fallback Speed (bps)	2400, 4800, 7200	7200, 4800	4800, 7200	4800
Synchronization	Synchronous	Synchronous	Synchronous	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Vendor did not specify
Configuration	Point-to-point	Point-to-point, multipoint	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	QAM	QAM	QAM	Trellis coding
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28	RS-232-C, V.28, V.24
Line Interface Setup	Two-/four-wire Hardware only	Two-/four-wire Hardware only	Two-/four-wire Hardware only	Two-/four-wire Hardware/software
Auto Answer/Dial	No	No	No	Yes
Alternate Voice/Data	No	No	No	Yes
Equalization	Fixed compromise	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Trellis encoding
Data Compression	No	No	No	No
Price/Availability Purchase (\$)	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	—	—	—

Vendor	NEC America, Inc.	NEC America, Inc.	NEC America, Inc.	NEC America, Inc.
<b>Product</b>	<b>N4810II</b>	<b>N4811</b>	<b>N9631</b>	<b>N9635</b>
<b>Hardware Configuration</b> Used With Microcomputers	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any serial device	Rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any serial device	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all serial ports	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all serial ports
Hayes AT Command Set Compatible Compatibility	No AT&T 208	No AT&T 208	Yes AT&T 103/113, V.22 bis, AT&T 212/212A, V.32	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32
<b>Communications Facility</b>	Dial-up/leased	Dial-up/leased	Dial-up/leased	Leased lines
<b>Maximum Data Rate (bps)</b> <b>Fallback Speed (bps)</b> <b>Synchronization</b> <b>Transmission Mode</b> <b>Configuration</b> <b>Line Conditioning</b> <b>Modulation</b>	4800 Vendor did not specify Synchronous Half/full duplex Point-to-point Vendor did not specify PSK	4800 Vendor did not specify Synchronous Vendor did not specify Point-to-point None PSK	9600 300, 1200, 2400, 4800 Async/sync Vendor did not specify Point-to-point None Trellis coding	9600 300, 1200, 2400, 4800 Async/sync Vendor did not specify Point-to-point None Trellis coding
<b>Terminal Interface</b>	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
<b>Line Interface</b> <b>Setup</b> <b>Auto Answer/Dial</b> <b>Alternate Voice/Data</b> <b>Equalization</b>	Two-/four-wire Hardware only Yes No Automatic adaptive	Two-wire Hardware only Yes No Automatic adaptive	Two-wire Hardware/software Yes Yes Automatic adaptive	Two-wire Hardware/software Yes Yes Automatic adaptive
<b>Protocol/Error</b> <b>Data Compression</b>	Vendor did not specify No	Vendor did not specify No	MNP No	MNP Yes
<b>Price/Availability</b> Purchase (\$)	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Comments</b>	—	—	—	—

Vendor	NEC America, Inc.	NEC America, Inc.	NEC America, Inc.	Network Software Associates, Inc.
<b>Product</b>	<b>SPN4800</b>	<b>SPN9600</b>	<b>SPN9600M</b>	<b>AdaptModem 4800</b>
<b>Hardware Configuration</b> Used With Microcomputers	Standalone, rackmount Yes, IBM PC family	Standalone, rackmount Yes, IBM PC family	Standalone Yes, IBM PC family	Plug in Yes, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible Compatibility	No Vendor did not specify	No Vendor did not specify	No Vendor did not specify	No Bell 208A/B
<b>Communications Facility</b>	Leased lines	Leased lines	Leased lines	Dial-up/leased
<b>Maximum Data Rate (bps)</b> <b>Fallback Speed (bps)</b> <b>Synchronization</b> <b>Transmission Mode</b> <b>Configuration</b> <b>Line Conditioning</b> <b>Modulation</b>	4800 2400 Synchronous Half/full duplex Point-to-point, multipoint None DPSK	9600 7200, 4800, 2400 Synchronous Half/full duplex Point-to-point, multipoint None QAM	9600 7200, 4800, 2400 Synchronous Half/full duplex Point-to-point None QAM	4800 Vendor did not specify Synchronous Half/full duplex Point-to-point, multipoint None PSK
<b>Terminal Interface</b>	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	PC Bus, PS/2 Micro Channel
<b>Line Interface</b> <b>Setup</b> <b>Auto Answer/Dial</b> <b>Alternate Voice/Data</b> <b>Equalization</b>	Four-wire Software only No No Fixed compromise	Four-wire Software only No No Fixed compromise	Four-wire Software only No No Fixed compromise	Two-/four-wire Hardware only Yes No Fixed compromise
<b>Protocol/Error</b> <b>Data Compression</b>	Vendor did not specify No	Vendor did not specify No	Vendor did not specify No	Vendor did not specify No
<b>Price/Availability</b> Purchase (\$)	Contact vendor	Contact vendor	Contact vendor	1,140
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Comments</b>	—	—	—	—

Vendor	Network Software Associates, Inc.	Network Software Associates, Inc.	Optocom Systems, Inc.	Optocom Systems, Inc.
<b>Product</b>	<b>AdaptModem V.32</b>	<b>AdaptModem2 4800</b>	<b>OSI8196</b>	<b>OSI8596</b>
<b>Hardware Configuration Used With Microcomputers</b>	Plug in Yes, IBM PC family, IBM PS/2	Plug in Yes, IBM PC family, IBM PS/2	Standalone Yes, IBM PC family, IBM PS/2, also compatible with any V.24	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any RS-232C, V.24
<b>Hayes AT Command Set Compatible</b>	Yes CCITT V.32	No Bell 208A/B	Yes AT&T 103/113, 212/212A, V.22, V.22bis, V.21, V.23, V.29, V.33, V.32	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.32, V.23, V.26bis
<b>Communications Facility</b>	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	9600	4800	9600	4800
<b>Fallback Speed (bps)</b>	Vendor did not specify	Vendor did not specify	2400, 2400, 1200, 300	1200, 300
<b>Synchronization</b>	Async/sync	Synchronous	Async/sync	Async/sync
<b>Transmission Mode</b>	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
<b>Configuration</b>	Point-to-point, multipoint	Point-to-point, multipoint	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	QAM	PSK	FSK, QAM, PSK, Trellis coding, DPSK	FSK, PSK, Trellis coding, DPSK
<b>Terminal Interface</b>	PC Bus	PC Bus, PS/2 Micro Channel	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
<b>Line Interface Setup</b>	Two-/four-wire Hardware only	Two-/four-wire Hardware only	Two-wire Software only	Two-wire Software only
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	No	No	Yes	Yes
<b>Equalization</b>	Automatic adaptive	Fixed compromise	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	Vendor did not specify	Vendor did not specify	MNP, V.42	MNP, V.42/V.42bis
<b>Data Compression</b>	No	No	Yes	Vendor did not specify
<b>Price/Availability</b>				
<b>Purchase (\$)</b>	1,295	1,140	Contact vendor	Contact vendor
<b>Date Of First Installation</b>	Vendor did not specify	Vendor did not specify	December 1988	Vendor did not specify
<b>Comments</b>	—	—	Automatic rate detection and constant speed; terminal interface	Compatible with NMS OSI 810/821/821E/821N/830
Vendor	Okidata Corp.	Okidata Corp.	Okidata Corp.	Okidata Corp.
<b>Product</b>	<b>CLP 9600</b>	<b>CLX 96</b>	<b>CLX 96DP</b>	<b>CLX 96M</b>
<b>Hardware Configuration Used With Microcomputers</b>	Standalone Yes, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, Apple Macintosh, IBM PC family, IBM PS/2, all serial parts	Standalone Yes, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, Apple Macintosh, IBM PC family, IBM PS/2, all serial parts
<b>Hayes AT Command Set Compatible</b>	No V.29	No V.29	No V.29	No V.29
<b>Communications Facility</b>	Dial-up/leased	Leased lines	Leased lines	Leased lines
<b>Maximum Data Rate (bps)</b>	9600	9600	9600	9600
<b>Fallback Speed (bps)</b>	7200, 4800	7200, 4800	7200, 4800	7200, 4800
<b>Synchronization</b>	Synchronous	Synchronous	Synchronous	Synchronous
<b>Transmission Mode</b>	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	QAM	QAM	QAM	QAM
<b>Terminal Interface</b>	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
<b>Line Interface Setup</b>	Two-/four-wire Hardware only	Four-wire Hardware only	Two-/four-wire Hardware only	Four-wire Hardware only
<b>Auto Answer/Dial</b>	Yes	No	Yes	No
<b>Alternate Voice/Data</b>	No	No	Yes	No
<b>Equalization</b>	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Data Compression</b>	No	No	No	No
<b>Price/Availability</b>				
<b>Purchase (\$)</b>	Contact vendor	995	1,395	1,495
<b>Date Of First Installation</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Comments</b>	Menu driven LCD display, autodial backup, remote configuration	—	—	4 port TDM

Vendor	Omnitel, Inc.	Omnitel, Inc.	Penril DataCom	Penril DataCom
<b>Product</b>	<b>Encore 9632BT</b>	<b>Encore 9632SDT</b>	<b>Alliance 9600 FT</b>	<b>Alliance V.32</b>
<b>Hardware Configuration Used With Microcomputers</b>	Plug in Yes, IBM PC family	Standalone Yes, IBM PC family	Standalone, rackmount Yes, IBM PC family, IBM PS/2, any with RS-232-C interface	Standalone, rackmount Yes, IBM PC family, IBM PS/2, any with RS-232-C interface
<b>Hayes AT Command Set Compatible Compatibility</b>	Yes V.22, V.22 bis, AT&T 212/212A, V.21, V.32	Vendor did not specify V.22, V.22 bis, AT&T 212/212A, V.21, V.32	No V.29, V.27 bis/ter	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32
<b>Communications Facility</b>	Dial-up	Dial-up	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps) Fallback Speed (bps) Synchronization Transmission Mode Configuration Line Conditioning Modulation</b>	9600 4800, 2400, 1200 Async/sync Half/full duplex Point-to-point None QAM, Trellis coding	9600 4800, 2400, 1200 Async/sync Half/full duplex Point-to-point None QAM, Trellis coding	9600 7200, 4800, 2400 Synchronous Half/full duplex Point-to-point, multipoint None QAM	9600 4800, 2400, 1200, 300 Async/sync Half/full duplex Point-to-point None FSK, QAM, PSK
<b>Terminal Interface</b>	PC Bus	PC Bus	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
<b>Line Interface Setup Auto Answer/Dial Alternate Voice/Data Equalization</b>	Two-/four-wire Hardware/software Yes Yes Vendor did not specify	Four-wire Hardware only Yes Yes Vendor did not specify	Two-/four-wire Hardware only Yes No Automatic adaptive	Two-/four-wire Hardware/software Yes Yes Automatic adaptive
<b>Protocol/Error Data Compression</b>	MNP Yes	MNP Yes	Vendor did not specify No	MNP Yes
<b>Price/Availability Purchase (\$)</b>	895	995	1,295 (SA), 1,265 (RM)	1,295 (SA), 1,265 (RM)
<b>Date Of First Installation</b>	November 1988	November 1987	Vendor did not specify	Vendor did not specify
<b>Comments</b>	19.2K bps with data compression	19.2K bps with data compression	—	—

Vendor	Penril DataCom	Penril DataCom	Penril DataCom	Racal-Milgo
<b>Product</b>	<b>Datalink 4800</b>	<b>Datalink 9600</b>	<b>Datalink 9600FT</b>	<b>Omnimode 48</b>
<b>Hardware Configuration Used With Microcomputers</b>	Standalone, rackmount Yes, IBM PC family, IBM PS/2, all with RS-232-C interface	Standalone, rackmount Yes, IBM PC family, IBM PS/2, all with RS-232-C interface	Standalone, rackmount Yes, IBM PC family, IBM PS/2, all with RS-232-C interface	Standalone, plug in, rack Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all
<b>Hayes AT Command Set Compatible Compatibility</b>	Yes Bell 208 A/B V.27 bis/ter	No V.29, V.27 bis/ter	No V.29, V.27 bis/ter	No V.27 bis/ter
<b>Communications Facility</b>	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps) Fallback Speed (bps) Synchronization Transmission Mode Configuration Line Conditioning Modulation</b>	4800 2400 Async/sync Half/full duplex Point-to-point, multipoint None, C1; C2 DPSK	9600 7200, 4800, 2400 Async/sync, <sup>1</sup> Half/full duplex Point-to-point, multipoint None, C1; C2 QAM	9600 7200, 4800, 2400 Async/sync Half/full duplex Point-to-point, multipoint None QAM	4800 2400 Async/sync Half/full duplex Point-to-point, multipoint None DPSK
<b>Terminal Interface</b>	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
<b>Line Interface Setup Auto Answer/Dial Alternate Voice/Data Equalization</b>	Two-/four-wire Hardware only Yes No Fixed compromise, automatic adaptive	Two-/four-wire Hardware only Yes No Fixed compromise, automatic adaptive	Two-/four-wire Hardware only Yes No Fixed compromise, automatic adaptive	Two-/four-wire Software only Yes No Automatic adaptive
<b>Protocol/Error Data Compression</b>	MNP Yes	MNP No	MNP No	Vendor did not specify No
<b>Price/Availability Purchase (\$)</b>	1,295 stand alone/1,265 rackmount	1,795	1,995	1,770
<b>Date Of First Installation</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	1982
<b>Comments</b>	—	—	—	—

Vendor	Racal-Milgo	Racal-Milgo	Racal-Milgo	Racal-Milgo
Product	Omnimode 96	RM-4827	RM-4891	RM-9629
Hardware Configuration Used With Microcomputers	Standalone, plug in, rack Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all	Rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all	Rackmount Yes	Standalone, plug in, rack Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all
Hayes AT Command Set Compatible Compatibility	No V.29	No V.27	No Bell 208 CCITT V.27bis/ter	No V.29
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Leased lines
Maximum Data Rate (bps)	9600	4800	4800	9600
Fallback Speed (bps)	7200, 4800	2400	2400	7200, 4800
Synchronization	Async/sync	Async/sync	Synchronous	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point, multipoint	Point-to-point, multipoint	Point-to-point, multipoint	Point-to-point, multipoint
Line Conditioning	None	None	None	None
Modulation	DPSK	DPSK	QAM	DPSK
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C, V.28, RS-449, V.24	RS-232-C	RS-232-C, V.28, RS-449, V.24
Line Interface Setup	Four-wire Software only	Two-/four-wire Software only	Two-/four-wire Hardware/software	Four-wire Software only
Auto Answer/Dial	Yes	Yes	Yes	No
Alternate Voice/Data	No	No	No	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error Data Compression	Vendor did not specify No	Vendor did not specify No	Vendor did not specify No	Vendor did not specify No
Price/Availability Purchase (\$)	3,250	1,250	1,395	1,850
Date Of First Installation	1983	1987	Vendor did not specify	1987
Comments	—	—	—	—

Vendor	Racal-Milgo	Racal-Milgo	Racal-Vadic, Inc.	Racal-Vadic, Inc.
Product	RMD 3221	RMD 4850	2400LC	2450PX
Hardware Configuration Used With Microcomputers	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port
Hayes AT Command Set Compatible Compatibility	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32	No V.27ter, Bell 208B	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	No Bell 201/BC
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up	Dial-up/leased
Maximum Data Rate (bps)	9600	4800	2400	2400
Fallback Speed (bps)	4800	2400	1200, 0-300	1200
Synchronization	Async/sync	Synchronous	Async/sync	Synchronous
Transmission Mode	Full duplex	Vendor did not specify	Full duplex	Half duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, PSK, Trellis coding, DPSK	PSK	FSK, QAM, PSK	PSK
Terminal Interface	RS-232-C, V.28	RS-232-C	RS-232-D	RS-232-D
Line Interface Setup	Two-wire Software only	Two-wire Hardware/software	Two-wire Hardware/software	Two-/four-wire Hardware only
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Coherent detection
Protocol/Error Data Compression	MNP Vendor did not specify	Vendor did not specify Vendor did not specify	MNP No	Vendor did not specify No
Price/Availability Purchase (\$)	1,195	1,295	395	725
Date Of First Installation	February 1989	Vendor did not specify	May 1989	November 1980
Comments	—	Supports S.A.D.L	Auto answer but no auto dial	Auto answer but no auto dial

Vendor	Racal-Vadic, Inc.	Racal-Vadic, Inc.	Racal-Vadic, Inc.	Racal-Vadic, Inc.
<b>Product</b>	<b>4840PX</b>	<b>4850PA</b>	<b>4891</b>	<b>9600VP</b>
<b>Hardware Configuration</b> Used With Microcomputers	Rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port	Standalone Yes, IBM PC family, IBM PS/2, PC needs sync card + software	Rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port
Hayes AT Command Set Compatible	No	No	No	Yes
Compatibility	Bell 208 A/B	V.27 ter, 208B	Bell 208, CCITT V.27	AT&T 103/113, AT&T 212/212A, V.29
<b>Communications Facility</b>	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	4800	4800	4800	9600
<b>Fallback Speed (bps)</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	1200, 0-300
<b>Synchronization</b>	Synchronous	Synchronous	Synchronous	Async/sync
<b>Transmission Mode</b>	Half duplex	Half duplex	Half duplex	Half/full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	PSK	QAM	QAM	FSK, QAM, PSK
<b>Terminal Interface</b>	RS-232-D	RS-232-D	RS-232-D	RS-232-D
<b>Line Interface</b>	Two-/four-wire	Two-wire	Two-/four-wire	Two-wire
<b>Setup</b>	Hardware only	Hardware/software	Software only	Hardware/software
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	No	Yes	No	Yes
<b>Equalization</b>	Coherent detection	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Proprietary
<b>Data Compression</b>	No	No	No	Yes
<b>Price/Availability</b>				
Purchase (\$)	1,200	1,295	1,295	995
<b>Date Of First Installation</b>	April 1983	May 1986	May 1986	November 1988
<b>Comments</b>	Auto answer but no auto dial	—	—	—

Vendor	Racal-Vadic, Inc.	Racal-Vadic, Inc.	Racal-Vadic, Inc.	Racal-Vadic, Inc.
<b>Product</b>	<b>9624E</b>	<b>9632</b>	<b>9632B</b>	<b>9632VP</b>
<b>Hardware Configuration</b> Used With Microcomputers	Rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any PC with a serial port	Rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port
Hayes AT Command Set Compatible	Vendor did not specify	Yes	Yes	Vendor did not specify
Compatibility	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32	AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32
<b>Communications Facility</b>	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	9600	9600	9600	9600
<b>Fallback Speed (bps)</b>	4800, 2400, 1200, 300	4800, 2400, 1200, 300	Vendor did not specify	4800, 2400, 1200, 300
<b>Synchronization</b>	Async/sync	Async/sync	Async/sync	Async/sync
<b>Transmission Mode</b>	Full duplex	Half/full duplex	Full duplex	Full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	FSK, QAM, PSK, Trellis coding	FSK, QAM, PSK, Trellis coding	FSK, QAM, PSK, Trellis coding	FSK, QAM, PSK, Trellis coding
<b>Terminal Interface</b>	RS-232-D	RS-232-D	RS-232-D	RS-232-D
<b>Line Interface</b>	Two-/four-wire	Two-/four-wire	Two-/four-wire	Two-wire
<b>Setup</b>	Hardware/software	Hardware/software	Hardware/software	Hardware/software
<b>Auto Answer/Dial</b>	Vendor did not specify	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	Yes	Yes	Yes	Yes
<b>Equalization</b>	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	MNP	MNP	MNP	MNP
<b>Data Compression</b>	Yes	Yes	Yes	Yes
<b>Price/Availability</b>				
Purchase (\$)	1,195	1,595	1,695	1,195
<b>Date Of First Installation</b>	August 1989	September 1989	November 1989	April 1989
<b>Comments</b>	—	—	—	—

Vendor	Racal-Vadic, Inc.	Racal-Vadic, Inc.	Rohm Corp.	Rohm Corp.
Product	9650PA	VA9612	BP 4521	BP 4541
Hardware Configuration Used With Microcomputers	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, PC needs a sync card & software	Rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, any computer with a serial port	Plug in Yes, IBM PC family	Plug in Yes, IBM PC family
Hayes AT Command Set Compatible Compatibility	No V.29, V.27 ter	Yes AT&T 103/113, V.22, V.29	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	9600	9600	9600	9600
Fallback Speed (bps)	7200, 4800	2400 to 300	2400, 1200, 300	4800, 300
Synchronization	Synchronous	Async/sync	Async/sync	Async/sync
Transmission Mode	Half duplex	Half/full duplex	Half/full duplex	Half duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	QAM	FSK, QAM, PSK	FSK, QAM, PSK, DPSK	FSK, QAM, PSK, DPSK
Terminal Interface	RS-232-D	RS-232-D	RS-232-C, RS-232C on TTL Levels	RS-232-C, RS-232C on TTL Levels (14 Pins)
Line Interface Setup	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Hardware/software	Two-four-wire Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	No	No
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Vendor did not specify	MNP-like proprietary	MNP	MNP
Data Compression	No	Yes	Yes	Yes
Price/Availability Purchase (\$)	Contact vendor	995	179-quantity discounts available June 1989	250-quantity discounts available July 1989
Date Of First Installation	April 1987	June 1987	June 1989	July 1989
Comments	Supports S.A.D.L.	Service available at Flat Rate or Emergency exchange	No DAA on board, EEPROM for phone # + configuration saving on board	DAA on board, anti-tapping capability; EEPROM on board
Vendor	Spectrum Cellular	Telec Systems Corp.	Telebit Corporation	Telenetics Corp.
Product	The Bridge	2496	T1000	TC921-96
Hardware Configuration Used With Microcomputers	Standalone, plug in, rack Yes, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount, PC Yes, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family
Hayes AT Command Set Compatible Compatibility	Yes AT&T 103/113, V.22 bis, AT&T 212/212A, V.42,V.42bis, SPCL	Yes AT&T 103/113, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.33, V.32
Communications Facility	Dial-up, cellular telephone network	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	9600	9600	9600	9600
Fallback Speed (bps)	2400, 1200, 300	4800/2400/1200/300	In steps of 100 bps	4800/2400/1200/300
Synchronization	Async/sync, AutoSync	Asynchronous	Asynchronous	Async/sync
Transmission Mode	Full duplex	Full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, PSK, DPSK	Vendor did not specify	FSK, QAM, DPSK, DAMQAM	FSK, QAM, PSK, Trellis coding
Terminal Interface	RS-232-C, PC Bus	RS-232-C	RS-232-C	RS-232-C, V.24
Line Interface Setup	Two-four-wire Software only	Two-wire Hardware/software	Two-wire Software only	Two-four-wire Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	No	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	T 7TAP adaptive	Fixed compromise
Protocol/Error	Proprietary, V.42	Proprietary, MNP	Proprietary, MNP	MNP
Data Compression	Yes	Yes	No	Vendor did not specify
Price/Availability Purchase (\$)	795	895	745-795	995 (2 weeks ARO)
Date Of First Installation	Vendor did not specify	1986	September 1988	June 1988
Comments	Patented technology; can be used over cellular or land lines	3 year warranty; DES encryption option - \$100	Protocol support for UNIX, UUCP, Kermit, Xmodem, and Ymodem	5-year warranty; return to factory; Internal X.25 PAD is optional

Vendor	TIL Systems, Inc.	TIL Systems, Inc.	TIL Systems, Inc.	TIL Systems, Inc.
Product	EM1900	EM2400	EM9600	EM9610
<b>Hardware Configuration Used With Microcomputers</b>	Standalone, plug in, rack Yes, IBM PC family, IBM PS/2	Standalone, plug in, rack Yes, IBM PC family, IBM PS/2	Standalone Yes, IBM PC family, IBM PS/2	Standalone Yes, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible Compatibility	Yes AT&T 103/113, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.32	Yes AT&T 103/113, V.32
<b>Communications Facility</b>	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	56K	56K	9600	9600
<b>Fallback Speed (bps)</b>	9600, 4800, 1200, 300	9600, 4800, 1200, 300	4800, 2400, 1200	4800, 2400, 1200
<b>Synchronization</b>	Async/sync	Async/sync	Async/sync	Async/sync
<b>Transmission Mode</b>	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Modulation</b>	FSK	FSK	FSK	FSK
<b>Terminal Interface</b>	RS-232-C, PC Bus	RS-232-C, PC Bus	RS-232-C	RS-232-C
<b>Line Interface Setup</b>	Two-/four-wire Hardware/software	Two-/four-wire Hardware/software	Two-/four-wire Hardware/software	Two-/four-wire Hardware/software
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data Equalization</b>	Yes Automatic adaptive	Yes Automatic adaptive	Yes Automatic adaptive	Yes Automatic adaptive
<b>Protocol/Error Data Compression</b>	X.25 No	X.25 No	X.25 No	X.25 No
<b>Price/Availability Purchase (\$)</b>	1,945	345	1,795	1,945
<b>Date Of First Installation</b>	June 1987	June 1987	1987	1987
<b>Comments</b>	—	—	—	—

Vendor	Universal Data Systems	Universal Data Systems	Universal Data Systems	Universal Data Systems
Product	9648T	FasTalk V.32/5	FasTalk V.32/5 PC	Sync Up 208A/B
<b>Hardware Configuration Used With Microcomputers</b>	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, IBM PC family, IBM PS/2	Plug in Yes, IBM PC family, IBM PS/2	Plug in Yes, IBM PC family
Hayes AT Command Set Compatible Compatibility	Yes V.29, Bell 208, 9600 Trellis	Yes Vendor did not specify	Yes Vendor did not specify	Vendor did not specify 208 A/B
<b>Communications Facility</b>	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up, dial-up/leased, leased lines
<b>Maximum Data Rate (bps)</b>	9600	9600	9600	4800
<b>Fallback Speed (bps)</b>	7200, 4800	300 to 9600	300 - 9600	None
<b>Synchronization</b>	Async/sync	Async/sync	Asynchronous	Synchronous
<b>Transmission Mode</b>	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
<b>Configuration</b>	Point-to-point, multipoint	Vendor did not specify	Vendor did not specify	Point-to-point, multipoint
<b>Line Conditioning</b>	None	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Modulation</b>	QAM, Trellis coding	QAM	QAM	DPSK
<b>Terminal Interface</b>	V.24, EIA-232-D	Vendor did not specify	Vendor did not specify	PC Bus
<b>Line Interface Setup</b>	Two-/four-wire Software only	Two-wire Hardware only	Two-wire Hardware only	Two-/four-wire Hardware/software
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data Equalization</b>	Yes Automatic adaptive	No Automatic adaptive	No Automatic adaptive	Yes Automatic adaptive
<b>Protocol/Error Data Compression</b>	Vendor did not specify No	MNP No	MNP No	Vendor did not specify No
<b>Price/Availability Purchase (\$)</b>	1,695	995	995	1,295
<b>Date Of First Installation</b>	1988	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Comments</b>	—	—	—	—

Vendor	Universal Data Systems	Universal Data Systems	Universal Data Systems	Universal Data Systems
Product	Sync-Up 2/208/201	Sync-Up 2/V.32	Sync-Up T9628B	Sync-Up V.32
Hardware Configuration Used With Microcomputers	Plug in Yes, IBM PS/2	Plug in Yes, IBM PS/2	Plug in Yes, IBM PC family, PS2-Model 25,30	Plug in Yes, IBM PC family, PS2-Model 25,30
Hayes AT Command Set Compatible	No AT&T 208/201	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, CCITT V.32	No Bell 208	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, CCITT V.32
Communications Facility	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
Maximum Data Rate (bps)	4800	9600	9600	9600
Fallback Speed (bps)	2400	4800, 2400, 1200, 300	7200, 4800	4800, 2400, 1200, 300
Synchronization	Synchronous	Async/sync	Synchronous	Async/sync
Transmission Mode	Half/full duplex	Half/full duplex	Vendor did not specify	Half/full duplex
Configuration	Point-to-point, multipoint	Point-to-point	Point-to-point, multipoint	Point-to-point
Line Conditioning	None	None	None	None
Modulation	DPSK	FSK, QAM, Trellis coding	QAM, Trellis coding	FSK, QAM, Trellis coding
Terminal Interface	PS/2 Micro Channel	PS/2 Micro Channel	PC Bus	PC Bus
Line Interface Setup	Two-/four-wire Software only	Two-/four-wire Software only	Two-wire Hardware/software	Two-/four-wire Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Fixed compromise	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	Provided in sync protocol	Vendor did not specify	Software Protocol SNA,BSC	MNP
Data Compression	No	No	No	Yes
Price/Availability				
Purchase (\$)	1,140	1,295	1,540	1,295
Date Of First Installation	Vendor did not specify	November 1988	March 1988	June 1988
Comments	—	—	—	—
Vendor	U.S. Robotics, Inc.	Western DataCom	Western DataCom	Western DataCom
Product	Courier V.32	432 Class 5	432 Crypto Card	432 Error Free
Hardware Configuration Used With Microcomputers	Standalone, Internal Yes, all with RS-232-C	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface
Hayes AT Command Set Compatible	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, CCITT V.32	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32
Communications Facility	Dial-up/leased	Dial-up, dial-up/leased, leased lines	Dial-up, dial-up/leased, leased lines	Dial-up, dial-up/leased, leased lines
Maximum Data Rate (bps)	9600	9600	9600	9600
Fallback Speed (bps)	4800, 2400, 1200, 300	0-9600	0-9600	0-9600
Synchronization	Async/sync	Async/sync	Async/sync	Async/sync
Transmission Mode	Vendor did not specify	FDX	Full duplex	Full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, PSK, Trellis coding, DPSK	FSK, QAM, Trellis coding, DPSK	FSK, QAM, Trellis coding, DPSK	FSK, QAM, Trellis coding, DPSK
Terminal Interface	RS-232-C, PC Bus, USR rackmount 30	RS-232-C, V.24	RS-232-C, V.24	RS-232-C, V.24
Line Interface Setup	Two-wire Hardware/software	Two-wire Hardware/software	2-wire, 2-/4-wire, 4-wire Hardware/software	Two-wire Hardware/software
Auto Answer/Dial	Yes	Yes	Yes	Yes
Alternate Voice/Data	Yes	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	MNP, V.42bis	MNP	MNP	MNP
Data Compression	Yes	Yes	Yes	No
Price/Availability				
Purchase (\$)	1,099 external	1,195	1,395	995
Date Of First Installation	December 1988	1988	1988	1988
Comments	—	—	NBS DES encryption	—

Vendor	Western DataCom	Western DataCom	Western DataCom	Western DataCom
<b>Product</b>	<b>432 Line Backer</b>	<b>432 MNP</b>	<b>432 Network Node</b>	<b>MESA 432</b>
<b>Hardware Configuration</b> Used With Microcomputers	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all with RS-232 interface
Hayes AT Command Set Compatible	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32
<b>Communications Facility</b>	Dial-up, dial-up/leased, leased lines	Dial-up, dial-up/leased, leased lines	Dial-up, dial-up/leased, leased lines	Dial-up, dial-up/leased, leased lines
<b>Maximum Data Rate (bps)</b>	9600	9600	9600	9600
<b>Fallback Speed (bps)</b>	0-9600	0-9600	0-9600	0-9600
<b>Synchronization</b>	Async/sync	Async/sync	Async/sync	Async/sync
<b>Transmission Mode</b>	Full duplex	Full duplex	Full duplex	Full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	FSK, QAM, Trellis coding, DPSK	FSK, QAM, Trellis coding, DPSK	FSK, QAM, Trellis coding, DPSK	FSK, QAM, Trellis coding, DPSK
<b>Terminal Interface</b>	RS-232-C, V.24	RS-232-C, V.24	RS-232-C, V.24	RS-232-C, V.24
<b>Line Interface Setup</b>	2-wire, 2-/4-wire, 4-wire	Two-wire	2-wire, 2-/4-wire, 4-wire	2-wire, 2-/4-wire, 4-wire
<b>Auto Answer/Dial</b>	Hardware/software	Hardware/software	Hardware/software	Hardware/software
<b>Alternate Voice/Data Equalization</b>	Yes	Yes	Yes	Yes
	Yes	Yes	Yes	Yes
	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error Data Compression</b>	MNP Yes	MNP No	MNP Yes	MNP Yes
<b>Price/Availability</b>				
Purchase (\$)	1,295	1,095	1,095	1,595
Date Of First Installation	1988	1989	1988	1988
<b>Comments</b>	Auto dial backup for lease lines	—	—	NBS DES encryption

Vendor	Adaptive Computer Technologies	BCH Equipment Corp.	BCH Equipment Corp.	BT Datacom, Inc.
<b>Product</b>	<b>V32-42</b>	<b>14.4 M Model</b>	<b>14.4 S Model</b>	<b>Datel 4142TCX</b>
<b>Hardware Configuration Used With Microcomputers</b>	Standalone, custom PCB Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount Yes, IBM PC family, IBM PS/2	Standalone, rackmount Yes, IBM PC family, IBM PS/2	Standalone, plug in, rack Yes
<b>Hayes AT Command Set Compatible</b>	Vendor did not specify AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.32, V.42, V.42 bis	No V.CC, V.29	No V.CC, V.29	No V.33, V.32 ext, V.32
<b>Communications Facility</b>	Dial-up/leased	Leased lines	Leased lines	Dial-up/leased, two-wire leased line
<b>Maximum Data Rate (bps)</b>	12K (38.4K compressed)	14.4K	14.4K	14.4K; 12K
<b>Fallback Speed (bps)</b>	300 to 9600	9600, 12K	1200, 9600	9600, 7200, 4800
<b>Synchronization</b>	Async/sync	Synchronous	Synchronous	Async/sync
<b>Transmission Mode</b>	Full duplex	Half/full duplex	Half/full duplex	Vendor did not specify
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	FSK, QAM, Trellis coding, proprietary at 12K	QAM	QAM	QAM, Trellis coding
<b>Terminal Interface</b>	RS-232-C, V.24	RS-232-C	RS-232-C	RS-232-C, V.28, V.24
<b>Line Interface Setup</b>	Two-/four-wire Hardware/software	Four-wire Hardware only	Four-wire Hardware only	Two-/four-wire Hardware/software
<b>Auto Answer/Dial</b>	Yes	No	No	Yes
<b>Alternate Voice/Data</b>	Yes	Yes	Yes	Yes
<b>Equalization</b>	Automatic adaptive	Automatic adaptive	Automatic adaptive	Fixed compromise, automatic adaptive
<b>Protocol/Error</b>	CRC, MNP, LAPM	Vendor did not specify	Vendor did not specify	Not applicable
<b>Data Compression</b>	Vendor did not specify	No	No	Yes
<b>Price/Availability</b>				
<b>Purchase (\$)</b>	1,095	1,295-1 port; 1,795 mux	1,295-1 port; 1,795-mux	Vendor did not specify
<b>Date Of First Installation</b>	1989	1985	1985	Vendor did not specify
<b>Comments</b>	Hardware and firmware available for license	Vendor did not specify	—	TDM, STDm, Pad, data compression; V.42 bis
Vendor	CASE/Datatel, Inc.	CXR Telcom/Anderson Jacobson	CXR Telcom/Anderson Jacobson	Data Race
<b>Product</b>	<b>DCM 4696</b>	<b>AJ 1951-1</b>	<b>AJ 1951-1D</b>	<b>Action 1496</b>
<b>Hardware Configuration Used With Microcomputers</b>	Standalone, plug in, rack Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount Yes, IBM PC family	Standalone, rackmount Yes, IBM PC family	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
<b>Hayes AT Command Set Compatible</b>	Yes AT&T 103/113, V.22, AT&T 108, V.22 bis, AT&T 212/212A	No Another model AJ 1951-1 unit	No Another model AJ 1951-10 Modem	Yes V.22, V.22 bis, AT&T 212/212A, V.29, V.33, CCITT V.23
<b>Communications Facility</b>	Dial-up/leased	Leased lines	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	19.2K	19.2K	19.2K	14.4K
<b>Fallback Speed (bps)</b>	9600, 2400, 1200, 0-300	16.8K, 14.4K, 12K, 9600	16.8K, 14.4K, 12K, 9600	12K, 9600, 4800
<b>Synchronization</b>	Async/sync	Synchronous	Synchronous	Async/sync, Hayes AutoSync
<b>Transmission Mode</b>	Vendor did not specify	Full duplex	Full duplex	Half/full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	FSK, QAM, DPSK	QAM, Trellis coding	QAM, Trellis coding	FSK, PSK, Trellis coding
<b>Terminal Interface</b>	RS-232-C, V.28, V.24	RS-232-C, V.24	RS-232-C, V.24	RS-232-C
<b>Line Interface Setup</b>	Two-wire Hardware/software	Four-wire Hardware/software	Four-wire Hardware/software	Two-/four-wire Hardware/software
<b>Auto Answer/Dial</b>	Yes	No	No	Yes
<b>Alternate Voice/Data</b>	Yes	No	No	Vendor did not specify
<b>Equalization</b>	Fixed compromise, automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	MNP
<b>Data Compression</b>	Yes	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Price/Availability</b>				
<b>Purchase (\$)</b>	Contact vendor	3,495	3,745	1,795
<b>Date Of First Installation</b>	Vendor did not specify	Vendor did not specify	1989	Vendor did not specify
<b>Comments</b>	—	Available with integral 2-port TDM for rackmount; 4- or 8-port for standalone	Available with integral 2-port TDM for rackmount; 4- or 8-port for standalone	—

Vendor	Data Race	Data Race	Develcon Electronics Ltd.	Develcon Electronics Ltd.
<b>Product</b>	<b>PC Race 24/96</b>	<b>PC Race 96</b>	<b>Alliance V.32 - 14.4</b>	<b>LN14.4 Network Modem</b>
<b>Hardware Configuration Used With Microcomputers</b>	Plug in Yes	Plug in Yes	Standalone, rackmount Yes, all	Rackmount Yes, all
<b>Hayes AT Command Set Compatible Compatibility</b>	Yes AT&T 103/113, V.22 bis, AT&T 212/212A	Yes RACE-VM, BMX-VM, Group 3 Fax	Yes V.22, V.22 bis, CCITT V.32, Bell 212A, 103	Yes V.33
<b>Communications Facility</b>	Dial-up/leased	Dial-up	Dial-up/leased	Leased lines
<b>Maximum Data Rate (bps)</b>	19.2K	19.2K	14.4K	14.4K
<b>Fallback Speed (bps)</b>	9600, 7200, 4800	9600, 7200, 4800	9600/4800/2400/1200/300	12K, 9600, 7200, 4800
<b>Synchronization</b>	Asynchronous	Async, sync w/autosync	Async/sync	Synchronous
<b>Transmission Mode</b>	Half/full duplex	Half/full duplex	Full duplex	Full duplex
<b>Configuration</b>	Dial-up	Dial-up	Point-to-point, multipoint	Point-to-point, multipoint
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	FSK, PSK	FSK, PSK	FSK, QAM, Trellis coding, DPSK	FSK, QAM, Trellis coding
<b>Terminal Interface</b>	PC Bus	PC Bus	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
<b>Line Interface Setup</b>	Two-wire	Two-wire	Two-/four-wire	Four-wire
<b>Auto Answer/Dial</b>	Hardware/software	Hardware/software	Hardware only	Hardware only
<b>Alternate Voice/Data</b>	Yes	Yes	Yes	No
<b>Equalization</b>	Yes	Yes	Yes	No
<b>Protocol/Error</b>	Automatic adaptive	Automatic adaptive	Fixed compromise, automatic adaptive	Fixed compromise, automatic adaptive
<b>Data Compression</b>	CRC, MNP	CRC, MNP	MNP	ARQ
<b>Purchase (\$)</b>	Yes	Yes	Yes	No
<b>Price/Availability</b>	995	795	Contact vendor	Contact vendor
<b>Date Of First Installation</b>	October 1987	October 1987	Vendor did not specify	Vendor did not specify
<b>Comments</b>	Compatibility supports Group 3 Fax, Race & BMX modes	—	—	Other models available for 9600bps, 9600bps fast poll, 4800, 2400bps

Vendor	Develcon Electronics Ltd.	Develcon Electronics Ltd.	Develcon Electronics Ltd.	Develcon Electronics Ltd.
<b>Product</b>	<b>M1926EZ</b>	<b>M1927L</b>	<b>M1928L</b>	<b>M1928LFT</b>
<b>Hardware Configuration Used With Microcomputers</b>	Standalone, rackmount Yes, all	Standalone, rackmount Yes, all	Standalone, rackmount Yes, all	Standalone, rackmount Yes, all
<b>Hayes AT Command Set Compatible Compatibility</b>	No Trellis, Viterbi, V.29 (9600)	No V.33, V.29, trellis coding	No Proprietary, trellis coding	No Proprietary, trellis coding
<b>Communications Facility</b>	Leased lines	Leased lines	Leased lines	Leased lines
<b>Maximum Data Rate (bps)</b>	14.4K	14.4K	19.2K	19.2K
<b>Fallback Speed (bps)</b>	9600, 7200, 4800	12K, 9600, 7200, 4800	16.8K, 14.4, 12K, 9600	16.8K, 14.4, 12K, 9600
<b>Synchronization</b>	Synchronous	Synchronous	Synchronous	Synchronous
<b>Transmission Mode</b>	Full duplex	Full duplex	Full duplex	Full duplex
<b>Configuration</b>	Point-to-point	Point-to-point, multipoint, poll	Point-to-point, multipoint, poll	Point-to-point, multipoint, poll
<b>Line Conditioning</b>	None	None	D1	D1
<b>Modulation</b>	PSK	QAM	QAM	QAM
<b>Terminal Interface</b>	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
<b>Line Interface Setup</b>	Four-wire	Four-wire	Four-wire	Four-wire
<b>Auto Answer/Dial</b>	Hardware only	Hardware only	Hardware only	Hardware only
<b>Alternate Voice/Data</b>	No	No	No	No
<b>Equalization</b>	No	No	No	No
<b>Protocol/Error</b>	Fixed compromise, automatic adaptive, fixed line	Automatic adaptive	Fixed compromise, automatic adaptive	Fixed compromise, automatic adaptive
<b>Data Compression</b>	ARQ	ARQ	ARQ	ARQ
<b>Purchase (\$)</b>	No	No	No	No
<b>Price/Availability</b>	Contact vendor	Contact vendor	Contact vendor	Contact vendor
<b>Date Of First Installation</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Comments</b>	—	Optional 6-port internal TDM multiplexer	C/w 2 channel TDM multiplexer, 6-port optional addition	C/w 2 channel TDM multiplexer, 6-port optional addition

Vendor	E-Tech Research	E-Tech Research	Fujitsu America, Inc.	Fujitsu America, Inc.
Product	BulletModem E9696M	BulletModem PC9696M	EZ Series	L Series
<b>Hardware Configuration</b> Used With Microcomputers	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all computers	Plug in Yes, IBM PC family	Standalone, rackmount Yes, Any synchronous port	Standalone, rackmount Yes, Any synchronous port
Hayes AT Command Set Compatible Compatibility	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.32	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.32	No V.22, V.22 bis, V.29, V.33	No V.22, V.22 bis, V.29, V.33
<b>Communications Facility</b>	Dial-up	Dial-up	Leased lines	Dial-up/leased
<b>Maximum Data Rate (bps)</b> <b>Fallback Speed (bps)</b> <b>Synchronization</b> <b>Transmission Mode</b> <b>Configuration</b> <b>Line Conditioning</b> <b>Modulation</b>	19.2K 75-9600 Async/sync Full duplex Point-to-point None Trellis coding	19.2K 75-9600 Async/sync Full duplex Point-to-point None Trellis coding	14.4K 2400 to 14.4K Synchronous Half/full duplex Point-to-point, tail circ. Vendor did not specify QAM, Trellis coding	19.2K 16.8K to 2400 Synchronous Half/full duplex Point-to-point, multipoint, tail D1 for 19.2 only QAM, Trellis coding
<b>Terminal Interface</b>	RS-232-C, V.24	RS-232-C, V.24	RS-232-C	RS-232-C
<b>Line Interface</b> <b>Setup</b> <b>Auto Answer/Dial</b> <b>Alternate Voice/Data</b> <b>Equalization</b>	Two-/four-wire Hardware/software Yes Yes Automatic adaptive	Vendor did not specify Hardware/software Yes Yes Automatic adaptive	Four-wire Vendor did not specify No No Automatic adaptive	Four-wire Vendor did not specify Yes No Automatic adaptive
<b>Protocol/Error</b> <b>Data Compression</b>	MNP Yes	MNP Yes	Vendor did not specify No	Vendor did not specify No
<b>Price/Availability</b> Purchase (\$)	1,095	995	595 - 1,795	845 to 4,495
Date Of First Installation	January 1988	January 1988	1986	1986
<b>Comments</b>	Remote configuration	Remote configuration	—	—

Vendor	Fujitsu America, Inc.	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.
Product	LN Series	DataComm 19202	DataComm 19202A	DataComm 19202A/ADR
<b>Hardware Configuration</b> Used With Microcomputers	Standalone, rackmount Yes, Any synchronous port	Standalone, rackmount Yes, IBM PC family, IBM PS/2	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible Compatibility	No V.22, V.22 bis, V.29, V.33	No Proprietary	No Proprietary	Yes Proprietary
<b>Communications Facility</b>	Dial-up/leased	Leased lines	Leased lines	Dial-up/leased
<b>Maximum Data Rate (bps)</b> <b>Fallback Speed (bps)</b> <b>Synchronization</b> <b>Transmission Mode</b> <b>Configuration</b> <b>Line Conditioning</b> <b>Modulation</b>	19.2K 16.8K to 2400 Synchronous Half/full duplex Point-to-point, multipoint, tail D1 for 19.2 only QAM, Trellis coding	19.2K 16.8K, 14.4K, 12.2K, 9600 Async/sync Full duplex Point-to-point D1 Vendor did not specify	19.2K 16.8K, 14.4K, 9600 Async/sync Vendor did not specify Point-to-point D1 Trellis coding	19.2K 16.8K, 14.4K, 9600 Async/sync Vendor did not specify Point-to-point D1 Proprietary
<b>Terminal Interface</b>	RS-232-C	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
<b>Line Interface</b> <b>Setup</b> <b>Auto Answer/Dial</b> <b>Alternate Voice/Data</b> <b>Equalization</b>	Four-wire Vendor did not specify Yes No Automatic adaptive	Four-wire Software only No No Automatic adaptive	Four-wire Software only No No Fixed compromise	Four-wire Hardware/software Yes No Fixed compromise
<b>Protocol/Error</b> <b>Data Compression</b>	Vendor did not specify No	Trellis No	Trellis No	Trellis No
<b>Price/Availability</b> Purchase (\$)	1,495 - 6,995	3,995	4,395	5,495
Date Of First Installation	1988	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Comments</b>	—	LCD display; two port mux built-in; has autospeed	LCD display; extensive line impairments info; two port mux; autospeed/port speed control	Automatic dial back-up; integral V.32 modem for dial back-up; LCD display

Vendor	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.	General DataComm, Inc.
<b>Product</b>	<b>Diagnostic Modem NMS 14433</b>	<b>Diagnostic Modem NMS 14434/36</b>	<b>Diagnostic Modem NMS 19202A</b>	<b>Multiport 14433</b>
<b>Hardware Configuration Used With Microcomputers</b>	Standalone, rackmount Yes, NMC 30B laptop computer (MS/Dos based)	Standalone, rackmount Yes, NMC 30B laptop computer (MS/Dos based)	Standalone, rackmount Yes, NMC 30B laptop computer (MS/Dos based)	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible	Vendor did not specify	Vendor did not specify	Vendor did not specify	No
<b>Communications Facility</b>	Leased lines	Leased lines	Leased lines	Leased lines
<b>Maximum Data Rate (bps)</b>	14.4K	14.4K	19.2K	14.4K
<b>Fallback Speed (bps)</b>	12K, 9600	12K, 9600	16.8K, 14.4K, 9600	12K, 9.6K
<b>Synchronization</b>	Synchronous	Async/sync	Async/sync	Async/sync
<b>Transmission Mode</b>	Full duplex	Full duplex	Full duplex	Vendor did not specify
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	D1	D1	D1	3002 with D1 or M1020
<b>Modulation</b>	FSK, Trellis coding	FSK, Trellis coding	FSK, Trellis coding	QAM, Trellis coding
<b>Terminal Interface</b>	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
<b>Line Interface Setup</b>	Four-wire	Four-wire	Four-wire	Four-wire
<b>Auto Answer/Dial</b>	Software only	Software only	Software only	Hardware/software
<b>Alternate Voice/Data Equalization</b>	Yes	Yes	Yes	No
<b>Protocol/Error Data Compression</b>	No	Vendor did not specify	Vendor did not specify	No
<b>Price/Availability</b>	Proprietary	Proprietary	Proprietary	Trellis
<b>Purchase (\$)</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	No
<b>Date Of First Installation</b>	July 1988	August 1988	February 1987	Vendor did not specify
<b>Comments</b>	Controlled/configured via GDC Netcon Network Management Systems	Integral 4 or 6 channel mux; controlled/configured via GDC Netcon NMS	Integral 2 channel mux; controlled/configured via GDC Netcon NMS	Integral 6 channel mux

Vendor	International Business Machines Corp. (IBM)	Microcom	Microcom	Microcom
<b>Product</b>	<b>PS/2 Leased Line Modem</b>	<b>2400t</b>	<b>QX/3296c</b>	<b>QX/V.32c</b>
<b>Hardware Configuration Used With Microcomputers</b>	Plug in Yes, IBM PS/2	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family
Hayes AT Command Set Compatible	No	Yes	Yes	Yes
<b>Communications Facility</b>	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	14.4K	12K	19.2K	30K
<b>Fallback Speed (bps)</b>	12K	3200, 2400, 1200	9600/4800/2400/1200/300	4800/2400/1200/300
<b>Synchronization</b>	Synchronous	Async/sync	Async/sync	Async/sync
<b>Transmission Mode</b>	Half/full duplex	Full duplex	Full duplex	Full duplex
<b>Configuration</b>	Point-to-point, multipoint	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	Vendor did not specify	None
<b>Modulation</b>	Trellis coding	FSK, QAM, PSK, DPSK	FSK, QAM, PSK, Trellis coding, DPSK	FSK, QAM, PSK, Trellis coding, DPSK
<b>Terminal Interface</b>	RS-232-C	RS-232-C	RS-232-C	RS-232-C
<b>Line Interface Setup</b>	Four-wire	Two-wire	Two-/four-wire	Two-/four-wire
<b>Auto Answer/Dial</b>	Software only	Hardware/software	Hardware/software	Hardware/software
<b>Alternate Voice/Data Equalization</b>	Yes	Yes	Yes	Yes
<b>Protocol/Error Data Compression</b>	No	Yes	Yes	Yes
<b>Price/Availability</b>	IBM Netview-LPDAZ	MNP	MNP	MNP
<b>Purchase (\$)</b>	No	Yes	Yes	Yes
<b>Date Of First Installation</b>	3,335	699	1,199	1,599
<b>Comments</b>	New product	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Comments</b>	—	RJ45 programmable transmit level; remote access and configuration	RJ45 - MI/MIC support; programmable transmit level	RJ45 - MI/MIC support; programmable transmit level

Vendor	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.	Multi-Tech Systems, Inc.	Mux Lab, Inc.
Product	MT932EC	MT932EM	MultiModem V32L	Fastware
Hardware Configuration Used With Microcomputers	Internal Yes, IBM PC family, PC AT/XT and compatibles	Standalone Yes, Apple Macintosh	Standalone Yes, IBM PC family, PC AT/XT and compatibles	Standalone, plug in Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible Compatibility	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.32	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.32	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.32/V.42	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A
Communications Facility	Dial-up	Dial-up/leased	Dial-up/leased, dial back-up	Dial-up/leased
Maximum Data Rate (bps)	19.2K with data compression	19.2K with data compression	19.2K with data compression	19.2K
Fallback Speed (bps)	9600, 4800	9600, 4800	9600, 4800	9600, 4800
Synchronization	Asynchronous	Async/sync	Async/sync	Asynchronous
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	None	None	None	None
Modulation	FSK, QAM, PSK, Trellis coding	FSK, QAM, PSK, Trellis coding	FSK, QAM, PSK, Trellis coding	FSK, QAM, PSK, DPSK
Terminal Interface	RS-232-C	RS-232-C, & RS-422	RS-232-C	RS-232-C, PC Bus
Line Interface Setup	Two-wire Hardware/software	Two-wire Hardware/software	Two-/four-wire Hardware/software	Two-/four-wire Hardware/software
Auto Answer/Dial	Vendor did not specify	Yes	Yes	No
Alternate Voice/Data	No	Yes	Yes	Yes
Equalization	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
Protocol/Error	X/Ymodem, MNP, Kermit	X/Ymodem, MNP, Kermit	X/Ymodem, MNP, Kermit	MNP
Data Compression	Yes	Yes	Yes	Yes
Price/Availability				
Purchase (\$)	999	1,195	1,395	895
Date Of First Installation	1989	Vendor did not specify	December 1989	1988
Comments	Also supports remote configuration	V.25bis dialing and remote configuration	—	—
Vendor	NEC America, Inc.	NEC America, Inc.	NEC America, Inc.	NEC America, Inc.
Product	DSP14400MII	DSP1920MII	SPN 19205M	SPN 19275M
Hardware Configuration Used With Microcomputers	Standalone Yes, IBM PC family	Standalone Yes, IBM PC family	Standalone Yes, IBM PC family	Standalone Yes, IBM PC family
Hayes AT Command Set Compatible Compatibility	No V.29, V.33	No Vendor did not specify	No Vendor did not specify	No Vendor did not specify
Communications Facility	Leased lines	Leased lines	Leased lines	Leased lines
Maximum Data Rate (bps)	14.4K	19.2K	19.2K	19.2K
Fallback Speed (bps)	7200, 9600, 12K	16.8K, 14.4K, 12K, 9.6K	9600, 12K, 14.4K, 16.8K	9600, 12K, 14.4K, 16.8K
Synchronization	Synchronous	Synchronous	Synchronous	Synchronous
Transmission Mode	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
Configuration	Point-to-point	Point-to-point	Point-to-point	Point-to-point
Line Conditioning	D1	D1	D1	D1
Modulation	QAM	FSK, QAM, Trellis coding	QAM, Trellis coding	QAM, Trellis coding
Terminal Interface	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28	RS-232-C, V.28, V.24
Line Interface Setup	Four-wire Hardware/software	Four-wire Hardware/software	Four-wire Software only	Four-wire Software only
Auto Answer/Dial	No	No	No	No
Alternate Voice/Data	No	No	No	No
Equalization	Automatic adaptive	Fixed compromise	Fixed compromise	Fixed compromise
Protocol/Error	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Data Compression	No	No	No	No
Price/Availability				
Purchase (\$)	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Date Of First Installation	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Comments	—	—	—	—

Vendor	NEC America, Inc.	Octocom Systems, Inc.	Octocom Systems, Inc.	Octocom Systems, Inc.
<b>Product</b>	<b>SPN14.4M</b>	<b>OSI8296 Universal Modem</b>	<b>OSI8396</b>	<b>OSI8996</b>
<b>Hardware Configuration</b> Used With Microcomputers	Standalone Yes, IBM PC family	Standalone, rackmount Yes, IBM PC family, IBM PS/2	Standalone, rackmount Yes, IBM PC family, IBM PS/2	Standalone, rackmount Yes, IBM PC family, IBM PS/2
Hayes AT Command Set Compatible Compatibility	No Vendor did not specify	Yes AT&T 103/113, 212/212A, V.22/ V.22bis, V.29, V.21, V.32, V.33, V.26bis, V.27bis/ter	Yes AT&T 103/113, 212/212A, V.22/ V.22bis, V.29, V.21, V.32, V.26/bis, V.27bis/ter	Yes AT&T 103/113, 212/212A, V.22/ V.22bis, V.21, V.23, V.29, V.32, V.33, 201B/C, 208A/B
<b>Communications Facility</b>	Leased lines	Dial-up/leased	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps)</b> <b>Fallback Speed (bps)</b> <b>Synchronization</b> <b>Transmission Mode</b> <b>Configuration</b> <b>Line Conditioning</b> <b>Modulation</b>	14.4K 4800, 7200, 9600, 16.8K Synchronous Half/full duplex Point-to-point None QAM, Trellis coding	14.4K 4800 Async/sync Half/full duplex Point-to-point None QAM, PSK, Trellis coding, DPSK	14.4K 1200, 300 Async/sync Half/full duplex Point-to-point None FSK, QAM, PSK, Trellis coding, DPSK	14.4K 1200, 300 Async/sync Half/full duplex Point-to-point None FSK, QAM, PSK, Trellis coding, DPSK
<b>Terminal Interface</b>	RS-232-C, V.28	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
<b>Line Interface</b> <b>Setup</b> <b>Auto Answer/Dial</b> <b>Alternate Voice/Data</b> <b>Equalization</b>	Four-wire Software only No No Fixed compromise	Two-/four-wire Software only Yes Yes Automatic adaptive	Two-/four-wire Software only Yes Yes Automatic adaptive	Two-/four-wire Software only Yes Yes Automatic adaptive
<b>Protocol/Error</b> <b>Data Compression</b>	Vendor did not specify No	MNP, V.42 Vendor did not specify	MNP, V.42 Vendor did not specify	MNP, V.42 Vendor did not specify
<b>Price/Availability</b> <b>Purchase (\$)</b>	Contact vendor	Contact vendor	Contact vendor	Contact vendor
<b>Date Of First Installation</b>	Vendor did not specify	Vendor did not specify	May 1989	Vendor did not specify
<b>Comments</b>	—	Compatible with NMS OSI 810/821/821E/821N/830	Compatible with NMS OSI 810/821/821E/821N/830	Compatible with NMS OSI 810/821/821E/821N/830

Vendor	Okidata Corp.	Patton Electronics, Inc.	Patton Electronics, Inc.	Penril DataCom
<b>Product</b>	<b>CLP 14.4</b>	<b>696 V.32 Modem</b>	<b>696LX V.32 Modem</b>	<b>Alliance V.32/14.4</b>
<b>Hardware Configuration</b> Used With Microcomputers	Standalone Yes, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, plug in Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount Yes, IBM PC family, IBM PS/2, RS-232 - C/D compatible
Hayes AT Command Set Compatible Compatibility	No V.33	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, CCITT V.32	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, CCITT V.32	Yes AT&T 103/113, 212/212A, V.22/ V.22bis, V.21, V.23, V.32, V.33, 208A/B
<b>Communications Facility</b>	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps)</b> <b>Fallback Speed (bps)</b> <b>Synchronization</b> <b>Transmission Mode</b> <b>Configuration</b> <b>Line Conditioning</b> <b>Modulation</b>	14.4K 12K, 9600, 7200, 4800 Synchronous Half/full duplex Point-to-point None QAM	19.2K at DTE 9600, 4800 Async/sync Half/full duplex Point-to-point None FSK, QAM, PSK, Trellis coding	19.2K DTE Rate 9600, 4800 Async/sync Half/full duplex Point-to-point Vendor did not specify QAM, Trellis coding	14.4K 1200 - 0 Async/sync Half/full duplex Point-to-point None FSK, QAM, Trellis coding, DPSK
<b>Terminal Interface</b>	RS-232-C, V.28, V.24	RS-232-C	V.28, V.24	RS-232-C, V.28, V.24
<b>Line Interface</b> <b>Setup</b> <b>Auto Answer/Dial</b> <b>Alternate Voice/Data</b> <b>Equalization</b>	Two-/four-wire Hardware only Yes No Automatic adaptive	Two-wire Software only Yes Yes Automatic adaptive	Vendor did not specify Hardware/software Yes Yes Automatic adaptive	Two-/four-wire Software only Yes Yes Fixed compromise, automatic adaptive
<b>Protocol/Error</b> <b>Data Compression</b>	Vendor did not specify No	MNP Yes	MNP Yes	MNP, V.42 Yes
<b>Price/Availability</b> <b>Purchase (\$)</b>	1,995	795	1,295	1,595
<b>Date Of First Installation</b>	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Comments</b>	Menu driven LCD display, autodial backup, remote config., set-up features	Supports full V.54 diagnostics	LCD display; front panel controls; remote config.; V.54 diagnostic	—

Vendor	Penril DataCom	Racal-Milgo	Racal-Milgo	Racal-Milgo
<b>Product</b>	<b>Alliance V.32/14.4M</b>	<b>Excalbur 19.2</b>	<b>Omnimode 14.4</b>	<b>Omnimode 14.4FP</b>
<b>Hardware Configuration</b> Used With Microcomputers	Standalone, rackmount Yes, IBM PC family, IBM PS/2, RS-232 - C/D compatible	Standalone, plug in, rack Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all microcomputers	Standalone, plug in, rack Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all	Standalone, plug in, rack Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, and compatibles
Hayes AT Command Set Compatible	Yes AT&T 103/113, 212/212A, V.22/V.22bis, V.21, V.23, V.32, V.33, 208A/B	No Racal-Milgo	No V.33	No Vendor did not specify
<b>Communications Facility</b>	Dial-up/leased	Dial-up/leased	Leased lines	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	14.4K	19.2K	14.4K	14.4K
<b>Fallback Speed (bps)</b>	1200 - 0	16.8K, 14.4K, 12K	12K	12K
<b>Synchronization</b>	Async/sync	Async/sync	Async/sync	Async/sync
<b>Transmission Mode</b>	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point, multipoint
<b>Line Conditioning</b>	None	D1	D1	D1, D5
<b>Modulation</b>	FSK, QAM, Trellis coding, DPSK	Trellis coding	Trellis coding	Trellis coding
<b>Terminal Interface</b>	RS-232-C, V.24	RS-232-C, V.28, V.24, EIA 530	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24
<b>Line Interface Setup</b>	Two-/four-wire Software only	Two-/four-wire Hardware/software	Four-wire Software only	Four-wire Software only
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data</b>	Yes	No	No	No
<b>Equalization</b>	Fixed compromise, automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	MNP, V.42	Vendor did not specify	Vendor did not specify	Vendor did not specify
<b>Data Compression</b>	Yes	No	No	No
<b>Price/Availability</b>				
Purchase (\$)	1,695	6,300	4,145	4,145
Date Of First Installation	Vendor did not specify	1989	1984	1989
<b>Comments</b>	Includes non-interruptive auxiliary channel for remote config., monitoring, mgmt.	—	—	—

Vendor	Racal-Milgo	Racal-Milgo	Racal-Milgo	Racal-Milgo
<b>Product</b>	<b>Omnimode 1614</b>	<b>RM-1433</b>	<b>RM-1822E/2</b>	<b>RM-1916</b>
<b>Hardware Configuration</b> Used With Microcomputers	Standalone, plug in, rack Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, and compatibles	Standalone, plug in, rack Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, and compatibles	Standalone, rackmount Yes, IBM PC family, IBM PS/2	Standalone, plug in, rack Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2, all
Hayes AT Command Set Compatible	No Vendor did not specify	No V.33	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, PEP2 Mode	No Vendor did not specify
<b>Communications Facility</b>	Dial-up/leased	Leased lines	Dial-up/leased	Leased lines
<b>Maximum Data Rate (bps)</b>	16.8K	14.4K	19.2K w/data compression	19.2K
<b>Fallback Speed (bps)</b>	14.4K, 12K	12K	2400, 1200, 300	16.8K, 14.4K, 12K, 9600
<b>Synchronization</b>	Async/sync	Async/sync	Asynchronous	Async/sync
<b>Transmission Mode</b>	Half/full duplex	Half/full duplex	Half/full duplex	Half/full duplex
<b>Configuration</b>	Point-to-point, multipoint	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	D1, GCITT M1020	None	D1
<b>Modulation</b>	Trellis coding	Trellis coding	FSK, QAM, DPSK, MQAM	Trellis coding
<b>Terminal Interface</b>	RS-232-C, V.28, V.24	RS-232-C, V.28, V.24	RS-232-C	RS-232-C, V.28, V.24
<b>Line Interface Setup</b>	Four-wire Software only	Four-wire Software only	Two-wire Software only	Four-wire Software only
<b>Auto Answer/Dial</b>	Yes	No	Yes	No
<b>Alternate Voice/Data</b>	No	No	Yes	No
<b>Equalization</b>	Automatic adaptive	Automatic adaptive	Automatic adaptive	Automatic adaptive
<b>Protocol/Error</b>	Vendor did not specify	Vendor did not specify	CRC, MNP, Xmodem, Kermit	Vendor did not specify
<b>Data Compression</b>	No	No	Yes	No
<b>Price/Availability</b>				
Purchase (\$)	5,160	3,150	1,150	7,600
Date Of First Installation	1985	1987	Vendor did not specify	1987
<b>Comments</b>	—	—	—	—

Vendor	Racal-Milgo	Scitex Communication Systems	Telcor Systems Corp.	Telcor Systems Corp.
<b>Product</b>	<b>RMD 3222</b>	<b>SAT D4</b>	<b>2919</b>	<b>2938</b>
<b>Hardware Configuration Used With Microcomputers</b>	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2
<b>Hayes AT Command Set Compatible</b>	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.33, see comments	Vendor did not specify Vendor did not specify	Yes AT&T 103/113, V.22 bis, AT&T 212/212A, V.29	Yes AT&T 103/113, V.22 bis, AT&T 212/212A, V.29
<b>Communications Facility</b>	Dial-up/leased	Leased lines	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	14.4K	1,544 megabits	19.2K	38.4K
<b>Fallback Speed (bps)</b>	12K, 4800	Vendor did not specify	9600/4800/2400/1200/300	300-19.2K
<b>Synchronization</b>	Async/sync	Synchronous	Asynchronous	Asynchronous
<b>Transmission Mode</b>	Half/full duplex	Full duplex	Full duplex	Full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	DSX	None	None
<b>Modulation</b>	FSK, QAM, PSK, Trellis coding, DPSK	Bipolar	Trellis coding	Trellis coding
<b>Terminal Interface</b>	RS-232-C, V.28	V.35/RS449	RS-232-C	RS-232-C
<b>Line Interface Setup</b>	Two-/four-wire Software only	Four-wire Hardware/software	Two-wire Hardware/software	Two-wire Hardware/software
<b>Auto Answer/Dial</b>	Yes	Vendor did not specify	Yes	Yes
<b>Alternate Voice/Data Equalization</b>	Yes Automatic adaptive	Vendor did not specify Automatic adaptive	Yes Automatic adaptive	Yes Automatic adaptive
<b>Protocol/Error Data Compression</b>	MNP Vendor did not specify	Vendor did not specify Vendor did not specify	Proprietary, MNP Yes	Proprietary, MNP Yes
<b>Price/Availability Purchase (\$)</b>	1,595	3,000	995	1,195
<b>Date Of First Installation</b>	1989	1986	1989	1989
<b>Comments</b>	Bell 208 A/B, V.32bis, V.23, V.13, V.54, V.42, V.42bis, V.32	—	3 year warranty; DES encryption option - \$100	3 year warranty; DES encryption option - \$100

Vendor	Telcor Systems Corp.	Telcor Systems Corp.	Telcor Systems Corp.	Telebit Corp.
<b>Product</b>	<b>3219</b>	<b>3238</b>	<b>3257</b>	<b>T2000</b>
<b>Hardware Configuration Used With Microcomputers</b>	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Plug in Yes, IBM PC family	Standalone, rackmount Yes, IBM PC family, IBM PS/2
<b>Hayes AT Command Set Compatible</b>	Yes AT&T 103/113, V.22 bis, AT&T 212/212A, V.32	Yes AT&T 103/113, V.22 bis, AT&T 212/212A, V.32	Yes AT&T 103/113, V.22 bis, AT&T 212/212A	Yes AT&T 103/113, V.22 bis, AT&T 212/212A
<b>Communications Facility</b>	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	19.2K	38.4K	57.6K	19.2K
<b>Fallback Speed (bps)</b>	9600 to 300	19.2K to 300	38.4K to 300	In 100 bps steps
<b>Synchronization</b>	Asynchronous	Asynchronous	Asynchronous	Asynchronous
<b>Transmission Mode</b>	Full duplex	Vendor did not specify	Full duplex	Half/full duplex
<b>Configuration</b>	Point-to-point	Point-to-point	Point-to-point	Point-to-point
<b>Line Conditioning</b>	None	None	None	None
<b>Modulation</b>	Trellis coding	Trellis coding	Trellis coding	FSK, QAM, DPSK, DAMQAM
<b>Terminal Interface</b>	RS-232-C	RS-232-C	PC Bus	RS-232-C
<b>Line Interface Setup</b>	Two-wire Hardware/software	Two-wire Hardware/software	Two-wire Software only	Two-wire Software only
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data Equalization</b>	Yes Automatic adaptive	Yes Automatic adaptive	Vendor did not specify Automatic adaptive	Yes Automatic adaptive, T 7TAP adaptive
<b>Protocol/Error Data Compression</b>	Proprietary, MNP Yes	Proprietary, MNP Yes	Proprietary, MNP Yes	Proprietary, MNP Yes
<b>Price/Availability Purchase (\$)</b>	1,295	1,695	1,195	1,395
<b>Date Of First Installation</b>	1989	1989	1989	June 1988
<b>Comments</b>	3 year warranty; DES encryption option - \$100	3 year warranty; DES encryption option - \$100	3 year warranty; DES encryption option - \$100	Protocol support for UNIX, UUCP, Kermit, Xmodem, and Ymodem

Vendor	Telebit Corp.	Telebit Corp.	Universal Data Systems	Universal Data Systems
<b>Product</b>	T2500	TrailBlazer Plus	FasTalk V.32/42	FasTalk V.32/42 bis
<b>Hardware Configuration Used With Microcomputers</b>	Standalone, rackmount Yes, Apple II family, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, rackmount Yes, Apple Macintosh, IBM PC family, IBM PS/2	Standalone, plug in, rack Yes, IBM PC family, IBM PS/2	Standalone, plug in, rack Yes, IBM PS/2
<b>Hayes AT Command Set Compatible</b>	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, V.33	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A	Yes V.22 bis, CCITT V.32/V.42	Yes V.22 bis, V.32/V.42bis
<b>Communications Facility</b>	Dial-up/leased	Dial-up/leased	Dial-up/leased	Dial-up/leased
<b>Maximum Data Rate (bps)</b>	19.2K	19.2K	19.2K bps	19.2K bps
<b>Fallback Speed (bps)</b>	100 bps increments	In 100 bps steps	9600 to 300	300 to 9600
<b>Synchronization</b>	Async/sync	Asynchronous	Async/sync	Async/sync
<b>Transmission Mode Configuration</b>	Half/full duplex	Half/full duplex	Half/full duplex	Full duplex
<b>Line Conditioning</b>	Point-to-point	Point-to-point	Vendor did not specify	Vendor did not specify
<b>Modulation</b>	None	None	Vendor did not specify	Vendor did not specify
	FSK, QAM, Trellis coding, DPSK, DAMQAM	FSK, QAM, DPSK, DAMQAM	QAM, Trellis coding	QAM, Trellis coding
<b>Terminal Interface</b>	RS-232-C	RS-232-C, PS/2 Micro Channel, PC bus	Vendor did not specify	Vendor did not specify
<b>Line Interface Setup</b>	Two-wire Hardware/software	Two-wire Software only	Vendor did not specify	Two-wire Hardware only
<b>Auto Answer/Dial</b>	Yes	Yes	Yes	Yes
<b>Alternate Voice/Data Equalization</b>	Yes Automatic adaptive	Yes T 7TAP adaptive	No Automatic adaptive	Vendor did not specify Automatic adaptive
<b>Protocol/Error Data Compression</b>	CRC, X/Ymodem, Kermit, MNP Yes	Proprietary, MNP Yes	MNP, V.42 Yes	MNP, V.42 Yes
<b>Price/Availability Purchase (\$)</b>	1,495	1,095-1,345	1,045	1,145
<b>Date Of First Installation</b>	September 1989	July 1985	Vendor did not specify	Vendor did not specify
<b>Comments</b>	—	Protocol support for UNIX, UUCP, Kermit, Xmodem, and Ymodem	Begin shipping 1st quarter 1990	Begin shipping 1st quarter 1990
<b>Vendor</b>	U.S. Robotics, Inc.	U.S. Robotics, Inc.		
<b>Product</b>	Courier HST	Courier HST Dual Standard		
<b>Hardware Configuration Used With Microcomputers</b>	Standalone, rack, internal Yes, all with RS-232-C	Standalone, rack, internal Yes, all with RS-232-C interface		
<b>Hayes AT Command Set Compatible</b>	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, USR HST	Yes AT&T 103/113, V.22, V.22 bis, AT&T 212/212A, V.21, CCITT V.32		
<b>Communications Facility</b>	Dial-up/leased	Dial-up, dial-up/leased, leased lines		
<b>Maximum Data Rate (bps)</b>	14.4K	14.4K		
<b>Fallback Speed (bps)</b>	300-9600	9600 to 300		
<b>Synchronization</b>	Async/sync	Async/sync		
<b>Transmission Mode Configuration</b>	Vendor did not specify	Half/full duplex		
<b>Line Conditioning</b>	Point-to-point	Point-to-point		
<b>Modulation</b>	None	None		
	FSK, QAM, PSK, Trellis coding, DPSK	FSK, QAM, PSK, Trellis coding, DPSK		
<b>Terminal Interface</b>	RS-232-C, USR Rackmount 30, PC Bus	RS-232-C, USR Rackmount 30, PC Bus		
<b>Line Interface Setup</b>	Two-wire Hardware/software	Two-wire Hardware only		
<b>Auto Answer/Dial</b>	Yes	Yes		
<b>Alternate Voice/Data Equalization</b>	Yes Automatic adaptive	No Automatic adaptive		
<b>Protocol/Error Data Compression</b>	MNP, V.42bis Yes	MNP, V.42bis Yes		
<b>Price/Availability Purchase (\$)</b>	995	1,595		
<b>Date Of First Installation</b>	January 1987	December 1988		
<b>Comments</b>	—	—		