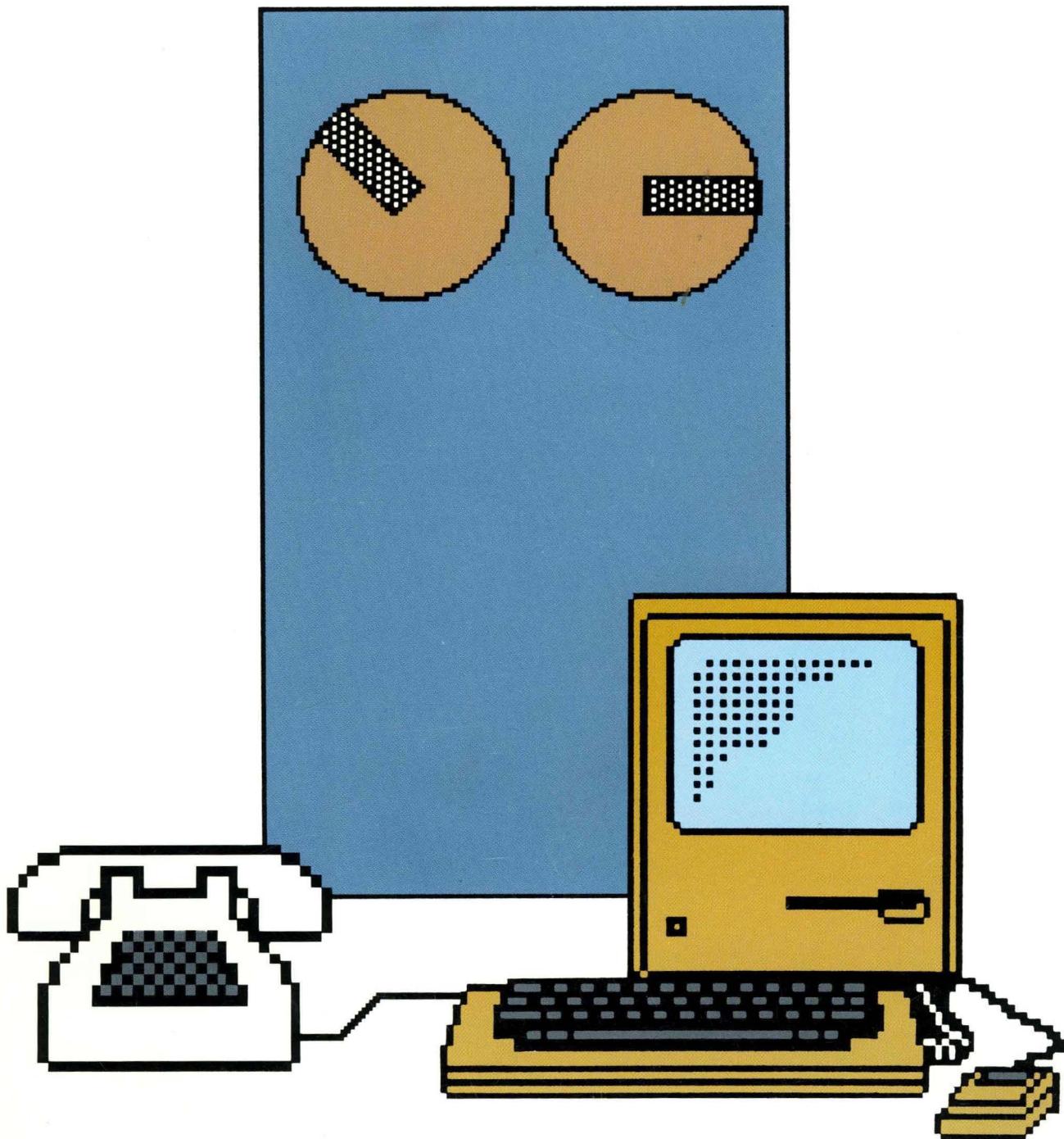




Sales and Reference Guide to Synchronous Communications Products



Acknowledgments

The following people at Apple Computer were principal contributors to this guide:

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Some of the information contained in this guide is from communications hardware and software manufacturers' literature and industry trade publications, and is therefore subject to updating. This Guide is informational in content, and products mentioned do not constitute endorsement by Apple Computer, Inc. Apple Computer cannot be responsible for changes in information given here regarding pricing, rates, availability, or suitability of products for any purpose. If you find incorrect information in this guide, please let us know, and we will attempt to correct it in future updates.

This guide was prepared on a Macintosh™, using MacWrite™, and printed with an Apple LaserWriter™ printer.

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Introduction

Purposes of the Sales and Reference Guide to Synchronous Communications Products

The purpose of this selling guide is to quickly familiarize an Apple authorized dealer or salesperson with the AppleLine and Apple Cluster Controller products. This guide will also explain the concepts of terminal emulation and protocol conversion. Furthermore, it will serve as a useful reference source and provide background material for seminars and demonstrations.

A glossary of data communications terminology is provided at the back of this guide. If data communications terms are unfamiliar to you, you may want to look at the glossary before you read the rest of this guide.

The Organization of this Guide

Chapter 1 covers synchronous and asynchronous communications worlds.

Chapter 2 is an introduction to data communications and an overview of customer needs.

Chapter 3 tells how Apple products meet customer needs.

Chapter 4 covers sales scenarios and the process of qualifying the prospect.

Chapter 5 covers the demonstration of Apple synchronous communications products.

Chapter 6 lists compatible and competitive software products.

Chapter 7 lists competitive hardware products.

Chapter 8 comprises Figures 5-10, a Glossary, a Guide to IBM Model Numbers, and a Reading List.

Chapter 1

COMMUNICATIONS MARKET OVERVIEW

The Three Worlds of Communications

One could say that there are three independent yet interrelated worlds of data communications. The American Telephone and Telegraph world is by far the biggest with yearly revenues of over \$165 billion. Wherever there is a communications wire between two points, chances are good that AT&T owns it.

The next biggest world is IBM. With yearly revenues of over \$40 billion, and about a 65% share of the mainframe computer market, it is nearly as big as everyone else in the computer business put together. IBM's communications are primarily EBCDIC (Extended Binary Coded Decimal Interchange Code) character-based and synchronously transmitted, with either a bisync or SDLC (Synchronous Data Link Control) protocol.

When standards regarding communications are set, they are generally patterned after either AT&T or IBM.

The third communications world consists of everyone else in the business of moving information electronically. This world is primarily ASCII (American Standard Code for Information Interchange) character-based and asynchronously transmitted.

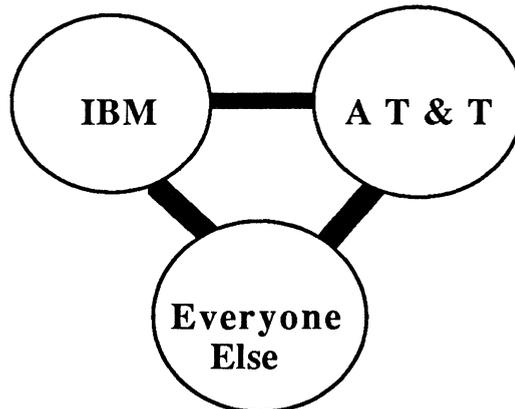
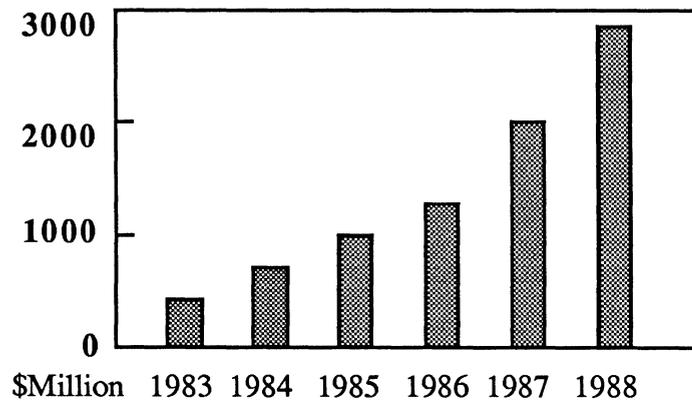


Figure 1

The Micro-to-Mainframe Marketplace

The exciting and demanding new micro-to-mainframe marketplace for communications products is exploding. In the early days of computers, the market was primarily technology-driven. The micro-to-mainframe market is primarily customer-driven. Early users of personal computers in major corporations have helped generate a pent-up demand for methods to access existing data stored in their companies' mainframe computers. As the number of installed personal computers in large businesses doubles and quadruples, so too will the number of products that connect them to the corporate mainframe computers. Projected annual sales in this market are shown in Figure 2.



Projected Total Installed Base as of 1988: \$7.97 billion with a 43% average growth rate. Source: International Resource Development

Figure 2

The Objectives of this Guide

The objectives of this sales guide are to explain the IBM communications world and to tell how Apple's synchronous communications products enable Apple personal computers to fit into that world. First we'll introduce you to the 3270 communications environment. Next we'll tell who the customers are that will be buying these products. Then we'll explain how Apple products meet these customers' needs.

Chapter 2

INTRODUCTION TO DATA COMMUNICATIONS

A Brief Introduction to the IBM 3270 World

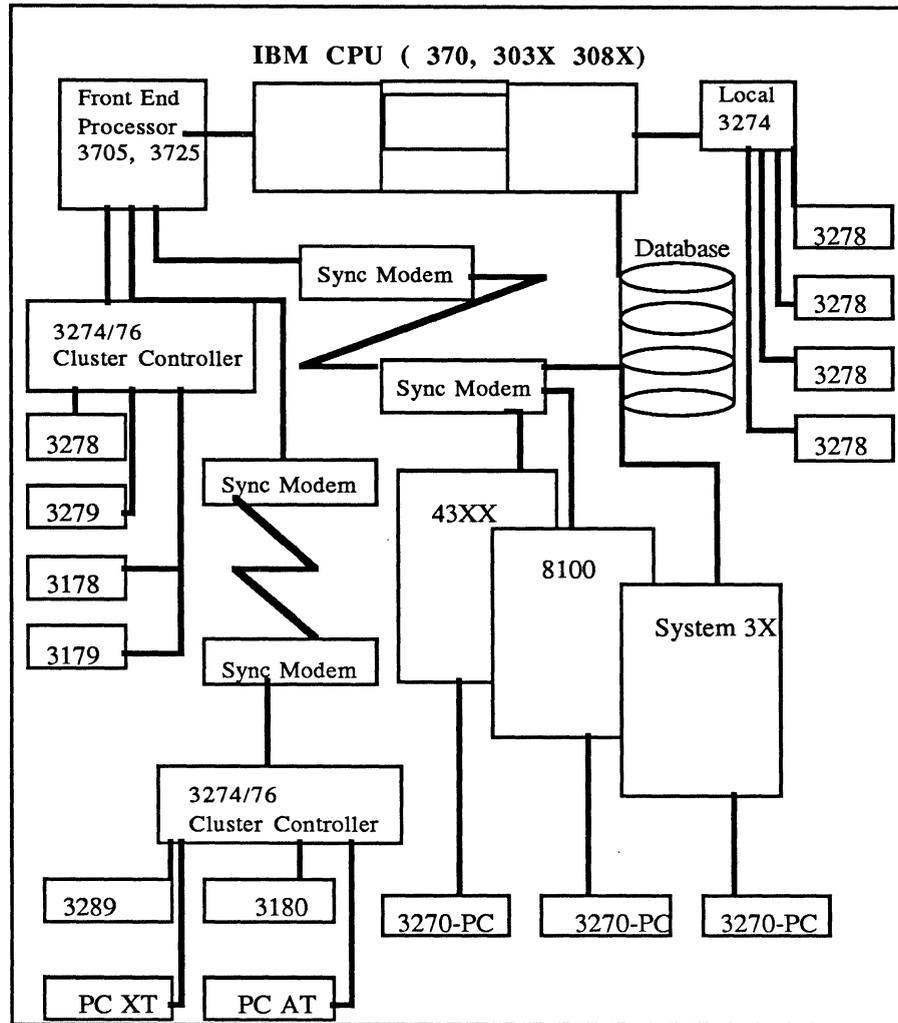
In order to express the significant benefits offered by AppleLine and Apple Cluster Controller to the corporate customer, it is necessary to understand the nature of that customer's environment. For those who desire additional depth, a glossary of IBM software and hardware terminology and a guide to IBM product numbering are provided in Chapter 8.

The great majority of large corporations today use large-scale IBM or IBM plug-compatible mainframes as the central computers (Central Processing Unit, or CPU) in their data-processing systems. Typically, hundreds or even thousands of CRT (cathode ray tube) terminals and printers are in use on these systems. If all of these had to be handled directly by the mainframe little capacity would remain for actual computing. Therefore, IBM distributes this terminal-handling burden to intelligent control devices (called, simply enough, controllers). Thus, a mainframe rarely communicates directly with a user's terminal or printers, communicating instead through a number of controllers arranged in some form of communications network.

The most widely used type of communications network utilizes an interrelated group of controllers, terminals, printers, and miscellaneous devices called, collectively, the IBM 3270 or 327X family. When an IBM mainframe system is installed or expanded, members of this family are arranged, building-block style, into a 3270 Communications Network. Many different configurations are possible, and a fairly representative one is diagrammed in Figure 3. You may wish to refer to this diagram as the individual components are briefly described.

The heart of any computer system is the central or host computer (CPU). IBM has divided its various models of computers into families (also called series). The main memory size and processing power of different machines within a family may vary widely.

Significantly, software written for one machine in a family can run with little or no modification on any other machine in the family. This feature makes upgrading computer systems within a family simple and cost-effective. It's this approach that catapulted IBM into its prominent market position in the mid-1960's.



The IBM Big Picture

Figure 3

In an IBM 3270 Terminal Network, the host is a member of the IBM 370, 303X, 308X, 309X, or 43XX family. (Note that the X's represent actual digits in model numbers of family members. For instance, the 43XX family includes, among others, models 4331 and 4341.)

As mentioned earlier, the host communicates with terminals and printers through a network of controllers. The type and arrangement of the controllers vary according to whether the controllers are handling local or remote terminals and printers. Thus, there exist two classes of terminal controllers -- local and remote.

Local controllers attach directly to a mainframe channel (a channel is roughly analogous to a connector into the system bus on a microcomputer). They are, therefore, often referred to as channel-attached controllers.

Remote controllers, as the name implies, are located anywhere from a few miles to several thousand miles away from the host computer site. Remote terminal controllers

are not managed directly by the host, but are instead supported by an IBM Communications Controller (sometimes called a "front-end processor" (FEP) or simply a "front-end"). It is typically a model 3705, though a newer version called the 3725 is starting to appear. Like a local terminal controller, a Communications Controller is channel-attached directly into the host.

Remote terminal controllers communicate with the 3705 or 3725 via modems and communications lines (such as standard dial-up phone lines or dedicated transmission lines). A single 3705 or 3725 can be configured to support up to 32 remote terminal controllers in this way.

Local controllers in a 3270 network are typically model 3274's. Remote controllers are typically either 3274's or 3276's. You should note that a local 3274 and a remote 3274 are slightly different models and are not interchangeable. Either one, however, can be configured to support up to 32 peripheral devices (such as terminals and printers). On the other hand, a 3276 can only support up to eight peripheral devices. The Apple Cluster Controller emulates an IBM 3274/76 to the IBM host, but can have either three or seven ports. A 3276 has a CRT terminal built into it, while a 3274 does not.

Each terminal controller, (also called a cluster controller), acts as a communications hub for the peripheral devices clustered in its vicinity. Each peripheral device is connected to the cluster controller with a coaxial cable (similar to those used in cable television connections, and often called "coax") which may be up to 5,000 feet long. The attached peripheral devices are most often terminals or printers, but various other input/output devices such as card readers and bar-code readers are also supported.

A number of different models of IBM printers are used with 3274 and 3276 cluster controllers. The 3287, 3288, and 3289 are fairly common models.

The 3270 series CRT terminals, called terminal workstations in the IBM world, are available in both monochrome (model 3278) and color (model 3279) versions. Screen size options are available for both models. These options are (in columns by rows): mod 1 (80x12 or 40x24), mod 2 (80x24), mod 3 (80x32), mod 4 (80x43), and mod 5 (132x27). The mod 1, mod 4, and mod 5 options are available only for the 3278.

The 3278 and 3279 terminals are available in either full-graphics or character-only versions. This is indicated with a suffix as follows: B or G suffix = full graphics, A or no suffix = character only. For example, the most widely used terminal workstation, the 3278 mod 2 (or mod 2A), is a monochrome, 80x24, character-only terminal. This is often represented simply as a model 3278-2 or 3278-2A. The color equivalent of this, which is fairly common, is the 3279-2 (or 3279-2A). The less common 3279-2G (or 3279-2B) is a color, 80x24, full-graphics terminal.

The 3278 and 3279 terminal workstations are "dumb" terminals; that is, they have no stand-alone computing capabilities. Replacing them with "intelligent" terminals which have full stand-alone computing capabilities is very attractive to many IBM 3270 network users.

You will sometimes encounter an older class of 3270 devices, represented by the 3271 and 3272 cluster controllers and 3277 terminals. These aren't nearly as common as the newer 3274 and 3276 cluster controllers and 3278 and 3279 terminals.

You should note that a 3274 controller can support both newer 3278/3279 terminals and older 3277 terminals. (3276 controllers don't support 3277's.) The 3274 accomplishes this through the use of terminal adapters; Type A adapters work with 3278's and 3279's, and Type B adapters work with 3277's.

You'll often hear the terms BSC and SNA/SDLC applied to a 3270 environment. These are software protocols, one or the other being used for the transmission of data through a 3270 network. BSC, which stands for Binary Synchronous Communications (often called bi-synch), is an older protocol, but remains popular. SNA/SDLC, which stands for System Network Architecture/Synchronous Data Link Control (often called SNA or SDLC), is more powerful, but also much more expensive. These protocols have different effects on the various components of the network. However, the protocol used between a cluster controller and a 3278 or 3279 terminal is essentially the same in the BSC and SNA/SDLC environments.

Protocols and Protocol Converters

Protocols are established rules governing communications. Whenever two pieces of equipment are connected, certain rules must be preset for communications to take place. A protocol provides a method for the orderly and efficient exchange of data, by establishing rules for such things as transmission speed, how to verify connection, the organization of 1's and 0's to identify characters, and identifying which characters are control characters and which are data.

Types of protocols include ASCII asynchronous and EBCDIC synchronous (with either BSC or SNA/SDLC line protocols).

Some of the key tasks of a communications protocol are to:

- **Specify the Code Set -- ASCII or EBCDIC**
- **Specify Data Format -- Asynchronous or Synchronous, Full- or Half-Duplex**
- **Initiate and Verify a Communications Connection**
- **Identify Persons or Equipment on Each End**
- **Establish Order of Transmission and Precedence**
- **Handle Error Situations and Re-transmissions**

The purpose of a protocol converter is to change from one protocol to another: from ASCII-to-EBCDIC, from Asynchronous to Synchronous, and from the control functions of one environment to those of another.

Customers' Requirements

The integration of microcomputers, either as personal computers or as intelligent workstations, into the data-processing environment of major organizations--corporate, governmental, and institutional--became a key issue of the data processing industry in 1983. In that year, vendors began providing ASCII to EBCDIC converters, which made possible the connection of micros to mainframes. A demand for access to corporate information stored in mainframe data bases began to grow. It was led by managers and professionals who found that re-entering data from printed spreadsheets wasted time and effort when the same data was already stored in digital form on the corporate mainframe. The question now is how micros can be integrated to best use an organization's computing resources.

In attempting to replace DEC® and IBM terminals with microcomputers, it is important to understand the different types of users and what their needs are. The following is a brief profile of the various terminal users and how Apple best answers their needs.

The Four Types of Users:

1. **Casual** -- The casual user has minimal requirements for accessing the mainframe. For example, a casual user may occasionally query a data base, may use an electronic mail system, and check the prices of securities. Even though the requirements are few, it's important to have this capability at the casual user's fingertips. *These users are perfect candidates for the kind of capabilities Apple offers in the area of data communications. These users usually don't want a lot of equipment on their desk; therefore, the concept of the integrated workstation is very attractive to them.*
2. **Clerical -- the Power User** -- This user may spend over seven out of eight hours in a day at a terminal, inputting data. The data may comprise inventory information, purchase order information, or some other type of major data base information. *More often than not, this user is trained on a particular type of terminal. Given the differences between the Apple computer in terminal mode and the 3278, you may find resistance to change.* It is therefore important to stay informed about software and hardware development: improvements in function and cursor keys, and improved emulation capability in the software, will make Apple computers increasingly attractive to this user. However, if this user is always in terminal mode and has no use for the rest of the power of the personal computer, this is clearly not our best target for a sale.
3. **Professional** -- This person's needs are similar to those of the casual user. The professional has some requirements for terminal mode, for example, accessing a corporate data base, occasionally accessing a securities data base, and using electronic mail. But, the professional probably has a greater requirement for things like spreadsheets, personal data bases, word processing, and Macintosh drawing packages. As with the casual user, the professional often wants the ability to tie into a mainframe, but wants one integrated workstation that is easy to use instead of a cumbersome, complicated terminal in addition to a personal computer. The Apple computer enables the user to access the data base and then use the data in conjunction with existing application software, such as spreadsheets. This lets the user avoid copying the data on paper when in terminal mode, and then re-keying the data into the spreadsheet. *The professional is an ideal candidate for the sale of Macintoshes, which integrate the personal computing functions required by the individual and the terminal software with AppleLine or Apple Cluster Controller to give him or her access to the mainframe.*

4. **Programmers** -- IBM-environment programmers are usually used to the functionality of the 3278 with all of its special keys and attributes. If they have spent a long time on this kind of terminal, they may be quite resistant to the changes required when using a personal computer for this function. There are a few considerations here. First, are they used to a true terminal and are they resistant to learning variations? Second, do they have a need for the other applications on a personal computer? There are various levels of programmers. Some have the need to design projects, in which case they may use one of the project programs. They also may have the need to use word processing. Selling Apples as terminals is much easier when the user has other personal computer needs in addition to mainframe access.

Apple Personal Computers as Intelligent Terminals

Since Apple computers are programmable, they can emulate many different types of terminals, the most commonly emulated being the DEC VT100™.

The IBM 3278 and 3279 display stations are "dumb terminals". Replacing them with an intelligent terminal which has full stand-alone computing capabilities is a very attractive prospect to IBM 3270 network users. The most common of the IBM 3278's and 3279's can be replaced by an Apple computer and a terminal emulation device.

In particular, the IBM 3278 model 2, monochrome, character-only terminal, with a typewriter-style keyboard, is easily replaced by an Apple personal computer.

The biggest advantages and benefits of using personal computers as "intelligent" terminals to replace "dumb" terminals are:

- Cost advantages
- Easy to use Macintosh technology, mice, and pull-down menus
- Downloading and remote storage of information
- Remote processing
- Creating, editing, and uploading of information
- Eliminates duplicate equipment
- Eliminates re-keying of information

- End-users are able to write their own programs
- Remote mainframe program creation, testing, updating.
- Permits running applications not available on mainframe computers, such as:

Spreadsheets
 Integrated software products
 Graphics programs with output to LaserWriter
 Project management software

Terminal Types

The following is a list of the most popular terminal types, beginning with IBM models and followed by terminals from other manufacturers.

IBM Terminals:

- | | |
|------|---|
| 3101 | Models 10, 12, 13, 20, 22 and 23. ASCII terminal w/character or block mode. |
| 3178 | Models C1 and C2. Replacements for the 3278. |
| 3179 | Color replacement for the 3279. |
| 3180 | Monochrome replacement for 3278. |
| 3275 | Discontinued Models 1,2,11,12. |
| 3276 | Control Unit Display Station. Models 1,2,3,4,11,12,13,14. |
| 3277 | Model 2 Display Station. |
| 3278 | Models 2,3,4,5 Display Station. |
| 3278 | Personal Computer Adapter. |
| 3278 | Attachment Option. An adapter in the IBM PC to interface w/ 3278 keyboard. |
| 3279 | Color Terminal Models S2A, S2B, S3G, 2X, 3X. |
| 3280 | Display Station replacement for 3278. |
| 3290 | Plasma Information Panel Display. |

- 5150 Personal Computer. 3770, 3101, 3278 emulation.
- 5160 Personal Computer XT/370. Models 568 and 588. 3277 and 3101 emulation.
- 5251 Model 11/12 Terminal for the System 34, 36 and 38.
- 5271 3270 Personal Computer.

Terminals from other manufacturers:

ADDS Regent 25,60; Viewpoint 60, 78, 90; Executive 80; V210.

Ampex 80,81.

Anderson Jacobson 510,520, APL.

Beehive DM5, DM78, Topper.

Burroughs SR 110, TD830, MT983, ET 1100, ET 2130/2230.

Data General Dasher: D-100, D-200, D-400; 6052; 6053.

DEC VT52™, VT61, VT100, VT101, VT102, VT125, VT131, VT132, VT200.

Esprit 78,51.

Hazeltine 1400's and 1500's, "Esprit".

Hewlett-Packard 86, 125, 2621, 2622A, 2624, 2626, 2641, 2645A.

Honeywell VIP 7700, 7800.

Lear Siegler ADM-3A, ADM-5, ADM-11, ADM-12, ADM-24E, ADM-31.

NCR 501, 796, 7900, Model 3, NCR-1, NCR-4.

Microdata Sequoia, Reality.

Perkin Elmer 1251.

Prime PT45, PST100.

Renex 278, 378,379.

Soroc IQ-120.

Sperry Uniscope 100, U200, UTS 20.

Tektronix 4010 Series: 4010,4012,4014,4016, and 4662 Option 31.

Televideo 900 Series.

Teletype Corp. TTY KSR 33, 43, 5420.

Texas Instruments 911.

Visual 50,100,200,400,450,550.

Zenith/Heath Z-19, H-19.

Chapter 3

APPLE SYNCHRONOUS PRODUCTS OVERVIEW

This chapter describes two Apple products, AppleLine and the Apple Cluster Controller (ACC), that make possible the use of an Apple computer in place of an IBM 3278-2 terminal. Refer to Figure 4 for a visual representation of where these products fit into the IBM environment.

What is AppleLine?

AppleLine is a powerful, cost-effective terminal-emulation and protocol-conversion device that allows Apple computers to communicate in an IBM mainframe environment. AppleLine allows Apple computers to emulate the functions of the 3278-Model 2 (3278-2) terminal (with typewriter-style keyboard).

Where does AppleLine Fit In?

AppleLine is installed at a controller site with a direct coaxial cable connection to an IBM 3274, 3276, or integral terminal controller with Type A adapters. (3274 controllers can have either Type A or Type B adapters; 3276 controllers will have only Type A.) The protocol used between the IBM 3274/76 and the 3278-2 terminal is essentially the same in BSC and SNA/SDLC environments. AppleLine operates with BSC or SNA/SDLC-linked 3274 controllers that are either channel-attached or remote. The Apple computer communicating with the 3274 controller via the AppleLine can be either remotely attached to the AppleLine using a full-duplex modem or directly attached to AppleLine by an RS-232 cable. These two configurations are shown in Figure 4.

AppleLine enables corporations with large 3270 installations to preserve their investment in coaxial cable. Customers who already have 3270 controllers can simply replace a 3278 display with an Apple and AppleLine, without changing host software or network configuration.

It is estimated that 50% of installed 3270 controllers are channel-attached to the IBM mainframe.

AppleLine expands the potential market for the Macintosh because it allows access to channel-attached 3270 controllers.

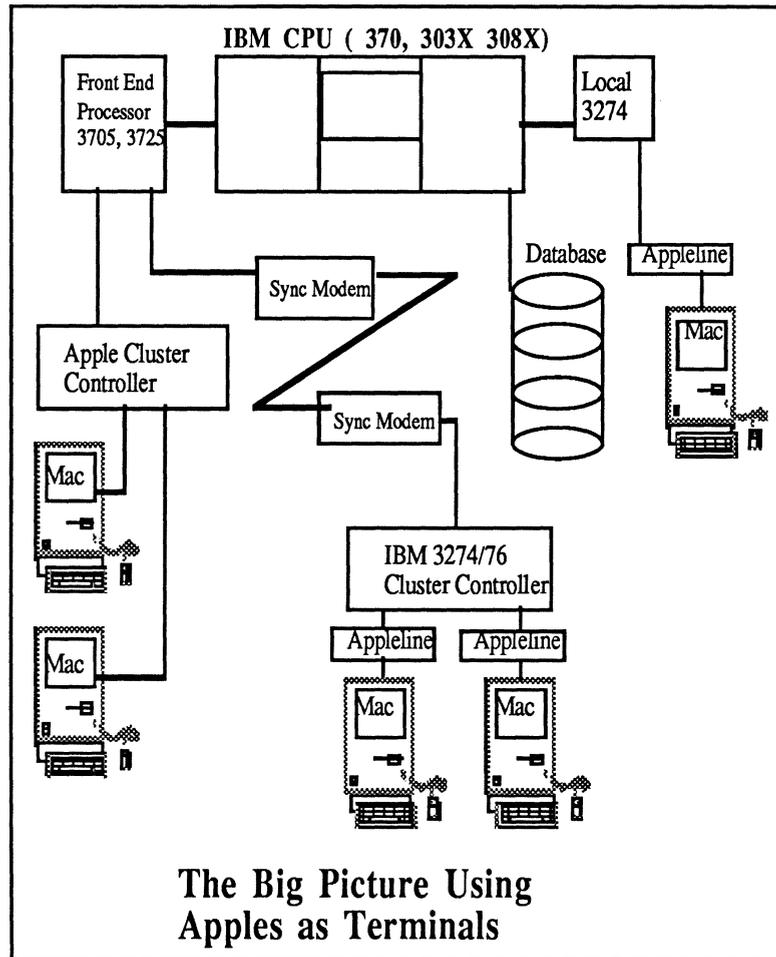


Figure 4

How does AppleLine Work?

AppleLine's on-board, high-speed microprocessor (8x305) handles the 3270 coaxial protocol. A second microprocessor handles the RS-232 protocol independently.

When the terminal emulator (which must be a DEC VT100 emulator such as LisaTerminal or MacTerminal™) has been activated and the user has successfully logged on to AppleLine, the 3270 system protocol will be accepted and acknowledged.

AppleLine's 3278-2 emulator package includes a menu-driven configuration routine. This routine is used to establish the communications requirements for the attached

device and to select the passwords for AppleLine. There is no additional software or special network configuration needed to accommodate AppleLine.

To enhance network security, multi-level password selection is provided in the configuration process.

AppleLine Feature/Benefit Summary

Feature: Coaxial cable protocol connector that works with IBM 3270 controllers (3274/6).

Benefit: Allows Apple computers to attach to BSC (binary synchronous communications) network or to SNA/SDLC networks.
Preserves coaxial investment.

Feature: IBM 3278 - 2 emulation capability.

Benefit: Transforms a Macintosh, Lisa, Apple II, or Apple III into a multi-functional workstation; network flexibility.

Feature: Multi-level password scheme.

Benefit: Built-in security.

What is an Apple Cluster Controller?

The Apple Cluster Controller (ACC) is a stand-alone device manufactured by Protocol Computers, Inc. (PCI). This unit allows up to seven serial devices - - Apple personal computers, ImageWriters™, Daisy Wheel printers, or Scribe® Printers - - to be attached to an IBM 3270 network. These devices are connected to the ACC via serial (RS-232C) ports. The ACC "looks like" an IBM 3274 or 3276 cluster controller to the IBM network.

How does the Apple Cluster Controller work?

The ACC communicates to the IBM mainframe using either the IBM Binary Synchronous Communication (BSC)

protocol, or the IBM System Network Architecture/Synchronous Data Link Control (SNA/SDLC) protocol. (Different ACC versions are required for each.) The ACC, in turn, communicates to Apple systems using a DEC VT100 Asynchronous ASCII protocol, instead of the 3278 high-speed coaxial protocol. In simple terms, the ACC acts like an IBM 3271/ 3274/ 3276 cluster controller with respect to the IBM mainframe. On the terminal side, the ACC connects to almost any asynchronous serial terminal device. The Apple personal computers communicate to the ACC with VT100-type protocol.

The ACC is an 8-bit Z-80A-based microcomputer configured with 16KB of ROM (read-only memory) and 32KB of RAM (random-access memory). Each unit is equipped with its own internal power supply.

Apple Cluster Controller Feature/Benefit Summary:

Feature: IBM 3278-2 (terminal) and 3287-1 (printer) emulation capability.

Benefit: Allows users access to mainframe data base information.

Feature: Built-in diagnostic testing for power-up and line monitoring.

Benefit: User is assured that equipment is functioning properly when it is turned on and while it is operating.

Feature: Xon/Xoff flow control for printer operation.

Benefit: Printer functions at maximum speed without losing characters.

Feature: Transmission speed of up to 9600 bps.

Benefit: Fast communication between mainframe computers and Apple personal computers.

Chapter 4

QUALIFYING THE PROSPECT

Selling AppleLine and the Apple Cluster Controller

Wherever IBM mainframes, Apple personal computers, and 3270 peripherals are found, AppleLine and Apple Cluster Controllers are a great potential sale. Because of IBM's considerable marketing power, the list of qualified organizations includes the vast majority of government agencies, universities, financial institutions, utilities, and the coveted Fortune 1000 companies. The list doesn't stop there, however. The recent popularity of IBM's low-cost 4300 series mainframes has delivered 3270 networks into the hands of tens of thousands of smaller concerns as well. In short, 80% of all medium to large corporations are potential prospects for AppleLine, Apple Cluster Controller, and the Apple personal computers.

Further qualifying should guide you toward the people in these organizations who can benefit most directly from Apple personal computers. Current Apple application programs support two major groups of users: executives and data processing professionals.

The executives are decision-makers whose jobs depend upon information handling. Often the information can be found on the organization's mainframe. The ability to access and process that information on their own Apple personal computer is extremely attractive to these people. They are prime candidates for AppleLine sales.

The data-processing people create and use tools to access mainframe information. Though their own needs for micros may not be great, they are still tremendously valuable to your sales campaign since they are developing tomorrow's tools for the executive: your greatest successes will come from customers whose data-processing shops are sold on Apples as terminals.

Once you have qualified the prospects in your area, visit them. If you wait for corporate customers to walk into your place of business and ask to buy, you will lose out on the majority of corporate customers. These people expect to be courted. Despite what some trade publications claim, most corporate purchasing agents do not walk into stores to buy their personal computers.

The most important selling points of Apple computers connected to AppleLines or Apple Cluster Controllers are:

AppleLine:

1. Combines easy-to-use Apple personal computers with the IBM mainframe environment (BSC or SNA/SDLC).
2. Transforms Macintosh, Lisa, Apple II, or Apple III into a multi-functional workstation.
3. Provides network flexibility through dial-up capability (which cannot be done with an IBM 3278-2).
4. Preserves investment in coaxial cable.
5. If customer is currently tying ASCII terminals to IBM mainframes through the use of Network Terminal Option (NTO) software on the front end controller, using AppleLine or Apple Cluster Controllers will significantly reduce costs (since the costly NTO subscription can be dropped) and increase efficiency (since communicating through NTO is slower than through synchronous communications channels, BSC or SNA/SDLC).

Apple Cluster Controller:

1. Combines easy-to-use Apple personal computers with the IBM mainframe environment (BSC or SNA/SDLC).
2. Provides IBM mainframe users with more flexible network hardware arrangements.
3. Dial-up capability allows users access to the IBM network from remote locations.
4. If customer is currently tying ASCII terminals to IBM mainframes through the use of Network Terminal Option (NTO) software on the front end controller, using AppleLine or Apple Cluster Controllers will significantly reduce costs (since the costly NTO subscription can be dropped) and increase efficiency (since communicating through NTO is slower than through synchronous communications channels BSC or SNA/SDLC).

When to Sell AppleLine:

Customer owns, or is about to purchase, a 3274 or 3276 cluster controller with Type A adapters.

Customer has a channel-attached controller (approximately 50% of IBM mainframes have channel-attached controllers—refer to Figure 2).

Customer wants a coaxial connection.

Customer has a fully loaded 3705 or 3725 and wants to connect a personal computer to the IBM network.

Customer has NTO (Network Terminal Option) on front end, to handle protocol conversion of ASCII terminals. NTO is a very expensive software extension to the IBM Network Control Program, which customers usually lease. AppleLine eliminates the need for NTO. If an organization has NTO on their front end, they are an excellent prospect for the sale of Apple systems.

When to Sell Apple Cluster Controller:

Customer is cost-conscious and wants cheapest connect cost per attachment. A three-port ACC costs \$2,900, compared to three AppleLines, which would cost \$3,885.

Customer has three or more personal computers in a remote location (not near an IBM 3274/76) and needs to dial into an IBM network asynchronously.

Customer wants to replace IBM 3274/76 and have personal computers as terminals on the network.

Customer has various types of personal computers and wants to hook them all up to the same protocol converter.

Customer needs to connect printers directly to the converter or to an Apple computer.

Customer has NTO (Network Terminal Option) on front end, to handle protocol conversion of ASCII terminals. NTO is a very expensive software extension to the IBM Network Control Program, which customers usually lease. ACC eliminates the need for NTO. If an organization has NTO on their front end, they are an excellent prospect for the sale of Apple systems.

The following is an APPLE/IBM cost comparison:

IBM SYSTEM EQUIPMENT PRICES*

IBM PC

Hardware (256K)	\$2420
IrmaCard	\$1295
Total	\$3520

IBM PC/XT

Hardware (256K)	\$4395
IrmaCard	\$1295
Total	\$5495

IBM 3270 PC

Hardware (256K)	\$3785
Hardware (512K)	\$4650
Hardware (512K/10MB)	\$6210

IBM Front End Processor \$46,600/10 lines
• Comes with 10 to 312 lines

IBM 3274 Cluster Controller \$ 6,350
• Can accomodate up to 32 terminals
• Typically contains 7 terminals, 1 printer
• Cost per port: \$699

IBM 3278-2 Terminal \$ 2,140

IBM 3287 Printer
Model 1 (80 cps) \$ 3,690
Model 2 (120 cps) \$ 4,800

* Obtained from IBM Product Center. Prices do not include service or maintenance charges. Lease charges vary between specific contracts.

PURCHASE SCENARIO I
Incremental Cost Comparison*

(Software not included)

	<u>IBM Solution</u>	<u>Apple Solution</u>	<u>Savings with Apple</u>
IBM CPU	*	*	*
Front End Processor (3705)	*	*	*
6 Cluster Controllers	\$ 36,000 (\$6000 x 6)	\$ 34,300 (\$4900 x 7)	\$1,700
Terminals (3278's and Macintoshes)	\$ 96,600 (2300 x 42)	\$105,000 (2500 x 42)	\$<8,400>
Printers (IBM's, ASCII)	\$ 36,000 (\$6000 x 6)	\$ 4,900 (\$700 x 7)	\$31,100
Total Incremental Cost	\$168,000	\$144,200	<u>\$24,000</u>
Added Convenience of Having a P.C.	No	Yes	

NOTE: Average savings per Apple Cluster Controller: $\$24,400 \div 7 = \$3,485$. (Worth one additional PC plus software and printer.)

* Prices for items used in both solutions (for example, the CPU) are not included.

PURCHASE SCENARIO II
Using AppleLine & Macintosh vs. IBM PC & IrmaCard

	<u>IBM 3278</u>	<u>IBM PC (256K)</u>	<u>Apple Macintosh</u>
CPU	*	*	*
F.E.P.	*	*	*
IBM 3274 Terminal	*	*	*
3278 Emulator (IrmaCard, AppleLine)	\$2,140	\$2,420	\$2,500
	*	\$1,295	\$1,295
Total Incremental Cost	<u>\$2,140</u>	<u>\$3,715</u>	<u>\$3,795</u>

* Prices for items used in both solutions are not included.

NOTE: The greater expense associated with personal computers is more than made up for by their added capabilities and flexibility.

Comparative Pricing of Personal Computer Systems with 3278 Terminal Emulation Capability

	IBM 3178	IBM PC	3270 PC	Macintosh
Terminal	\$1650	\$2420	\$5285	\$2795
3278 Emulator		\$240		\$1295
PC Attachment	\$2400			
Comm. Software, Modems, and Cables	<u>\$700</u>	<u>\$700</u>	_____	<u>\$99</u>
Total	\$4750	\$3360	\$5285	\$4189

The following are current prices for AppleLine and Apple Cluster Controller:

AppleLine: \$1,295

Apple Cluster Controller:

three port ACC \$2,900 (\$966/port)

seven port ACC \$4,900 (\$700/port)

Total System Prices—AppleLine:

Macintosh		Apple IIe	
Macintosh	\$2,495	Apple IIe	\$1,295
MacTerminal	\$100	Super Serial Card	\$140
		Access II	\$75
AppleLine	<u>\$1,295</u>	AppleLine	<u>\$1,295</u>
TOTAL	\$3,890	TOTAL	\$2,805

Total System Prices for Apple Cluster Controller
Per-port price using price of seven-port ACC:

Macintosh		Apple IIe	
Macintosh	\$2,495	Apple IIe	\$1,295
MacTerminal	\$100	Super Serial Card	\$140
ACC	<u>\$700</u>	ACC	<u>\$700</u>
TOTAL	\$3,295	TOTAL	\$2,135

Chapter 5

HOW TO DEMONSTRATE THE PRODUCTS

The following is a guide to assist you in demonstrating the AppleLine and Apple Cluster Controller. Preparation and set up procedures are covered to assure your success. AppleLine will be discussed first.

AppleLine:

Pre-demo preparation at customer site

There are various ways to demonstrating AppleLine to your customer. The most effective way is to tie the AppleLine into the customer's existing mainframe environment so that he or she can be assured that the two work together. It has a very positive effect on the customer to see the IBM mainframe screens appear on the Apple computer. Another way to demo AppleLine is to subscribe to a timesharing service and tie into it.

At this point, we will assume you are hooking up to the customer's mainframe. To choose an AppleLine demo you must determine:

1. Whether there is a 3274/76 IBM cluster controller with Type A adapters; and
2. Whether the IBM controller has a port generated ("gen'd") for a 3278 model 2 terminal with typewriter keyboard.

If either of these conditions is not met, you must work with the systems programmer in charge of communications to generate a line for a 3278 model 2, in order to assure proper functioning of the AppleLine. When both of the above are ensured you may go on to the actual preparation of the equipment at the customer site.

Setting up the equipment for demo at customer site

If you will be replacing an existing 3278-2 on the customer's system and if the 3278-2 is in operation at the time of your set up, ask the customer to properly log-off and power off his or her own system to assure that it will not be disturbed by you. If the customer has a port properly configured but

does not have a true 3278-2 plugged in, you can just plug directly in without having to disconnect the terminal.

There are two possible set ups for the AppleLine:

1. With the AppleLine located away from your Apple (see Figure 5, in Chapter 8); and
2. With the AppleLine near your Apple (see Figure 5, in Chapter 8).

The configuration with the AppleLine near your Apple is covered first.

Equipment needed:

1. AppleLine
2. Apple serial cable
3. Gender changer provided with the AppleLine
4. Coaxial cable up to 5000 ft. (customer provided)
5. Wall-mounted transformer, provided with AppleLine
6. Self-test plug (loop-back plug), provided with AppleLine
7. Communications software. The following is the software recommended for use with the various Apples:

MacTerminal on Macintosh
Access II on Apple II

Note: In addition to the above items, a set of full-duplex, asynchronous modems (such as Apple's) is needed when installing AppleLine in a location away from your Apple.

Installation Steps for AppleLine:

1. Connect coaxial cable to AppleLine connector labeled "controller".
2. Connect the other end of the coaxial cable to the 3274/76 configured for a 3278-2 terminal with a typewriter keyboard.
3. Connect transformer to port labeled "24V AC" and to power source in wall. (When AppleLine is on, it consumes 50 watts of power, as much as an electric clock.)

4. For an AppleLine located away from your Apple computer:

If your AppleLine and your Apple computer must be more than five meters away from each other (in order for the AppleLine to reach the IBM Control Unit), they cannot be connected by ordinary cable. They must communicate by means of telephone lines and a pair of asynchronous modems, like the Apple modems. In this case, attach one Apple modem to the serial connector on the back of AppleLine and a second Apple modem to the serial connector on the back of your Apple computer.

The AppleLine is connected to the IBM 3274/76 controller via coaxial cable, as described above. For instructions on operating the Apple Modem 300/1200, consult the appropriate manual.

5. Turn on Apple computer and create a document from the appropriate terminal software.
6. Configure terminal software.

Using AppleLine for the First Time

Turn on the power for AppleLine (switch is located on right side; switch to 1). Initially the red, green, and yellow LED's (on front) all blink. Then the red LED goes out. Finally, the yellow and green LED's blink alternately; AppleLine has gone through its self-test successfully.

Assuming that the AppleLine has never been used, there are two procedures which must be performed: sending the autobaud message and using the supervisor program.

To send an autobaud message:

1. Press the "Break" key (labeled **Enter**, located to the right of the space bar) then press the **Return** key. This sends the autobaud message.
2. Your AppleLine will respond by displaying an identification line across the top of your screen, followed by this message:

Press RETURN to begin log-on sequence.

To use the supervisor program:

1. Press **Return**. Your AppleLine will reply with this prompt:

Enter Password:

2. Type "APPLES" and press **Return**.

This is the default password to the AppleLine's supervisor program. Your AppleLine will reply with his message:

```
AppleLine has been reset to "factory"
settings. Please log-on as AppleLine
SUPERVISOR using the supervisor
password "APPLES" to set AppleLine to
your particular configuration.
```

A terminal type must be selected before you continue. You will be shown the following

Possible selections:

```
A - LisaTerminal
B - MacTerminal
C - Access 3270
D - VT100
```

Your selection [LisaTerminal]:

The LisaTerminal in brackets means that it is the default setting. For practice we'll change the terminal to MacTerminal, (assuming we are using a Macintosh to communicate and not a Lisa), so

3. Type "B" and press **Return**.

This tells the AppleLine that you are using MacTerminal to communicate with it. Your AppleLine will reply with this prompting message:

```
Current terminal type is
"MacTerminal". Is this correct [Y]?
```

4. Press **Return**.

Pressing **Return** accepts the default response shown inside the brackets (in this case the default is Y, which stands for "yes"). Your AppleLine will reply with this prompting message:

```
AppleLine Supervisor Logged-ON
```

Possible selections:

- A - Display terminal type and modem settings
- B - Modify terminal type and modem settings
- C - Change USER or SUPERVISOR passwords
- D - Log off and hang up modem
- E - Log off and return to log-on screen

Your selection [Log off and return to log-on screen]:

At this point you can make any of the abovefive selections to:

- A - Display the communications parameters stored in AppleLine for communication between the Apple and AppleLine.
- B - Modify the communications parameters stored in AppleLine for communication between the Apple and AppleLine.
- C - Change the default passwords.
- D - Log off the supervisor program.
- E - Log off the supervisor and return to AppleLine screen.

Select option "A" to make sure the default settings meet your requirements. If the default settings do not match your needs, select option "B" and run through all of the currently stored options by pressing return to accept, or by selecting the proper option and then pressing return to accept.

Refer to the AppleLine User's Manual (Chapter 3 part 1) for specific information about AppleLine parameter definitions.

At this point you can make selection "E" and log-on to AppleLine and begin demonstration.

Demonstrating AppleLine

1. Press **Return** to begin log-on sequence. AppleLine responds by asking for your password:

Enter password:

2. Type your user password. If no special password has been established through the supervisor program you can use any of the four provided by the default setting of AppleLine. They are:

APPLE1
APPLE2
APPLE3
APPLE4

3. When the AppleLine recognizes your password, the screen will go blank and then a new message will appear on it, transmitted from the IBM mainframe.
NOTE: If AppleLine does not recognize your password, it will ask you to enter it again. After three attempts, the AppleLine will ignore further password attempts for 20 seconds.
4. You are now ready to log on to the IBM system. To best demonstrate the Apple-to-mainframe connection, hand the keyboard over to the customer: let the customer sign on to the mainframe and use his or her own system.
5. **Using your Apple like an IBM terminal:**

Now you can start using your Apple keyboard and monitor screen as if they were the keyboard and screen of an IBM Model 3278-2 terminal. The Operator Information Area, by which the IBM system informs you of its status, will appear as the bottom line on your (24-line by 80-column) Apple screen. (To see the twenty-fifth line of the IBM 25-line by 80-column display, press the **Escape** key twice.)

Special IBM keys:

The Model 3278-2 terminal has keys with special labels on them, (such as "ATTN" and "SYS REQ") which do not exist on your Apple keyboard. However, all their functions are still available. To achieve the same result with your Apple as you would by pressing these keys on a 3278-2 terminal, you use a combination of keystrokes. These combinations are listed in Figure 6 (Chapter 8). In addition, MacTerminal has a built-in pictorial keypad which allows you to select the IBM keys (also referred to as PF keys) by pointing and clicking with the mouse. (Refer to Figure 7, Chapter 8)

6. Logging-off:

First, have the customer log off of his or her IBM environment. Then, you can log off AppleLine. There are three different log-off procedures you can use to terminate a work session with your AppleLine, depending on what you have been doing and what you want to do next. They are as follows:

- a. If you have been working with the mainframe and want to quit, just break off communication with your AppleLine. How you break off communication depends on how your AppleLine is connected.
- b. If the AppleLine is connected directly to your Apple computer, simply quit the communication program you have been using. If you are not sure how to do this, consult the user's manual for your communication program.
- c. If it is connected through a pair of asynchronous modems like the Apple modems, tell the modem connected to your Apple computer to "hang up"; the modem at the other end will then disconnect itself from your AppleLine.

If you have been working with the mainframe and want to switch to your AppleLine's supervisor program, first log off the mainframe; then press **Escape**, and then hold down **Control** and type "Z". Your AppleLine will display the message:

AppleLine User Logged OFF

but will not discontinue communication. Twenty seconds later, it will automatically return to the start of its log-on sequence. At this point you can log back on the AppleLine with the supervisor password.

Subsequent Demonstrations of AppleLine

Assuming the default parameters have been defined, subsequent use of AppleLine does not require resetting the parameters. Therefore, when AppleLine receives power, the user will be prompted to enter the password. Enter the user password. If the password is acknowledged by AppleLine, communication with the mainframe is established.

Problems During and After Installation

Any problems in bringing up AppleLine, during or after installation, are very likely to be due to difficulties with the

baud rates. If a line of "garbage" appears on the screen, the baud rates on AppleLine and the terminal emulator do not match.

Solution: AppleLine will autobaud if you press the **Break** key for several seconds and then press the **Enter** key. If it doesn't work the first time, try again.

If this does not work, reset AppleLine with the loop-back plug (comes with the AppleLine). This will set the baud rate to 4800. Set the terminal software to 4800 and try connection again.

This is the procedure for using the loop back plug:

1. Turn your AppleLine's power switch to OFF.
2. Unplug its connection to your Apple computer.
3. Replace the plug that went to your Apple with the loop-back plug.
4. Turn the power switch ON.
5. Your AppleLine's yellow light should blink slowly to indicate that it is OK.

Errors Associated with the Mainframe

After the connection is made, you may still have problems talking to the mainframe.

If "X2%%" appears on the status line, the keyboard is locked.

Solution: The port you're hooked up to is not gen'd for a 3278 mod 2 with typewriter keyboard. The typewriter keyboard is the problem. Have your mainframe support re-gen your controller port for typewriter keyboards, or have them update the 3274 code to the latest version.

To get around the problem in the meantime, a reset will clear it. This is done by pressing **Control** and typing "R".

Other strange numbers may appear on the status line. First, check to make sure you are connected to a port gen'd for a 3278 model 2 or 3279 model 2A with typewriter keyboard.

Anytime you get an "-F", you've typed on the keyboard before the controller is ready for you. A reset (**Control** and "R") should clear it.

If your screen is blank with a blinking cursor, even after depressing the **Escape** key twice, you are not getting a connection to your controller. Controller connection will always give you a 4A, 4B, 6A, or 6B in the bottom left corner of the screen.

Solutions:

1. Check coax connection
2. Check coax wire for breaks
3. Change coax
4. Check RS-232 connections
5. Check RS-232 for breaks
6. Repair or change RS-232 cable

Apple Cluster Controller

Pre-demo preparation at customer site

The following discussion assumes that you will be tying the Apple Cluster Controller (ACC) into the customer's existing network. If you will be tying into your own system or a timesharing service instead, you must work out your own set-up for the ACC based on your service requirements. Tying into your own system has one advantage, in that you need only set up the hardware once. However, it is not as impressive to the customer as tying into the customer's existing network.

Before installing your Apple Cluster Controller, you should have a discussion with the operator of the IBM host computer. He or she will need to inform the host Network Control Program (NCP) of the addition of your ACC to the network. Tell the host operator which ACC model you are going to install so that he or she can properly "SYSGEN" the host computer. Changes to the NCP when a Model 76 is added are the same as those required when an IBM 3276/12 or 3274 is added. Changes when a Model 71 is added are the same as those required when an IBM 3276/2 is added.

You also need to indicate to the systems programmer the types of devices that will be hooked up to the ACC. If your computer will be emulating a 3278-2, you should indicate to the programmer that the device to be attached to the ACC is a 3278-2. If you are hooking up a printer, then you should indicate to the programmer which ports on the ACC should be reserved for the printer.

The host operator will inform you of your user ID and password, and of any operating characteristics you need to know about in order to properly set up and configure your ACC to communicate with the IBM host.

If the customer is disconnecting an existing, functioning, IBM 3274/6 controller and replacing it with an ACC, you need not do a gen on their system. In this case you need only set a couple of switches on your ACC; refer to the following discussions on defining the configuration and configuring the hardware.

If the customer has only a channel-attached IBM controller, you cannot disconnect their controller and hook up an ACC, because there are no channel-cable connectors on the ACC. (If this is the case, AppleLine may be the solution).

Equipment Needed for a Demo at the Customer's Site:

1. Apple Cluster Controller
2. RS232 cables (one for each computer or printer hooked up)
3. Two RJ-11 phone cords
4. Power cord
5. Terminal software. The following are recommended for use with the various Apple computers:

MacTerminal on Macintosh
Access II on Apple II

Selecting the Set-Up for the ACC

Your next step is to decide how you are going to physically set up your ACC and Apple computers and/or printers. You need to think about where they will be located and how you will assign printers.

You can locate your ACC either in the same computer room as the IBM mainframe host to which it is connected or in a remote location. The former set up permits the fastest communication with the IBM host. You can connect your ACC to as many as seven Apple computers or six printers, either directly or through individual asynchronous modems if you want to place your computers and/or printers in remote locations.

These options give rise to three possible set ups:

1. The IBM mainframe host, the ACC, and the Apple computers and/or printers can all be located in the data center. In this situation the ACC is directly attached to the front end processor (such as the 3705 or 3725). (Refer to Figure 8 in Chapter 8).
2. The IBM host and the ACC can be located in the data

center while the Apple computers and/or printers reside in remote locations and are linked to the ACC through asynchronous modems. (Refer to Figure 10 in Chapter 8). Apple computers connected through individual modems need not all operate at the same speed; their speeds can range from 300 to 1200 bps.

3. The ACC with Apple computers attached directly can reside in a location remote from the IBM host and be linked to it through a synchronous modem. (Refer to Figure 9).

Defining the ACC's Configuration

To properly configure your ACC, you need to answer a few questions in advance. (Refer to the back panel of your ACC during this discussion.)

SNA/SDLC (or BSC) Port

The first set of questions pertains to the SNA/SDLC (or BSC) port:

1. How will the ACC be connected to the IBM frontend processor—directly, or through a modem?
2. Does the IBM host use NRZI (Non-Return-to-Zero-Inverted) format coding?
3. What is the polling address of the ACC? (This is normally a two-letter hexadecimal code, and should be the same address code as that of the IBM front end processor.)
4. At what speed will the IBM host be operating? (This speed is normally specified in bps, and can be 1200, 2400, 4800, or 9600.)

Asynchronous Ports

The second set of questions pertains to the asynchronous ports:

1. Will the ACC be connected to the Apple computer/printer directly, or through a modem?
2. Do you want to set the port to autospeed (automatic speed detection)? Autospeed allows the incoming data to set the speed of the ACC port. It is used when a port is connected to a modem whose data rate may change; it is usually between 300 and 1200 bps.

3. At what speed will the port be operating? (This speed can be 300, 1200, 2400, 4800, or 9600 bps; however, if a port is set to autospeed, then it must be set to 1200 bps.)
4. Will a printer be connected to the port?
5. If so, what is the delay requirement of the printer? This delay allows time for the paper and the print head to move after a carriage return or a line feed. This information should be provided in the table of specifications in your printer manual. If you connect more than one printer to your ACC, answer this question for the printer requiring the shortest delay.

Configuring the Hardware

Once you and your customer have determined the configuration requirements, you must configure the ACC hardware to meet your specifications. Ideally, the hardware configuration should be done before the day of the demo. The set-up is not difficult, but it looks a little messy; therefore, you may want to do it before you meet with the customer.

Refer to the Cluster Controller User's Manual (Publ. #A9L0301), Part 1: Reference, pages 16-23, for details on the ACC configuration. Configuring the hardware requires you to take off the cover of the ACC and set quite a few switches. The ACC manual diagrams the necessary hardware configuration very well.

NOTE: If you will always be demonstrating your own ACC via a timesharing network to which you have subscribed, you need only set up the ACC once to meet that system's requirements.

Installation Steps:

1. Place the ACC in its operating position. Make sure that all the cables you are planning to use can reach the rear of the unit.
2. Connect the cable coming from the IBM front end processor (either directly or through a synchronous modem) to the SNA/SDLC (or BSC) port on the rear of the ACC.
3. If you are planning to use an asynchronous modem to connect printers or Apple computers to the ACC, make sure that the modem is set as follows:

Originate mode
Full-duplex
Speed matches that of the printer or computer

4. Connect the cables coming from your Apple computers, printers, or modems to the asynchronous ports. Secure the cable connectors to the ACC.

NOTE: There is no need for modem-eliminator cables in this set-up.

5. Make sure that the POWER switch is turned OFF. Then plug the power cord into the connector marked 115 VAC 60 HZ, at the rear of the ACC. Plug the other end of the cord into the wall outlet.
6. Set up terminal software. The location of your ACC and the recipient baud rate will determine the baud rate for the terminal software.

Demonstration of the Apple Cluster Controller

1. Turn on power for the appropriate computer and create a terminal document with the proper settings. (If the ACC is linked to the Apple computer via an asynchronous modem, you must establish communications with the ACC at this point.)
2. Turn the ACC's power switch to "on" and wait for self test to finish (green light on front panel will go on when it's complete).

The following ACC banner message will be displayed on your screen:

```
<<Apple/SSS-N VY,Z AA BB CC DD RRRR  
TTTT LU:X>>
```

This banner message gives information about your ACC's configuration:

Message Components and Meanings:

SSS	SNA for Model 76 BSC for Model 71
N	Number of ports recognized by the ACC
VY,Z	Internal software version number (Y is a number, Z is a letter)
AA	SWO address setting of SNA/SDLC, or BSC polling address
BB	SW1 terminal type setting

CC	SW2 prompting and autospeed detection settings
DD	SW3 printer option setting
RRRR	Current retransmission count from host to ACC
TTTT	Current retransmission count from ACC to host computer
LU:X	Local address of the terminal

3. The terminal type must be identified to the ACC. Press **Escape Control-B** and the ACC will display a list of terminal types and ask you to choose one. Your response will depend on what type of Apple computer you have.
4. Press **Escape Control-D**; you will get the prompt:

<<Enter XID:>>

Enter your XID number in response to this prompt (this command is for dial-up mode).

5. If you are communicating from the ACC to the front end via a synchronous modem, you must establish communication at this time. (Synchronous modem set-up: plug modem into AC line; set switch on front plate to TALK; plug phone line into connector labeled DIAL LINE on back of modem; plug phone handset into connector labeled TEL SET on back of modem; turn modem power switch to ON and check for dial tone.)
6. Dial phone number if using modem. When you hear tone, set modem front plate switch to NORMAL mode.
7. At this point, the host's banner screen should be transmitted to your computer.
8. Your Apple computer is now an IBM 3278 terminal. If you are logged on to the customer's system, you should allow the customer to experiment using his or her own system.

Special IBM Keys

Refer to Figure 6 (in Chapter 8) for the appropriate Macintosh 3278-2 keyboard equivalents when using the ACC. Refer to the Apple Cluster Controller User's Manual for greater detail on the use of the ACC.

Using Timesharing Services for Demos

A partial list of timesharing services to which you can subscribe in order to demonstrate the Apple Cluster Controller and AppleLine includes:

Boeing Computer Services
Litton-Mellonics
Electronic Data Systems (EDS)

The greatest advantage to using a timesharing service is that you can control the demo to a greater extent. However, it is more believable to the customer if he can tie into his or her existing network.

Important Tips and Hints for Demonstrations

The best demos of Macintosh and MacTerminal show the ease of use and consistency of user interface, in addition to the integration capability. In order to emphasize these critical selling points, the following outlines a demo for MacTerminal which you can duplicate on your system.

First, create a data set on your IBM mainframe within the environment that you will be tying into. For example, under the TSO operating environment, you can create a data set using the ISPF editor. Your technical support person should be able to do this either by using the HELP facility under ISPF, or by purchasing the appropriate user's guide from IBM. In some cases your timesharing service will create a data set for a fee. The data set should contain a small matrix of numbers (approximately 5x5). It should also include a title over each column. Once the data set is stored, you can use it as the permanent information to be copied and then pasted into a Multiplan® model. The data set is on the mainframe and can therefore be accessed by Macintosh by using either AppleLine or ACC.

Demonstrating MacTerminal in a 3270 Environment

Create a Multiplan model containing titles and formulas to receive the data set that will be copied from the mainframe. Remember to leave enough columns and rows empty to accommodate the data.. The formulas must be put into the model in advance so that the calculations will be performed as the numbers are pasted.

Create a MacTerminal document and make your connection to the IBM mainframe, following the instructions for demonstrating AppleLine or ACC, depending on which one you are using.

If you are using TSO:

Type "TSO"
Type your USER-ID
Type your PASSWORD
Type "ISPF"
Type your demo DATA SET NAME

Select the numbers you want copied and choose COPY TABLE from the Edit menu.

Now, log off the mainframe and open Multiplan:

Back out of ISPF
Log off of TSO
Quit MacTerminal
Open Multiplan model
Select a 5x5 matrix on Multiplan model
"Paste" numbers

Chapter 6

COMMUNICATIONS SOFTWARE PRODUCTS

The Desktop-to-Data-base Dating Decision or The Micro-to-Mainframe Software Marriage

Typical uses of corporate data bases exist in accounting, design and engineering, distribution, manufacturing, sales and marketing, research and development, and service departments. When considering software for the micro-to-mainframe marriage, people should consider those packages that are easy to use by non-technical personnel: the software should not require a programmer/analyst to operate it.

Features and capabilities to look for in a software package:

- **Access to corporate data bases**

Ability to do file transfers and extract partial reports. Upload and download screens of information. View and change information as needed.

- **Accuracy, integrity, security, and reliability of information**

Systematic backup of information. Passwords to restrict access to people with a need to know. Error checking built into hardware and software.

- **Auditability -- being able to trace transactions from input to update to output**

- **Applications software -- on the mainframe and on the micro**

Accounting -- A/P, A/R, G/L, Payroll, Inventory

Communications -- Text File Transfer, Graphics Transfer

Data Bases --

Mainframe: IDB, IMS/DB, IDMS-R, Nomad, Ramis

Micro: dBASE™II, dBASE III, DB Master™, Quick File®

Decision Support Software / Financial Modeling --

SAS/ETS econometric & modeling software; DSS/F

Integrated software packages for multiple-use applications --

AppleWorks™ from Apple Computer
Lotus® 1-2-3, Symphony™ and Jazz™ from Lotus
Framework™ from Ashton-Tate

Spreadsheets --

Mainframe: IFPS
Micro: VisiCalc®
SuperCalc®
Microsoft® Excel and Multiplan

Statistics --

BMDP, SPSS, Statpro

Specialized and Vertical Market --

Medical, Insurance, Banking, Construction, Legal

Wordprocessing --

AppleWriter™ from Apple Computer
WordStar® from Micropro
Microsoft Word
MacWrite from Apple Computer

- **Easy to read and comprehensive documentation**
- **Compatibility of the software with the operating system environment of your mainframe and/or micro:**

Mainframes and Minis: CICS, CMS, TSO, OS, DOS/VSE, MVS, VM, VTAM, IMS/DC, MVS/XA, ISAM, NCP with NTO, UNIX™

Micros: DOS 3.3, CP/M®, UNIX, ProDOS, MS-DOS™, UCSD, p-System

- **Training and support from the dealers and vendors**
- **User-friendliness of software**

Major vendors of mainframe-to-micro software are listed on the following pages.

Software Products for Micro-to-Mainframe Links

The following is a list of software products for use on either the mainframe end or the microcomputer end of a communications link. The reason that both compatible and competitive products are listed is that products that are competitive one day can be compatible the next day in this fast-moving business. We are trying to get the competitive companies compatible as soon as possible.

Apple Computer
20525 Mariani Avenue
Cupertino, CA 95014
408-996-1010

Apple Access // \$75.00
Digital Equipment Corporation VT-100 and VT-52 terminal emulation. 110 to 9600 bps. Includes data capture to disk and file transfer features. ProDOS-Based. Macro Capability. Transfers AppleWorks files.

Apple MacTerminal
Emulates VT-52, VT-100, IBM 3278 and TTY Terminals at 50-19,200 bps, 80- or 132-column width, XMODEM protocol, Pull-down PF keys. Converts files to tables for spreadsheet.

ABW Corp.
P.O. Box M 1047
Ann Arbor, MI 48106
313-971-9364
Teksim - Tektronics Terminal Emulation

Addison-Wesley
Applications Software Division
6 Jacob Way
Reading, MA 01867
617-655-9191
DSS/F Decision Support Software with Log-On communications program

Applied Data Research
Route 206 & Orchard Road, CN-8
Princeton, NJ 08540
201-874-9000
ADR/PC
Datacom/DB/DC
Empire Decision Support Tool
ADR/Librarian

AT&T Technology Licensing
P.O. Box 25000
Greensboro, NC 27420
919-697-5087
UNIX

Cincom Systems
2300 Montana Avenue
Cincinnati, OH 45211
800-543-3010
513-661-6000 662-2300
TOTAL DBMS \$13K-80K
TIS 4th-generation procedural language \$250K
Optional components: Intelligent Query, Comprehensive Retrieval, Intelligent Reporter, Decision Support.
Manage User Series:
Mancalc, Mantext, Mangraf, Mantis

Computer Associates International
125 Jerico Turnpike
Jerico, NY 11753
516-333-6700
800-645-3003
Owns IUS/Sorcim
CA Universe/Relational DBMS \$85K-102K

Communications Research Group
8939 Jefferson Highway
Baton Rouge, LA 70809
504-923-0888
BLAST - Blocked Asynchronous Trans

Comshare, Inc.
3001 South State Street
Ann Arbor, MI 48104
313-994-4800
Distributed W is a personal computer version of Comshare's mainframe W Software.

Cullinet Software
400 Blue Hill Drive
Westwood, MA 02090-2198
617-329-7700
IDMS, IDMS/R Relational database;
IDMS-DC; On-Line Query

Diversified Data Resources

25 Mitchell Boulevard, Suite 7
San Rafael, CA 94903
415-499-8870

Acom - Asynchronous Communication up to 9600 bps,
CRC error checking, IBM PC file transfer.
AcomHFT \$3,000; AcomFT \$240; Acom \$120

D & B Computing Services

187 Danbury Road
Wilton, CT 06897
203-762-2511
NOMAD 2 \$135K

Elcom Systems Peripherals

439 Harrison Street, Suite A
Corona, CA 91720
714-734-8220

EPS Consultants

1 Industrial Drive
Windham, NH
603-898-1800
FCS-EPS modeling software

Ergonomic Software, Inc.

305 East 86th Street
New York, NY 10028
212-427-2373

Execucom Systems Corp.

3410 Far West Boulevard
Austin, TX 78766
800-531-5038 512-346-4980
Interactive Financial Planning System (IFPS)
Goal Seeking, Monte Carlo (risk), Consolidation,
Sensitivity and Impact Analysis
Options: Graphics, Foreign File Interface,
Multiple Linear Regression,
Runs On: IBM, DEC, Prime, CDC, Honeywell, H-P, Wang
IFPS Decision Support Software \$64K
IFPS/SENTRY data entry and validation system \$12K
IFPS/DATASPAN transfers data into IFPS files \$10K
IFPS/Personal

Ferox Microsystems, Inc.

1201 North Ft. Meyer Drive
Arlington, VA 22209

IBM Corporation

1133 Westchester Avenue
White Plains, NY 10604
914-696-1900
IMS/VS/DB/DC \$1,310/Month+
DOS, DOS/MVT/VSE, DOS/VS,
OS/VS1, OS/VS2 (SVS and MVS),
SSX - Small System Executive/VSE \$15-20K

Informatics General Corporation

210 Ventura Boulevard
Woodland Hills, CA 91364
213-887-9040
401 Park Avenue South
New York, NY 10016
212-696-5700
Answer/DB - VisiAnswer
TAPS Transaction Processor, Application Development
Tool, Relational Datamanager

Information Builders, Inc.

1250 Broadway
New York, NY 10001
212-736-4433
FOCUS \$66K \$1680/month lease
PC/FOCUS

Intelligent Technologies

151 University Avenue
Palo Alto, CA 94301
415-328-2411

ISSCO

10505 Sorrento Valley Road
San Diego, CA 92121
619-452-0170
Tellegraf

Lotus Development

161 First Street
Cambridge, MA 02141
617-492-7171
800-343-5414
1-2-3 on IBM PC, XT, PCjr, 3270 PC, and PC-Compatibles
Jazz on Macintosh
Symphony on 3270/PC
Symphony on IBM PC/XT, PCjr

Management Science America (MSA), Inc.

3445 Peachtree Road
Atlanta, GA 30326
404-239-2000
PeachLink, Executive Peachpak II, DIF Interface with Lotus
1-2-3, Multiplan, VisiCalc

Mathematica

A Martin Marietta Data Systems Company
P.O. Box 2392
Princeton, NJ 08540
609-799-2600
RAMIS II \$40K-80K
Time Sharing: ADP, AVCO, Boeing Computer Services,
Informatics, Litton, Mellonics, Martin - Marietta,
National CSS, Time Sharing Resources,
RamLink for IBM PC and XT,
DIF for VisiCalc and Lotus 1-2-3

McCormack & Dodge
560 Hillside Avenue
Needham Heights, MA 02194
617-449-4012
PC Link

Mesa Graphics
P.O. Box 506
Los Alamos, NM 87544
Tekalike

Microcom
1400A Providence Highway
Norwood, MA 02062

Microsoft, Inc.
10700 Northrup Way
Bellevue, WA 98004
Access for IBM PC

Microstuf, Inc.
1845 The Exchange
Atlanta, GA 30339
Crosstalk XVI

Micro Tempus, Inc.
4 Farnham Place Bonaventure
P.O. Box 1339
Montreal, Quebec H5A 1H1
514-861-3335

On-Line Software International
Fort Lee, NJ 07024
OmniLink, OmniMicro

Oracle Corporation
2710 Sand Hill Road
Menlo Park, CA 94025
415-854-7350
Oracle R-DBMS \$12K

Pathway Design
177 Worcester Street
Wellesley, Massachusetts 02181
617-237-7722
800-343-0515

Pansophic Systems, Inc.
709 Enterprise Drive
Oak Brook, IL 60521
312-986-2260
Easytrieve

Ross Systems, Inc.
1860 Embarcadero Road
Palo Alto, CA 94303
415-856-1100
Management Aid for Planning Strategies (MAPS)
MAPS/DB \$12K-30K
DEC PDP-11, VAX-11 with RSTS/E and VMS

Seed Software
2300 Walnut Street, Suite 734
Philadelphia, PA 19103
215-568-2424

Softronic, Inc.
6626 Prince Edward Place
Memphis, TN 38119
901-755-5006
Softerm 1 and 2 - Terminal emulation software for the Apple IIe.

Software AG of North America
11800 Sunrise Valley Drive
Reston, Virginia 22091
703-860-5050
Natural -- 4th generation language
ADABAS -- Adaptable Data Base System
Runs on S/360, S/370, 303X, 4300, most compatibles. Runs under DOS, DOS/VS, DOS/VSE, OS, OS/VS.

SPSS, Inc.
444 Michigan Avenue, Suite 3000
Chicago, IL 60611
312-329-2400
SPSS Data Analysis System

Tominy, Inc.
4221 Malsbary Road
Cincinnati, OH 45242
513-984-6605
Data Base-Plus

Tymnet/Tymshare, Inc
2710 Orchard Parkway
San Jose, CA 95134
408-946-4900
InfoTym/PC

United Software Industries
ASCII Express "Professional"
1880 Century Park East, Suite 311
Los Angeles, CA 90067
619-562-9111
213-556-2211

Viking
2726 S. Moline Court
Aurora, CO 80014
303-337-2608

VM Personal Computing
60 E. 42nd Street
New York, NY 10165
212-697-4747
Please, Relay

Chapter 7

COMPETITIVE PRODUCT LISTING

The following is a list of manufacturers of competitive hardware for connecting personal computers to mini and mainframe computers.

AT&T Information Systems

P.O. Box 13970
Orlando, FL 32859
800-247-1212
Personal computers with 3270 capability

AT&T Communications

800-821-2121
Value Added Network
3270 emulation in the telephone circuit path

Avatar/ 3R Computers

18 Lyman Street
Westboro, MA 01581
617-366-5300
PA-1000 and PA-1500 protocol converters

AST Research, Inc.

Irvine, CA
714-540-1333
Protocol converters for IBM PC

Black Box Corp.

Pittsburgh, PA
Protocol converters

Burroughs Corporation

Burroughs Place
Detroit, MI 48232
313-972-7000
3270 terminals

Braegen Corp.

3340 East La Palma Avenue
Anaheim, CA 92086
3270 emulation with PC added-on

Carterphone Communications Corp.

Dallas, TX
Protocol converters

Computer Communications, Inc.

2610 Columbia Street
Torrance, CA 90503
800-421-1178
213-320-9101
Protocol converters

C. Itoh Electronics

CIE Terminals
2505 McCabe Way
Irvine, CA 92714-6297
800-854-5959
800-432-3687 in California
3270 terminals with PC's added-on

Codex

A Motorola Information Systems company
20 Cabot Boulevard
Mansfield, MA 02048
High Speed Synchronous Modems
Desktop computers with 3270, 3780 protocols

Commspecialists

206 East Park
Lebanon, OH 45036
513-932-8998

Commware

5710 Paradise Drive
Corte Madera, CA 94925
415-924-1777
Protocol converters

Control Data

8100 34th Avenue South
Minneapolis, MN 55440
612-853-8100
3270 terminals

Core Technology Corp.

1000 University Drive
Suite 109
Rochester, MI 48063
313-651-6421

CXI

3606 W. Bayshore Road
Palo Alto, CA 94303
415-424-0700

CXC Corporation

2852 Alton
Irvine, CA 92714
714-760-7171
PBX with 3270 emulation

Data General Corp.
4400 Computer Drive
Westboro, MA 02090

DataNetComm Inc.
P.O. Box 881283
San Francisco, CA 94188-1283
Protocol conversion devices

DCA/TAC
120 W. Wieuca Road, N.E.
Atlanta, GA 30042
404-252-1045
Protocol converters

Digital Equipment Corporation
146 Main Street
Maynard, MA 01754
VT-100/200 terminals

Digital Communications Associates, Inc. (DCA)
303 Technology Park
Norcross, GA 30092
404-448-1400
Protocol converters

Elcom Systems Peripherals
439 Harrison Street, Suite A
Corona, CA 91720
714-734-8220
Protocol converters

Fibronics International Inc.
218 W. Main Street
Hyannis, MA 02601
617-778-0700

Forte Data Systems
1500 Norman Avenue
Santa Clara, CA 95050
408-980-1750
800-233-3278
Protocol converters

Gateway Communications, Inc.
16782 Redhill Avenue
Irvine, CA 92714
714-261-0762

General Electric Information Services Company (GEISCO)
401 North Washington Street
Rockville, MD 20850
Value Added Network with 3270 emulation

GTE Spacenet Corporation
1700 Old Meadow Road
McLean VA 22102
703-790-7700
Value Added Network with 3270 emulation

IBM
National Accounts Division
1133 Westchester Avenue
White Plains, NY 10601
3270 Systems

IDEAssociates, Inc.
7 Oak Park Drive
Bedford, MA 01730
Protocol converters for IBM PC

Informer Computer Terminals, Inc.
22936 Mill Creek Road
Laguna Hills, CA 92653
3270 terminals

InteCom, Inc.
601 InteCom Drive
Allen, TX 75002
214-727-9141
PBX with built-in 3270 emulation

ITT Courier
1515 West 114th Street
Tempe, AZ
800-528-1400
3270 Terminals, IBM PC work-alikes

JBM Electronics
6020 N. Lindbergh Boulevard
St. Louis, MO 63042

Lee Data Corporation
7075 Flying Cloud Drive
Minneapolis, MN 55344
800-328-3998
3270 terminals

Lemcom Systems, Inc.
2104 W. Peoria Avenue
Phoenix, AZ 85029
602-944-1543

Le Roux International
3090 Acushnet Avenue
New Bedford, MA 02745
617-995-8519

Local Data
2701 Toledo Street
Suite 706
Torrance, CA 90503
213-320-7126

MA/Comm Data Communications Group
11717 Exploration Lane
Germantown, MD 20874-9989
Modems, multiplexers, error controllers

Memorex Corporaton

1125 Memorex Drive
Santa Clara, CA 95052
3270 terminals, cluster controllers

NCR Corporation

Box 606
Dayton, OH 45479
Mainframes, terminals, PC's

NCR Comten

2700 Snelling Ave. North
St. Paul, MN 55113
Communications equipment

Northern Telecom

259 Cumberland Bend
Nashville, TN 37228
PBX's with built-in protocol conversion

Northern Telecom

Business Communications Systems
1001 East Arapaho Road
Richardson, TX 75081

Northern Telecom

Terminal Systems Division
Data Park, P.O. Box 1222
Minneapolis, MN 55405

Phaze Information Machines, Corp.

7650 East Redfield Road
Scottsdale, AZ 85260
800-423-2994

Phaser Systems, Inc.

24 California Street
San Francisco, CA 94111
415-434-3990

PCI/ Protocol Computers, Inc.

6150 Canoga Avenue
Woodland Hills, CA 91367-3773
800-423-5904
213-716-5500 in California

Personal Systems Technology, Inc.

Persyst Products
15801 Rockfield Boulevard, Suite A
Irvine, CA 92714
714-859-8871
Protocol converters

Renex Corporation

6901 Old Keene Mill Road
Springfield, VA 22150
703-451-2200
Protocol converters

Rolm/IBM

4900 Old Ironsides Drive, M/S 626
Santa Clara, CA 95050
800-538-8154
408-986-3025
PBX's with built-in 3270 emulation

Rixon, Inc.

2120 Industrial Parkway
Silver Spring, MD 20904
301-622-2121
Synchronous modems

Sperry / Univac

Township Line & Jolly Road
P.O. Box 500
Blue Bell, PA 19424
Mainframes, communications equipment

Teletype Corporation

5555 Touhy Avenue
Department 3223-E
Skokie, IL 60077
800-323-1229
3270 terminals

Thomas Engineering

1040 Oak Grove Road
Concord, CA 94518
Protocol converters

Tymnet, Inc.

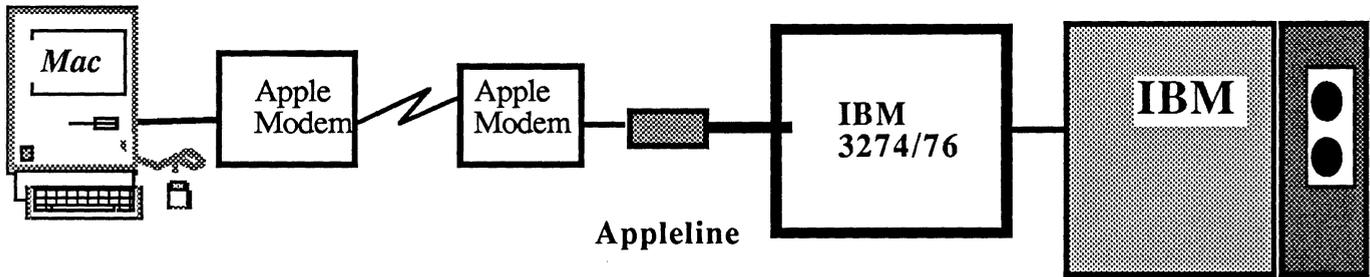
Division of McDonnell Douglas
2710 Orchard Parkway
San Jose, CA 95134
Value-Added Network

Telenet

Division of GTE
Network Systems & International Services
8229 Boone Boulevard
Vienna, VA 22180
703-442-1000
Value-Added Network

Chapter 8

APPLELINE LOCATED AWAY FROM APPLE COMPUTER



APPLELINE LOCATED NEAR APPLE COMPUTER

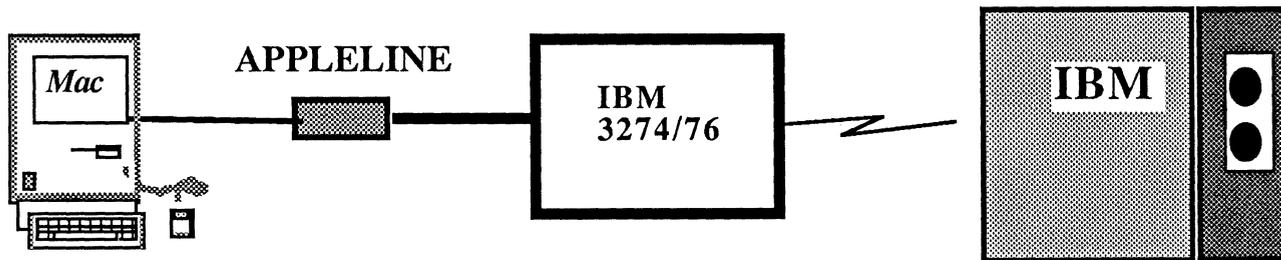


Figure 5

Mac Keyboard Equivalents for 3278-2 Using AppleLine

Macintosh Keyboard Equivalents for 3278-2 using AGC

IBM Key	Apple Keystrokes	IBM Key	Apple Keystrokes
DUP	Control U	PF22	Escape]
Field Mark	Control Y	PF23	Escape _
PA1	Escape [PF24	Escape +
PA2	Escape]	New Line	Return
PF1	Escape 1	Tab	Tab
PF2	Escape 2	Back Tab	Control K
PF3	Escape 3	Home	Control /
PF4	Escape 4	Left Cursor	Control <
PF5	Escape 5	Right Cursor	Control >
PF6	Escape 6	Up Cursor	Control ↑
PF7	Escape 7	Down Cursor	Control ↓
PF8	Escape 8	Attn	Control A
PF9	Escape 9	Sys Req	Control B
PF10	Escape 0	Cursr Sel	Control D
PF11	Escape -	Clear	Control E
PF12	Escape =	Erase Input	Control L
PF13	Escape	Erase EOF	Control F
PF14	Escape @	Print	Control P
PF15	Escape #	Ident	Control V
PF16	Escape \$	Test	Control T
PF17	Escape %	Reset	Control R
PF18	Escape ^	Dev Cncl	Control X
PF19	Escape &	Insert	Control I
PF20	Escape *	Delete	Control _
PF21	Escape (Enter	Enter

IBM	Mac	IBM	Mac
ATTENTION	ENTER	PF24	TILDE g
ENTER	RETURN	PA1	TILDE z
PF1	TILDE 0	PA2	TILDE x
PF2	TILDE 2	PA3	TILDE n
PF3	TILDE 3	CLEAR	TILDE m
PF4	TILDE 4	SYS REQ	TILDE .
PF5	TILDE 5	BACKSPACE	command h
PF6	TILDE 6	DUPLICATE	command n
PF7	TILDE 7	FIELD MARK	command w
PF8	TILDE 8	HORIZ. TAB	command l
PF9	TILDE 9	BACK TAB	command o
PF10	TILDE 0	ERASE EOF	command x
PF11	TILDE -	ERASE INPUT	command r
PF12	TILDE =	INSERT MODE	command y
PF13	TILDE q	DELETE	command i
PF14	TILDE w	NEW LINE	command j
PF15	TILDE e		
PF16	TILDE r		
PF17	TILDE l		
PF18	TILDE y		
PF19	TILDE u		
PF20	TILDE j		
PF21	TILDE o		
PF22	TILDE p		
PF23	TILDE l		

Figure 6

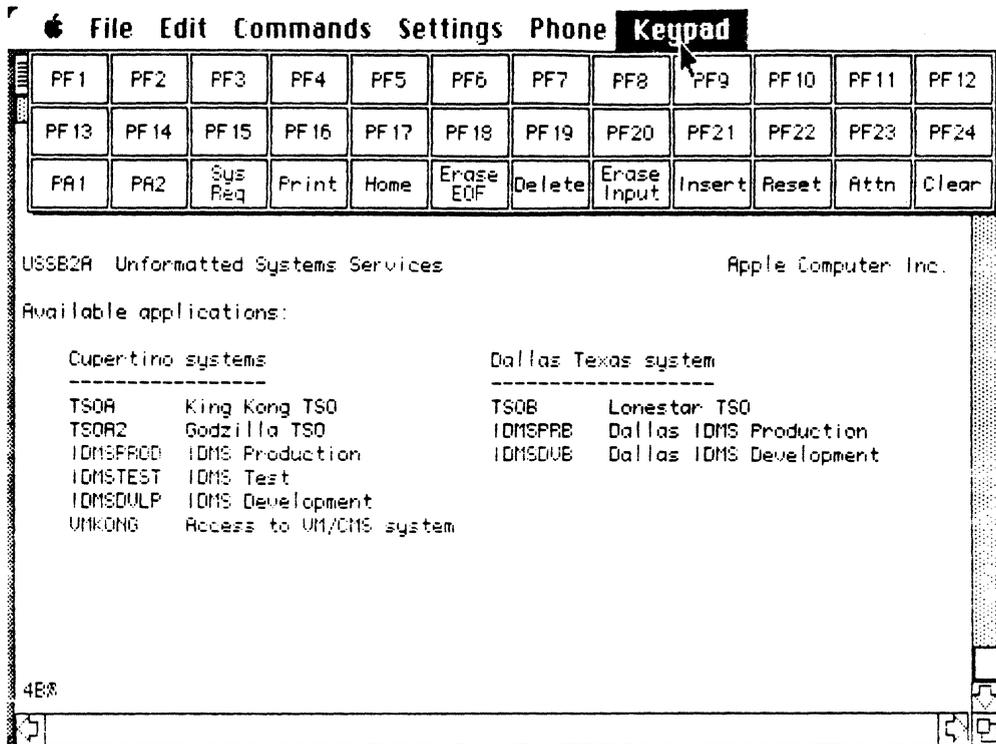


Figure 7

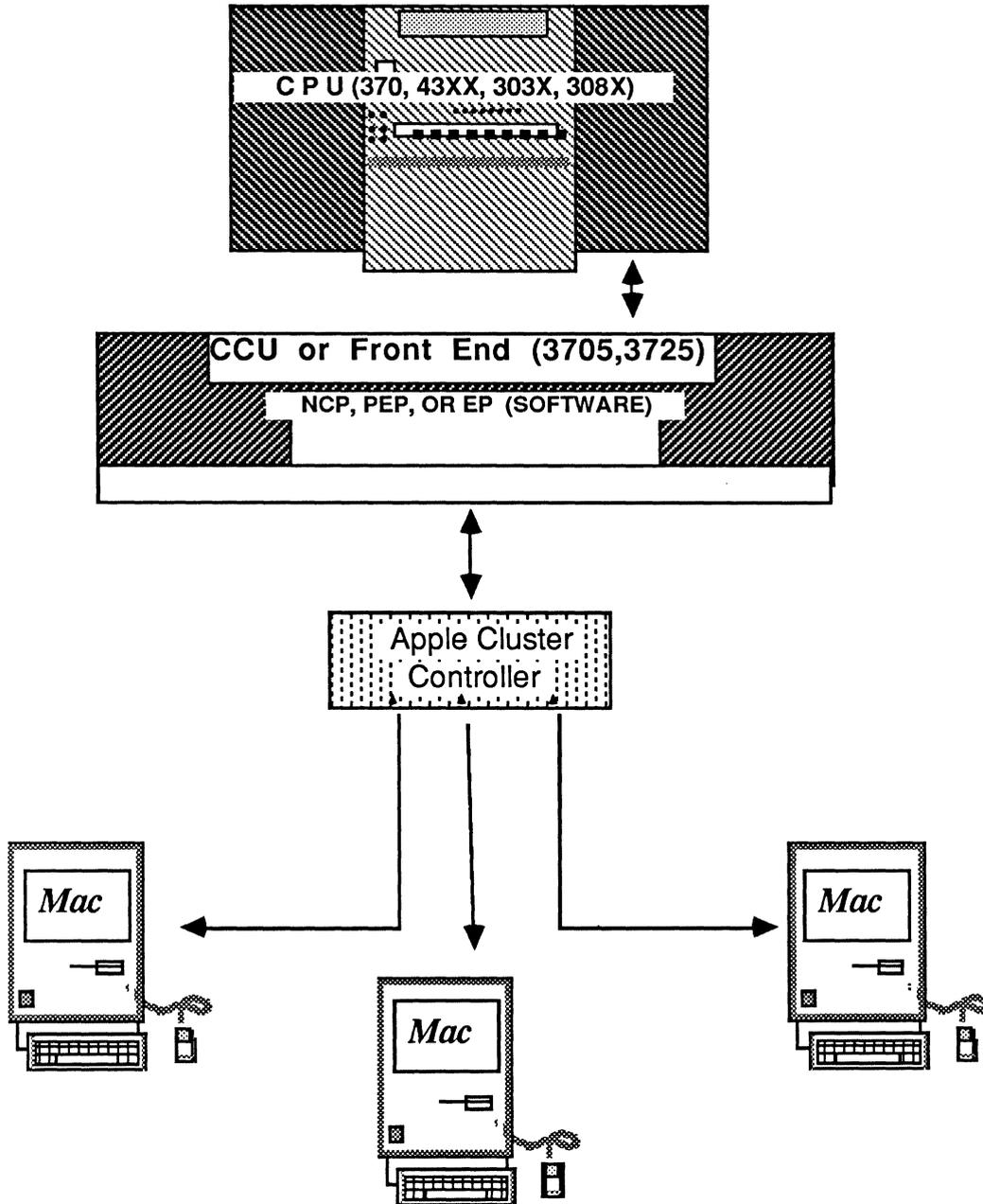


Figure 8

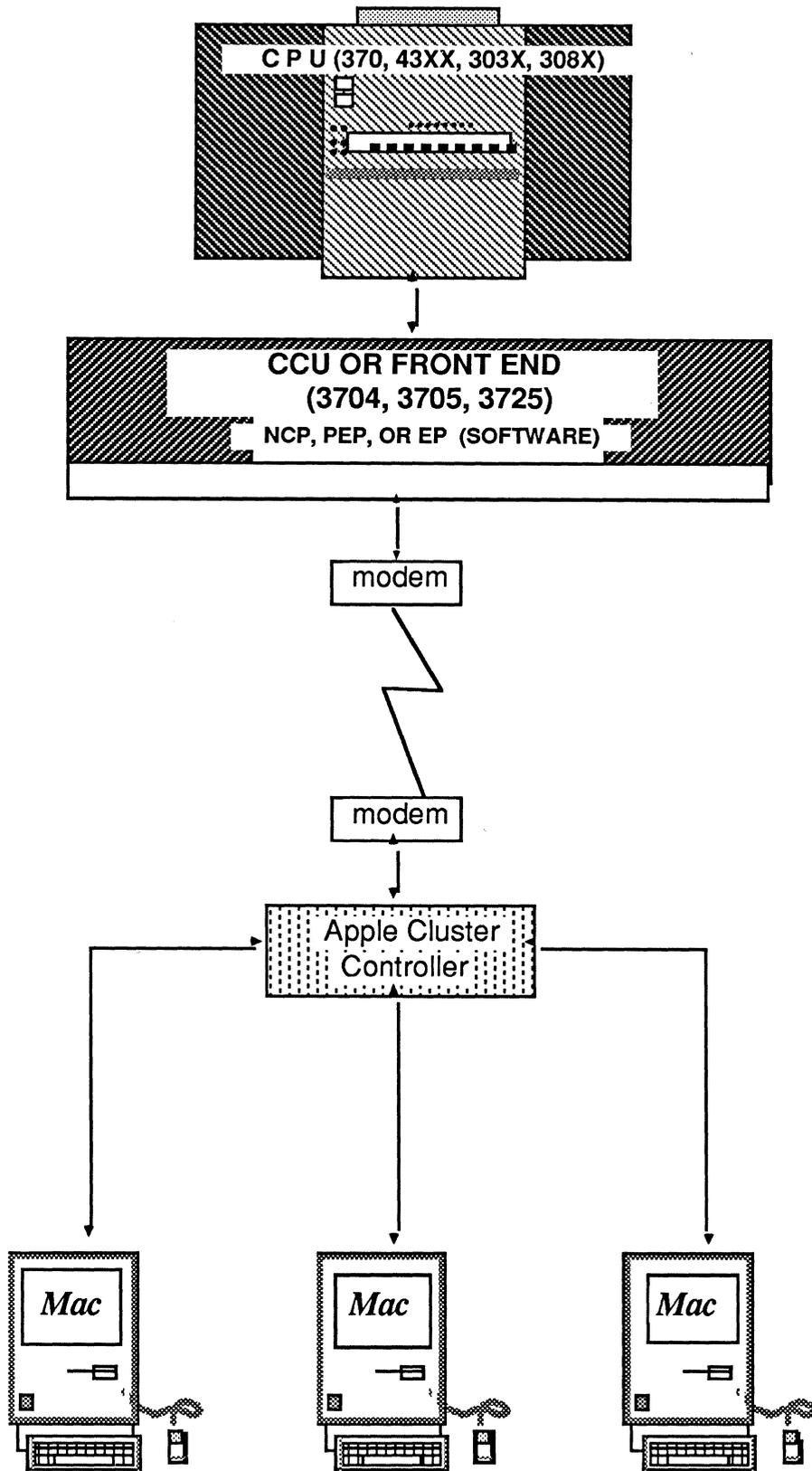


Figure 9

CPU (IBM 370, 43XX, 303X, 308X, 309X)

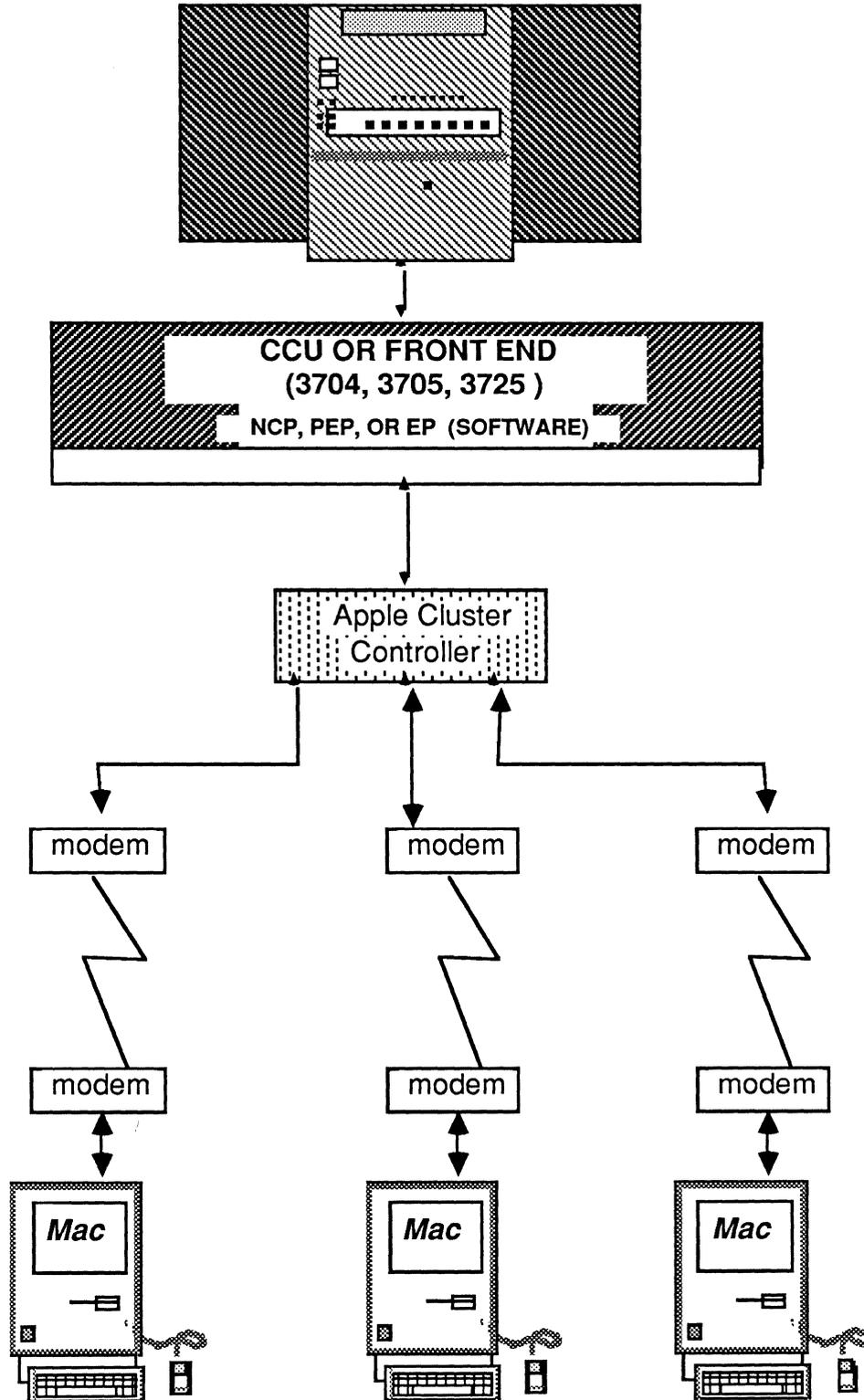


Figure 10

Glossary and Abbreviations

Access

Generally, the obtaining of data from a storage device or peripheral.

Access Method

The technique and/or program code for moving data between main storage and I/O devices. Existing access methods include: basic access method, basic direct access method, basic indexed sequential access method, basic partitioned access method, basic sequential access method, basic telecommunications access method, queued indexed sequential access method, queued sequential access method, queued telecommunications access method.

Access Time

The time interval between when data is called for or requested to be stored in a storage device and when delivery or storage is completed.

Acknowledge Character (ACK)

A transmission control character transmitted by a station as an affirmative response to the station with which a connection has been set up. An acknowledge character may also be used as an accuracy control character.

Acronym

A word formed from the first letter (or letters) of the words in a phrase or name. (Example: "IBM" for International Business Machines.)

Acoustic Coupler

A type of low-speed modem frequently used with portable terminals. It sends and receives data using a conventional telephone handset and does not require a permanent connection to the line.

Address

A coded representation of the destination of data, or of the originating terminal. Multiple terminals on one communication line, for example, must have unique addresses. Telegraph messages reaching a switching center carry an address before their text to indicate the destination of the message.

Advanced Communications Function/Telecommunications Access Method (ACF/TCAM)

A high-level access method which supports a large selection of terminals (BSC, S/S, Local Attachment and SDLC) and offers support for most MVS and VS1 applications.

Advanced Communications Function/Virtual Telecommunications Access Method (ACF/VTAM)

Provides an "operating system" for the network. Its functions are analogous to the function of a host operating system in terms of resource sharing and logical handling of user requests.

Advanced Data Communications Control Protocol (ADDCP)

A communications protocol endorsed by the American National Standards Institute. It is a bit-oriented protocol.

American National Standard Code for Information Interchange (ASCII)

(1) A coded character set consisting of 7-bit coded characters (8 bits including parity check), used for information interchange among data processing systems, data communication systems, and associated equipment. The ASCII set consists of alphanumeric characters, control characters, and graphic characters. (2) A widely used asynchronous protocol based on ASCII code.

Analog

Referring or pertaining to a signaling technique in which a transmission is conveyed by modulating (varying) the frequency, amplitude, or phase of a carrier. An analog signal is typified by a continuous wavelike pattern. Analog signaling is generic to the public switched telephone network, as well as to certain other audio frequency and radio frequency facilities. A digital baseband signal generated by a business machine must be converted to analog form in order to transmit that signal over an analog facility, for example, a voice-grade telephone line.

Application Layer

The functional layer of SNA, in which the end user's application program is executed.

Asynchronous

Occurring without a regular or predictable time relationship to a specified event (for example, the transmission of characters one at a time as they are keyed). Contrast with synchronous.

Asynchronous Transmission

Digital data transmission format in which start and stop bits identify the beginning and ending of each character. Also called start-stop bits.

Auto-Answer

A modem capability that allows automatic "pick-up" when the phone rings.

Auto-Dial

The ability to automatically make a connection with another modem.

Automatic Send-Receive

A teleprinter terminal with paper tape or magnetic tape devices, or editable internal memory. Refers to any keyboard terminal with off-line storage capabilities that permits a message to be generated off-line for later transmission.

Balanced Circuit

A circuit, terminated in a network, whose impedance balances the impedance of the line so that the return losses are negligible.

Baseband

The frequency band occupied by information-bearing signals before they are combined with a carrier in the modulation process.

Basic Telecommunications Access Method (BTAM)

An access method that permits read/write communications with remote devices.

Batched Job

A job that is grouped with other jobs as part of an input stream to a computer system.

Batch Processing

A technique of data processing in which jobs are collected and grouped before processing. Data is collected over a period of time and then submitted to the host machine for processing.

Baud

A measure of data rate, often used to denote bits per second. A baud is equal to the number of discrete conditions or signal events per second. There is disagreement over the

appropriate use of this word, since at speeds above 2400 bps, the baud rate does not equal the data rate in bits per second.

Bell Operating Companies (BOC's)

The seven Regional Operating Companies created since divestiture of AT&T.

Binary

The base-2 numbering system; uses only the symbols 0 and 1. It is especially well adapted to computer use since 0 and 1 can be used to represent on and off or negative charges and positive charges. The binary digits appear in strings of 0's and 1's. Most computers do their calculations in binary.

Binary Coded Decimal (BCD)

A binary-coded notation in which each of the decimal digits is represented by a binary numeral. For example in binary-coded decimal notation that uses the weights 8-4-2-1, the number "twenty three" is represented by 0010 0011 (compare to 10111, its representation in the pure binary numeration system).

Binary Synchronous Communications (BISYNC of BSC)

A half-duplex, character-oriented data communications protocol originated by IBM in 1964. It included control characters and procedures for controlling the establishment of a valid connection and the transfer of data. Also called bisync and BSC. Although still enjoying widespread usage, it is being replaced by IBM's more efficient protocol, SDLC.

Bit

The commonly used abbreviation for binary digit. A bit is the smallest unit of information recognized by a computer, and is a unit of information corresponding to a choice between two alternatives (such as one and zero).

Bit Error Rate Testing (BERT)

Testing a data line with a pattern of bits which are compared before and after the transmission to detect errors.

Bit Rate

The rate at which bits (binary digits) are transmitted over a communications path. Normally expressed in bits per second (bps). The bit rate is not to be confused with the data signaling rate (Baud) which measures the rate of signal changes being transmitted.

Bits Per Second (bps)

The basic unit of data communications rate measurement. Usually refers to rate of information bits transmitted.

Block

A group of characters, bytes, or words communicated as a unit.

Block Error Rate Testing (BLERT)

Testing a data line with groups of information arranged in blocks which are compared before and after the transmission to detect errors (see BERT)

Blocking

A condition in a switching system in which no paths or circuits are available to complete a call and a busy tone is returned to the calling party. In this situation there is no alternative but to hang up and try the call again. Also referred to as denial or busy condition.

Burroughs Data Link Control (BDLC)

A bit-oriented protocol.

Bypass

The act of going around the local central telephone company office using customer premises equipment.

Carrier

A signal of known characteristics (for example, frequency) which are altered (modulated) to transmit information. Knowing the expected signal, the receiving terminal interprets any change in signal as information. Changes to the signal made by outside influences (noise) can cause the receiving terminal to misinterpret the information transmitted.

Centrex

A type of private branch exchange service where incoming calls may be dialed direct to extensions without operator assistance. Out-going and intercom calls are dialed by extension users.

Channel

(1) In data communications, a one-way path along which signals can be sent between two or more points. Contrast with circuit. (2) In telecommunications, a transmission path (may be one-way or two-way, depending on the channel) between two or more points. Provided by a common carrier; also called a link, line, circuit, or facility.

Character

An informational/language unit composed of a group of bits.

Character Error Rate Testing (CERT)

Testing a data line with test characters to determine error rate.

Circuit

A two-way path along which signals can be sent between two or more points. See also channel.

Clocking

Synchronizing of communications information.

Cluster

A group of user terminals co-located and connected to a single controller through which each terminal is afforded the opportunity to access a single communication line.

Cluster Control Unit

A device, such as the IBM 3274 Control Unit, that can control the input/output operations of more than one terminal, such as a group (cluster) of 3278 Display Stations.

Common Carrier

A company that furnishes communications services to the general public at public-regulated prices. In data communications, a public utility company that is recognized by an appropriate regulatory agency as having a vested interest and responsibility in furnishing communications services to the general public (for example, AT&T, MCI and GTE).

Communication

Transmission of intelligence between points of origin and reception without alteration of sequence or structure of the information content. See also data communication.

Communication Controller

A type of communications control unit whose operations are controlled by a program stored and executed in the unit. Examples are the IBM 3704 and 3705 Communication Controllers.

Computerized Branch Exchange (CBX)

A telephone switch that is controlled by a computer.

Concentrator

An electronic device that interfaces in a store-and-forward mode with multiple low-speed communications lines and then retransmits those messages via one or more high-speed communications lines to a processing site.

Consultative Committee on International Telephone and Telegraph (CCITT)

A United Nations group that develops standards for international telecommunications carriers.

Contention

Competition by users for the use of the same communications facilities; a method of line control in which terminals request or bid to transmit. If the channel is not free, the terminals must wait until it is free.

Control Character

A coded character which does not print but initiates some kind of machine function such as a carrier return.

Conversational Monitor System (CMS)

A component of VM/370 which provides a high-performance, interactive computing system suitable for general problem solving and program development and which can serve as a base for interactive applications.

Converter

A device capable of converting impulses from one mode to another, such as analog to digital or parallel to serial, or from one code to another.

Customer Information Control System (CICS)

An IBM data base/data communication (DB/DC) program product that provides an interface between the operating system access methods and applications programs to allow remote or local display terminal interaction with the data base in the central processor. Different versions include Time Management facilities and support for bisync, dial-up, PL/1 support and expanded data base control items such as file browsing and dynamic file open and close.

Cyclic Redundancy Check

A powerful error-detection technique. Using a polynomial, a series of two 8-bit block check characters are generated that represent the entire block of data. The block check characters are incorporated into the transmission frame, then checked at the receiving end.

Data

Any type of information, including numbers, letters, or symbols, that can be processed by a computer.

Data Access Arrangement (DAA)

A telephone-switching system protective device used to connect non-telephone-company-manufactured equipment to the carrier network.

Data Communication Equipment (DCE)

The equipment installed at the user's premises which provides all the functions required to establish, maintain and terminate a connection, and perform the signal conversion and coding between the data terminal equipment and the common carrier's line. (For example, data sets, modems.)

Data Communications

A broad term covering any exchange of information between computers or similar systems over telephone lines.

Data Compression

A technique that saves storage space by eliminating gaps, empty fields, redundancies, or unnecessary data to shorten the length of records or blocks. For data transmission, a byte string of data is transmitted as a count plus a string value.

Data Integrity

A performance measure based on the rate of undetected errors. See also integrity.

Data Language/I (DL/I)

Used for reducing application programs and file maintenance while allowing more sharing of data by multiple programs and users.

Data Link

The physical connection and the connection protocols between units that exchange data over a communications line.

Dataphone Digital Service (DDS)

An AT&T leased line service offering digital transmission at speeds ranging from 2400 bps to 1.544M bps.

Data Terminal

Data processing equipment that is used for collection, use, or transfer of data.

Data Terminal Equipment (DTE)

Equipment comprising the data source, the data sink, or both, that provides for the communication control function (protocol). Data termination equipment is actually any piece of equipment at which a communications path begins or ends.

Decibel (dB)

Power level measurement unit. 1/10 Bel.

Demodulation

The opposite of modulation; the conversion of a signal from analog to its original, for example, digital form.

Dial-up Line

A communications circuit that is established by a switched circuit connection.

Dibit

A pair of bits treated as one information element. In modulation schemes with more than two states, multiple bits are represented by each state. The term "dibit" originally was used for the AT&T 201 series of modems, which used four phase states to encode information; each state could therefore represent two bits.

Digit

A character used to designate a quantity. The decimal system uses the digits 0-9; binary system: 0-1; hexadecimal system: 0-F. See also binary digit.

Digital

Referring or pertaining to a signaling technique in which a transmission is conveyed by generating pulses of electromagnetic energy in a discontinuous (on/off) coded pattern representing, for example, bits in a data stream. Contrast with analog.

Digital Data Communications Message Protocol (DDCMP)

A Digital Equipment Corporation data communications line protocol.

Digital Service Unit or Data Service Unit (DSU)

A device for amplifying, timing, and converting unipolar digital signals into bipolar digital signals suitable for transmission to the Central Office.

Direct Access Storage Device (DASD)

A device in which the access time is effectively independent of the location of the data.

Direct Distance Dialing (DDD)

A means for making long-distance telephone calls over the switched telephone network without operator assistance.

Disk Operating System/Virtual Storage Extended (DOS/VSE)

Disk-resident virtual storage operating system. Runs on S/370 (Model 115-158), 3031, and 43XX.

Distributed Office Support System (DISOSS)

A collection of systems and software that is aimed at integrating various IBM office product components. It is the foundation for much of the work in the DIA/DCA area.

DPPX/Data Base and Transaction Management System (DPPX/DTMS)

An online transaction system which runs on the 8100 under DPPX. Similar to CICS/VS for 370 users.

DPPX/SP

A program product which provides a simplified, full-screen, interactive interface to the DPPX command facility.

Document Content Architecture (DCA)

A method of defining the rules and format of documents which are known to programs and other systems. This scheme requires the program to format and store or transmit known formats between applications.

Document Interchange Architecture (DIA)

An access protocol to allow the transmission of documents over an SNA type of network. It relies heavily on the Advanced Program-to-Program Communication (APPC) technique.

Dual In-Line Package (DIP)

The most common integrated circuit package having dual, or parallel, rows of pins at 0.1-inch intervals.

Dumb Terminal

A device with a keyboard for inputting data, and a display screen for the output of data, but without local processing capability. A dumb terminal provides remote access to a computer but cannot itself be programmed.

Duplex

(1) (ISO) In data communications, pertaining to a simultaneous two-way independent transmission in both directions. Synonymous with full-duplex. (2) Contrast with half-duplex.

Electronics Industries Association (EIA)

A standards organization specializing in electrical and functional characteristics of interface equipment.

Electronic Switching System (ESS)

A type of telephone switching system which uses a special-purpose stored-program digital computer to direct and control the switching operation. ESS permits the provision of custom calling services such as speed dialing, call transfer, and three way calling.

Emulation

The use of programming techniques and special machine features to permit a computing system to execute programs written for another system. This form of imitation is primarily done via software. Emulation is generally used to minimize the impact of conversion from one computer system to another, and is used to continue the use of production programs. (As contrast to "simulation", which is used to study the operational characteristics of another, (possibly theoretical) system.)

Error Detection and Correction

A system employing an error detecting code and so arranged that a signal detected as being in error automatically initiates a request for retransmission.

Extended Binary-Coded Decimal Interchange Code (EBCDIC)

A coded character set consisting of 8-bit coded characters. EBCDIC is the usual code generated by synchronous IBM devices.

Facsimile (FAX)

A system for the transmission of images. The image is scanned at the transmitter, reconstructed at the receiving station, and duplicated on some form of hard copy.

Federal Communication Commission (FCC)

A board of commissioners empowered to regulate all interstate communications between the U.S. and other countries.

Foreign Exchange Service (FEX)

A service that connects a customer's telephone to a remote exchange. This service provides the equivalent of local telephone service to and from the distant exchange.

Forward Error Correction (FEC)

The technique which provides for the transmittal of additional information with the original bit stream such that if an error is detected the correct information can be recreated at the receiving end without a retransmission.

Four-wire Channel

Provision of two pairs of wires (or logical equivalent) for simultaneous two-way transmission.

Four-wire Circuits

Indicates the capability of the switching system to accommodate connections to special 4-wire circuits.

Framing Bits

In data transmission, noninformation carrying bits used to make possible the separation of characters in a bit stream. Synonymous with sync bits.

Frequency Division Multiplexing (FMD)

Division of the available transmission frequency range into narrower bands each of which is used for separate channels.

Frequency Modulation (FM)

A method of transmission whereby the frequency of the carrier wave is changed to correspond to changes in the wave signal.

Frequency Shift Keying (FSK)

A method of frequency modulation in which frequency is made to vary at significant instants by smooth as well as abrupt transitions.

Front End

An auxiliary computer system which performs network control operations, relieving the host computer system to do data processing.

Front-End Processor

A communications processor which regulates the flow of information between the host computer and other elements of a communications system.

Full-Duplex

Able to transmit in two directions simultaneously.

Full/full Duplex

A protocol which, when operating on a multidrop line, is capable of transmitting from the master location to one of the slave sites, while, at the same time, enabling the master location to receive a transmission from a different slave site on the same line.

Geosynchronous

A communications satellite orbit at the correct distance from the earth and at the correct speed to be fixed with respect to the earth as it rotates.

Half-Duplex

Able to transmit in two directions but not simultaneously.

Handshake

An exchange of control sequences between two locations to set up the correct parameters for transmission.

High-level Data Link Control (HDLC)

An ISO standard data communications line protocol.

Houston Automatic Spooling Priority (HASP)

A computer program that provides supplementary job management, data management, and task management functions such as control of job flow, ordering of tasks, and spooling.

Information Management System/Virtual System (IMS/VS)

IBM data base management software system that also provides communications monitor functions.

Intelligent Terminal

A terminal that can input data, edit, receive results, and be programmed (same as Smart Terminal).

Interactive Processing

The exchange of information and control between a user and a computer on an ongoing current basis; not in batch mode. Also called conversational.

Interface

A shared boundary. An interface might be a hardware component to link two devices, or it might be a portion of storage or registers accessed by two or more computer programs.

International Standards Organization (ISO)

An international federation of national standards organizations which also becomes involved in developing standards, including communications standards.

Job Entry Subsystem (JES)

A system facility for spooling, job queuing, and managing I/O under MVS.

Leased Line/Private Line/Dedicated Line

A communications line for voice and/or data, leased from a communications carrier on a monthly basis.

Limited Distance Modem

A short-haul modem or line driver that operates over a limited distance. Some limited distance modems operate at higher speeds than modems that are designed for use over analog telephone facilities, since line conditions can be controlled better over shorter distances.

Line Driver

An alternative device to a modem when transmitting via EIA cable over short distances. The line driver amplifies the signal and reshapes distorted pulses.

Line Hit

A disturbance causing a detectable error on a communications line.

Line Protocol

A control program used to perform data communications functions over network lines. Consists of both handshaking and line-control functions which move the data between transmit and receive locations.

Local Area Network

A user-owned, user-operated, high-volume data transmission facility connecting a number of communicating devices (computers, terminals, word processors, printers, mass storage units, robots, etc.) within a single building or campus of buildings.

Loop Current

A teletypewriter-to-line interface and operating technique without modems.

Management Information System (MIS)

(1) Management performed with the aid of automatic data processing. (2) An information system designed to aid in the performance of management functions.

Mark

The signal (communications channel state) corresponding to a binary "1". The marking condition exists when current flows (current-loop channel) or when the voltage is less than -3 volts (EIA RS-232-C channel).

Metallic Circuit

A physical wire between two points as opposed to microwave or fiber optics.

Modem

A device to convert computer signals into a form that is suitable for transmission over telephone lines. (Stands for modulator-demodulator.)

Modem Eliminator

A device for connecting two DTE interfaces physically and logically without requiring intervening modems.

Modulation

The application of information onto a carrier signal by varying one or more of the signal's basic characteristics (frequency, amplitude, or phase); the conversion of a signal from its original (e.g., digital) format to analog format.

Multidrop or Multipoint

A single line connecting more than one terminal. Communication is done on a time-share basis.

Multiple Virtual Storage (MVS)

An alternate name for OS/VS2.

Multiplex

Combines signals of multiple channels into one channel.

Negative Acknowledge Character (NAK)

A transmission control character that indicates a block of data was received incorrectly.

Network

A computer communications system consisting of one or more terminals communicating with a single host computer system, which acts as the network control component through internal programming or through a front end processor. The chief characteristic of a network is the single, controlling host computer system, which may include multiple processors. The general use of the word "network" to mean a collection of interconnected components is no longer precise, just as the word "system" no longer carries the connotation of close proximity of components.

Network Address

In SNA, the address, which consists of subarea and element subfields, and uniquely identifies a link or the location of a network-addressable unit. The conversion from a local address to a network address, or vice versa, is accomplished as part of the boundary function in the node attached to a cluster controller node or a terminal node.

Network Control Program (NCP)

Resides in the 3705 Communications Controller and provides the physical management of the communications network. Its main function is to control attached lines and terminals, perform error recovery, and route data through the network. NCP communicates with the host through VTAM, EXTM, ACP, or TCAM, or through another NCP.

Network Terminal Option (NTO)

A software protocol converter that resides in the front end processor

Non-Return-To-Zero (NRZ)

Pertains to both magnetic recording and communications.

Non-Return-To-Zero-Inverted (NRZI)

Non-Switched Lines

A communications link which is permanently installed between two points.

Off Hook

Activated (in regard to a telephone set). By extension, a data set automatically answering on a public-switched system is said to go "off hook."

On-line System

A data communications system which processes data as it is received by the host computer.

Open System Interaction (OSI)

Layered data communication model, or architecture, developed by the International Standards Organization.

Operating System/Virtual Storage 2 (OS/VS2)

An extension of the IBM System 360 Operating System that supports relocation hardware and the extended control facilities of System/370.

OS Disk Operating System/Virtual Storage Extended (OS/DOS/VSE)

Packet Assembler/Disassembler (PAD)

A software module that receives characters from terminals, assembles them into packets and sends them down the line. The receiving end disassembles the packets and sends the characters to the terminal.

Packet Switching

A data transmission technique in which a long message is broken into smaller units called packets. These packets can be individually addressed and routed through the network using several different routes. The receiving end node ascertains that all packets are received and are in the proper sequence before forwarding the complete message to the addressee.

Parity

A constant state or equal value. Parity checking is one of the oldest error checking techniques. Character bit patterns are forced into parity (by adding a one or zero bit as appropriate, as they are transmitted; the parity (odd or even) is then verified upon receipt by the receiving device.

Parity Bit

A check bit appended to an array of binary digits, to make the sum of all the binary digits, including the check bit, always odd or always even.

Phase Shift Keying (PSK)

A method of modulation that uses the differences in phase angle to indicate a certain bit or dibit. A reference oscillator determines the phase angle change of the incoming signal, which in turn determines which bit or dibit is being transmitted.

Physical Unit (PU)

Point-to-Point

Pertaining or referring to a communications line where exactly two stations are connected. Contrast to multipoint.

Polling

A procedure which asks a terminal on a network if there is any information to transmit; usually done on a multipoint line.

Private Automatic Branch Exchange (PABX)

An automatic switchboard for handling large concentrations of telephones (extensions). Synonymous with PBX.

Professional Office System (PROFS)

An IBM VM-based product that supports the functions of calendar management, electronic mail, project scheduling, and the execution of a variety of analysis tools. Its focus is the manager or the professional.

Protocol

A set of procedures for establishing and controlling transmissions. Examples include BSC and SDLC.

Protocol Conversion

The process of translating the protocol native to an end-user device (for example, a terminal) into a different protocol (for example, ASCII to BSC), allowing that end-user device to communicate with another device (for example, a computer) with which it would otherwise be incompatible. Protocol conversion can be performed by a dedicated device (a "protocol converter"); by a software package loaded onto an existing system, such as a general-purpose computer, front end processor, or PBX system; or by a value-added network, such as Telenet.

Public Data Network (PDN)

A networking service which fulfills all communications needs between the host computer and other processors and terminals.

Pulse Modulation

The modulation of the characteristics of a series of pulses in one of several ways to represent the information-bearing signal. Typical methods involve modifying the amplitude (PAM), width or duration (PDM), or position (PPM). The most common pulse modulation technique in telephone work is pulse code modulation (PCM). In PCM, the information signals are sampled at regular intervals and a series of pulses in coded form are transmitted, representing the amplitude of the information signal at that time.

Quadrature Amplitude Modulation (QAM)

16-level encoded amplitude modulation. Speed is usually 9,600 to 14,400 bps.

Real Time

Pertains to a computer application whose response time frame is simultaneous with or within milliseconds of, the actual event.

Remote Job Entry (RJE)

An HP software program which allows you to submit several jobs at once. Also called batch processing.

RS-232-C

A physical and electrical interface between computers, terminals, modems, and communications lines. A recommended standard developed by the Electronics Industries Association.

RS-422 and RS-423

Recommended Standards published by the Electronic Industries Association establishing the interface requirements between modems and terminals or computers.

Serial Transmission

The transmission of a character or byte of data, one bit at a time.

Session

(1) The engaging of two end-user processes in a logical connection. (2) Layer 5 of the International Standards Organization (ISO) Open Systems Interconnection(OSI) reference model for network architectures.

Signal-to-Noise Ratio

The ratio of signal to noise on a line. As the ratio decreases, it becomes more difficult to distinguish between information and interference.

Simplex

Able to transmit in one direction only. Contrast with half-duplex and full-duplex.

Single-wire Line

A transmission line that uses the ground as one side of the circuit.

Smart Terminal

A terminal that can input data, edit, receive results, and be programmed (same as Intelligent Terminal).

Space

(1) An impulse which, in a neutral circuit, causes the loop to open or causes absence of signal, but which, in a polar circuit, causes the loop current to flow in a direction opposite to that for a mark impulse. A space impulse is equivalent to a binary "0". (2) In some codes, a character which causes a printer to leave a character-width with no printed symbol.

Star

A network topology in which each station is connected only to a central station by a point-to-point link. Each station communicates with all other stations through the central station.

Start Bit

In asynchronous transmission, a signal used to signify the beginning of the transmission of a character.

Stop Bit

In asynchronous transmission, the quiescent state following the transmission of a character; usually required to be at least 1, 1.42, 1.5 or 2 bits long.

Switched Line

One of a series of lines that can be interconnected through a switching center; a line on the public telephone network. Contrast with leased line.

Switch Hook

A switch on a telephone set, associated with the structure supporting the receiver or handset. It is operated by removing the handset from, or replacing it on, the support.

Synchronous

Having a constant time interval between successive bits, characters, or events. Synchronous transmission uses no redundant information (such as the start and stop bits in asynchronous transmission) to identify the beginning and end of characters, and thus is faster and more efficient than asynchronous transmission. The timing is achieved by transmitting synchronous characters prior to data.

Synchronous Data Link Control (SDLC)

An IBM communications line discipline or protocol associated with SNA. SDLC is more efficient than BSC, and enables full-duplex transmissions.

Synchronous Transmission

A mode of data communications by which the bit stream and character stream are "slaved" to accurately synchronized clocks at the receiving and transmitting stations. Start and stop pulses are not required with each character.

System

An organized collection of parts or procedures united by regulated interaction and interconnected to perform a function.

System Generation (SYSGEN)

The process of using an operating system to assemble and link together all of the parts that constitute another operating system.

Systems Network Architecture (SNA)

The total description of the logical structure, formats, protocols, and operational sequences for transmitting information units through a communications system. Communications system functions are separated into three discrete areas: the application layer, the function management layer, and the transmission subsystem layer. The structure of SNA allows the end user to be independent of, and unaffected by, the specific communications system services and facilities used for information exchange.

Tariff

The published rate for a specific unit of equipment, facility, or type of service provided by a communications common carrier. Also, the vehicle by which the regulating agencies approve or disapprove such facilities or services. (In which case, the tariff becomes a contract between customer and common carrier.)

Telecommunications

Transmission of electrical signals over long distances, such as by radio, telegraph, or telephone lines.

Teleprocessing

A communications system combining two technologies, data processing and telecommunications. Originally, an IBM trademark.

Teletypewriter Exchange Service (TWX)

A switched teletypewriter service in which suitably arranged teletypewriter stations are provided with lines to a central office for access to other such stations throughout the United States and Canada.

Telex

A generic name for the international network of teleprinter subscriber services. Western Union provides such services within the U.S. and abroad under its Telex and Telex II trademarks. International record carriers (IRC'S) are now permitted to extend their telex services to the domestic (United States) market.

Terminal

Hardware device connected to a computer, used for inputting and receiving data. See Dumb Terminal, Smart Terminal, and Intelligent Terminal.

Time Sharing Option (TSO)

A full-function time sharing system that provides interactive computing for the large system environment. It is an integral part of Multiple Virtual Storage.

Token Passing

A local area network access technique in which participating stations circulate a special bit pattern (the token) that grants network access to each station in sequence; often used in networks with a ring topology.

Topology

The logical or physical arrangement of stations on a network in relation to one another.

Touch-Tone

An AT&T trademark for tone signaling equipment, which is superseding rotary dial equipment. Use of tones simplifies the switching system design and greatly expands the potential for adding features to telephone systems. It also speeds up the dialing operation for the person making a call.

Transparency

A transmission mode in which control character recognition is "suspended", allowing any bit pattern to be transmitted without unexpected results. The rules for control code recognition are changed so that commands involving specific operations, for example, Escape sequences, are not acted upon, but simply transmitted as data. Even in transparency mode, certain commands remain active; otherwise, once in transparency mode, there would be no way to get out of it.

Two-wire Channel

A circuit containing a single wire pair (or logical equivalent) for non-simultaneous (that is, half-duplex) two-way transmission.

Value-Added Network (VAN)

A common carrier service which has been upgraded by storage, addressing, and other forms of processing.

Virtual Storage (VS)

The storage space that may be regarded as addressable main storage by the user of a computer system in which virtual addresses are mapped into real addresses. The size of virtual storage is limited by the addressing scheme of the computing system and by the amount of auxiliary storage available, and not by the actual number of main storage locations.

Virtual Storage Access Method (VSAM)

An access method for direct or sequential processing of fixed and variable-length records on direct access devices. The records in a VSAM data set or file can be organized in logical sequence by a key field (key sequence), in the physical sequence in which they are written on the data set or file (entry-sequence), or by relative-record number.

Virtual Telecommunications Access Method/Network Control Program (VTAM/NCP)

A set of programs that control communication between terminals and application programs running under DOX/VS, OS/VS1, AND OS/VS2.

Voice-grade Channel

A channel with bandwidth equivalent to a telephone line obtained through the public telephone network. The maximum potential bandwidth of a voice-grade channel is approximately 20Khz; however, most voice-grade channels in a transmission facility are usually spaced 4000Hz apart, and not all of the bandwidth is generally available to a user, due to the presence of noise-limiting loading coils; the telephone network itself is usually defined in terms of channels with frequencies of from 300Hz to 3400Hz.

V.21

300 bps duplex modem standard for use on the general switched network

V.22

1200 bps duplex modem standard for use on the general switched telephone network and on leased circuits.

V.23

600/1200 bps modem standard for use on the general switched telephone network.

V.24

CCITT equivalent to EIA RS-232C standard.

Wideband Channel

Referring or pertaining to an analog circuit that provides more bandwidth than a voice-grade telephone line, that is, a circuit that operates at a frequency of 20Khz or greater. Wideband (also known as broadband) channels are used for high-speed voice and data communications, radio and television broadcasting, some local area data networks, and many other services.

X.3

Packet Assembly/Disassembly facility (PAD) in a public data network.

X.21

Interface between DTE and DCE equipment for synchronous operation on public data networks.

X.25

A protocol developed by CCITT for packet-switching procedures (governing the exchange of data units between the public data network and the user).

IBM Model Numbers

Series 1 Minicomputer Model 495X, 32K-512K,
System 23 Datamaster / 8086 Microprocessor 64K-128K
System/34

General-purpose minicomputer system for all types of small businesses. Uses the SSP operating system. Supports the 5250 Information Display System family of terminals and printers in local and remote environments. BSC or SDLC communications is supported. Supports programming in RPG II, COBOL, and BASIC.

System/36 General-Purpose Minicomputer
System/3

Multi-user, general-purpose SP system with a virtual design. Uses the CPF operating system. Supports the 5250 Information Display System family of terminals and printers in local and remote environments. Only SDLC data communications is supported. Supports programming in RPG and COBOL.

360 Mainframe Computer
370 Mainframe Computer

Models 138, 148, 158, 168, 195

XT/370 Mainframe in a micro box 68000 & 8088

650 Discontinued Mainframe
1401 Discontinued Mainframe
1403 Printer
1443 Printer
2250 Display Unit
2550 Single Cluster Feature
2551 Dual Cluster Feature
2704 Discontinued Front End Processor
2770 Bisync batch workstation
2780 Bisync batch workstation

303X (1,2,3) Mainframe

Full range of high-performance processors for large system environments with 2-32 MB processor storage. Five 2-block multiplexer channels.

308X (1,3,4) IBM's largest series of processors

3178 Display Station Models C1, C2 - Less expensive than 3278
3179 Display Station -- cheaper than 3279 color display
3180 Display Station
3203 Line Printer, up to 1200 lpm

3211 Line Printer, up to 2000 lpm
3230 Dot Matrix Printer, up to 350 cps
3262 Line Printer, Models 1,5: 650 lpm, Model 11: 325 lp;
3268 Printer 340 cps
3270 PC -- Communications Terminal & computer
3271 Bisync cluster controller

Device Control Unit - a controller for the 3270 Information Display System family of displays and printers (type B devices).

Models:

1 : 480-character buffer/BSC line control
2 : 1920-character buffer/BSC line control
3 : 480-character buffer/SDLC line control
4 : 1920-character buffer/SDLC line control

Features:

Remote cluster -- up to 32 devices attachable
Line speed up to 7200 bps for BSC (9600 via RPQ)
Line speed up to 9600 bps for SDLC

3272 Device Control Unit (type B devices)

Models:

1 : 480-character buffer
2 : 1920-character buffer

Features:

Local cluster -- up to 32 devices attachable
Data transfer to channel up to 650,000 bps

3274 Models 21A, 21B, 21D, 31A, 41A, 41D (local)

Cluster Controller (floor unit)

3274 51C, 61C Models A,B,C,D

Model 51C: Attaches up to eight type A and four type B devices. Supports full range of 3270 display and printer products.

3275 Bisync workstation, terminal, and printer
3276 SNA cluster controller and terminal

- 3276 Models 1, 2, 3, 4, BSC or SDLC
Models 11, 12, 13, 14 SDLC protocol
- Control Unit Display Station
- Models:
- 1: 960-character buffer/BSC
11: 960-character buffer/SDLC
2: 1920-character buffer/BSC
12: 1920-character buffer/SDLC
3: 2560-character buffer/BSC
13: 2560-character buffer/SDLC
4: 3440-character buffer/BSC
14: 3440-character buffer/SDLC
- Features:
Remote small cluster -- up to 8 devices attached;
Lease line facility up to 7200 bps (BSC) or
9600 bps (SDLC). Public switched network up
to 4800 bps.
- 3277 Batch Terminal
- 3278 Display Station
- Models:
- 1: 960-character buffer (12x80)
2: 1920-character buffer (24x80)
3: 2560-character buffer (32x80)
4: 3340-character buffer (43x80)
5: 3564-character buffer (27x132)
- Features:
Attaches to 3274 and 3276. Model 5 not
attachable to 3274B or 3276.
- 3279 Color Display Station
- Models:
- 2A: 1920-character buffer (24x80); four colors.
3A: 2560-character buffer (32x80); four colors.
2B: 1920-character buffer (24x80); seven colors.
3B: 2560-character buffer (32x80); seven colors.
- 3287 Printer
- Models:
- 1: 80 cps, 132 print positions
2: 120 cps, 132 print positions
11: 80 cps, 132 print positions
12: 120 cps, 132 print positions
Models 1 and 2 attachable to 3271, 3272;
Models 11 and 23 attachable to 3274, 3276
- 3289 Line Printer, up to 120 cps
- 3290 Plasma Display Information Panel
- 3299 Multiplexer
- 3330 Disk Storage Unit
- 3333 Disk Storage Unit
- 3370 Disk Storage Unit
- 3375 Disk Storage Unit
- 3540 Diskette Input/Output Unit
- 3600 Banking System
- 3601 Finance Controller
- 3650 Retail System
- 3660 Supermarket System
- 3694 Document Processor
- 3701 EIA/CCITT Interface
- 3704 Communications Controller. Withdrawn from
production in August 1978. Contains 64K
bytes of storage and can handle up to 34
half-duplex lines.
- 3705 Communications controller that provides for
the physical management of the communications
network. It can be locally attached or can
operate as a remote communications controller.
The 3705 has a maximum storage capacity of
512K memory which is used to store the
control program and to buffer incoming and
outgoing traffic. The control program can be
NCP (Network Control Program) or EP
(Emulation Program-270X emulation).
Provides attachment facilities for
asynchronous, binary synchronous (BSC), and
synchronous data link control (SDLC)
protocols. Can handle up to 352 lines.
- 3725 Communications Controller
- 3736 Daisy Wheel Printer
- 3740 8" Diskette Format
- 3776 Batch/Cluster Controller/Workstation
- 3777 Batch Terminal
- 3790 Programmable Terminal
- 3800 Printer Models 1 and 3
- 3830 Storage Control Unit Models 2 and 3
- 3851 Mass Storage Facility
- 3880 Storage Control Unit
- 3865 Model 1 (2400/1200 bps) modem
- 3864 Model 1 (4800/1200 bps) modem
- 3865 Model 1 and 2 (9600/4800 bps) modem
- 3872 Model 1 (2400/1200 bps) modem
- 4321 Minicomputer -- Pre-configured entry-level
4300 processor with 1MB processor storage.
Display/Printer Adapter which permits
attachment of 3278 Model 2A or 3279 Model
2C plus up to 15 additional A-type devices
such as 3262-line printers (Models 1C and 2C), or
3289-line printers (Model 4).

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- 4331 Mid-size minicomputer processor with 1-4MB processor storage. One standard byte multiplexer channel. One standard block multiplexer channel which can support up to 128 devices. Console/printer adapter for up to 15 A-type printers/displays.
- 4341 High-performance and high-function System/370-compatible 4300 processor with 2-16MB processor storage. 2 block multiplexer channels. Console/printer adapter.
- 4381 High-end minicomputer: 4-16 Megabytes, 12 I/O channels, air-cooling.
- 4701 Finance Controller
- 4962 Disk Storage Unit
- 4963 Disk Subsystem
- 4964 Diskette unit
- 4969 Magnetic Tape Subsystem
- 497X Printers
- 497X Display Stations
- 4987 Programmable Communications Subsystem
- 5110 Desktop Computer
- 5120 Desktop Computer
- 5150 IBM PC
- 5160 IBM PC XT
- 5203 Printer Model 3
- 5210 Daisy Wheel Printer
- 5211 Line Printers up to 300 lpm
- 5213 Printer
- 5224 Printers -- Model 1: 140 lpm, Model 2: 240 lpm
- 5225 Printers
- Model 1: 280 lpm; Model 2: 400 lpm;
Model 3: 490 lpm; Model 4: 560 lpm
- 5234 Time Entry Station
- 5235 Data Entry Station
- 5251-11 Display Station
- 5251-12 Cluster Controller/display terminal
- 5252 Dual Display Station
- 5256 Printers Model 1: 40cps; Model 2: 80 cps; Model 3: 120 cps
- 5280 Distributed Data System
- 530X Workstation Controller
- 5500 Modem 1200 bps, Nonswitched
- 550X Modem 1200 bps, Switched
- 5520 Administrative System
- 564X Modem 2400 bps
- 574X Modem 4800 bps
- 5798- RHE System 38 Front End Processor -- Software
- 6670 Information Distributor
- 7426 Terminal Interface Unit -- Protocol Converter
- 7850 Teletypewriter Adapter
- 81XX Distributed processing computer series (including Models 8130, 8140, 8150)
- 9000 Instrumentation System 68000 -- Xenix
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Reading List: Synchronous Communications Products

ComputerWorld Newsweekly
CW Communications
Box 880 Cochituate Road
Framingham, MA 01701

Data Communications
McGraw-Hill
1221 Avenue of the Americas
New York, NY 10020

Data Decisions
20 Brace Road
Cherry Hill, NJ 08034

Data Communications - a users' guide
by Kenneth Sherman
Reston Publishing, 1981

Data Communications For Microcomputers
by Nichols, Nichols, and Musson,
McGraw Hill, 1982

Data Communications Concepts Fourth Edition (June 1982)
GC21-5169-3
IBM Corporation, Information Development,
Department 245, Rochester MN 55901

Fundamentals of Data Communications
by Jerry FitzGerald and Tom S. Eason,
John Wiley and Sons, 1978

IBM System 38 Data Communications Programmer's Guide
SC21-7825
IBM Corporation

Introduction to the IBM 3270 Information Display System Manual
GA27-2739
IBM Corporation

Micros and Modems: Telecommunicating with Personal Computers
by Jack M. Nilles,
Reston Publishing, 1983

The Network Revolution Confessions of a Computer Scientist
by Jacques Vallee,
And/Or Press, Inc., 1982

RS-232 Made Easy
by Martin Sayer,
Prentice Hall, Inc., 1984

Systems Network Architecture General Information Manual
GA27-3102
IBM Corporation

Systems Network Architecture Reference Summary
GA27-3136
IBM Corporation

The RS-232 Solution
by Joe Campbell,
Sybex Computer Books, 1984

Telecommunications and the Computer
by James Martin,
Prentice-Hall, Inc., 1969

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