IBM

9370 Information System

Introducing the System

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Introducing the IBM 9370 Information System

IBM

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This book introduces you to the IBM 9370 Information System. In addition to using this manual to learn about the system, you will also find it valuable as a reference when planning your system. A system configuration and planning package (*GK2T-0822*) is available from your IBM marketing representative.

Who Should Use This Book

This book is for both entry and advanced data processing (DP) professionals. The chapters provide a building-block approach for understanding the 9370 system and its components. The entry DP professional should read the information in the presented sequence. The advanced DP professional can use the information as a reference.

How to Use This Book

This book lets you retrieve information quickly.

Chapter 1, "Highlights," gives you an overview of the system. It identifies some system features and applications.

Chapter 2, "Hardware," describes the hardware components that make up the nucleus of your system. These include racks, processors, and the processor console.

Chapter 3, "Input/Output Controllers," explains how various input and output devices attach to the system through input/output (I/O) controller cards. This chapter describes each type of I/O controller and identifies the I/O devices it can attach.

Chapter 4, "Input/Output Devices," provides general information about I/O devices you can attach to the system. It includes information on device features, speeds, and capacities.

Chapter 5, "Software," gives you an overview of the 9370 operating systems and associated software packages.

Chapter 6, "Requirements and Support," tells you what to expect in planning for, setting up, and using your 9370 system. It also explains the support IBM provides.

This manual also contains a **glossary**, a list of **associated publications**, and an **index**.

Contents

Contents

The IBM 9370 System in an Office Environment

Highlights 1

This chapter gives you an overview of the IBM 9370 Information System. It identifies some of the features and applications of the system.

1 Highlights

Introducing the 9370 System

The IBM 9370 Information System is a family of powerful System/370 processors and I/O devices that support many users and applications in the office, commercial, engineering, scientific, and industrial environments. The 9370 system gives you the choice of three types of processors, a variety of I/O controllers, two types of disk drives, and a magnetic tape unit – all mounted in two types of small-footprint racks.

The 9370 Processors accommodate a wide variety of intelligent and general-purpose work stations – personal computers, display stations, and printers. You can attach printers to your personal computers for local hard copy output. You can also share resources such as graphic applications that run on the 9370 Processor, or high-quality printers.

The 9370 system is designed primarily for use as a departmental system to provide a bridge between end-user work stations and large host systems in a computer center. The 9370 system allows you to move application processing closer to end users. It is a flexible system that you can tailor to your applications or to the needs of a growing department or enterprise. It is small and quiet enough to operate in an office environment.

Packaged software offerings are available with the 9370 system that include a number of general business and engineering/scientific applications. These packaged offerings are easy to install, operate, and maintain.

You can operate the 9370 system as a stand-alone computer system or connect it to other computer systems in a network. As part of a network, your system can share data with other systems. A typical network environment for the system would be a three-layer departmental environment (as shown in Figure 1-1 on page 1-3). The lower end is occupied by personal computers, the middle layer by intermediate-size 9370 systems, and the upper layer by one or more large 9370 systems or other System/370 host systems.

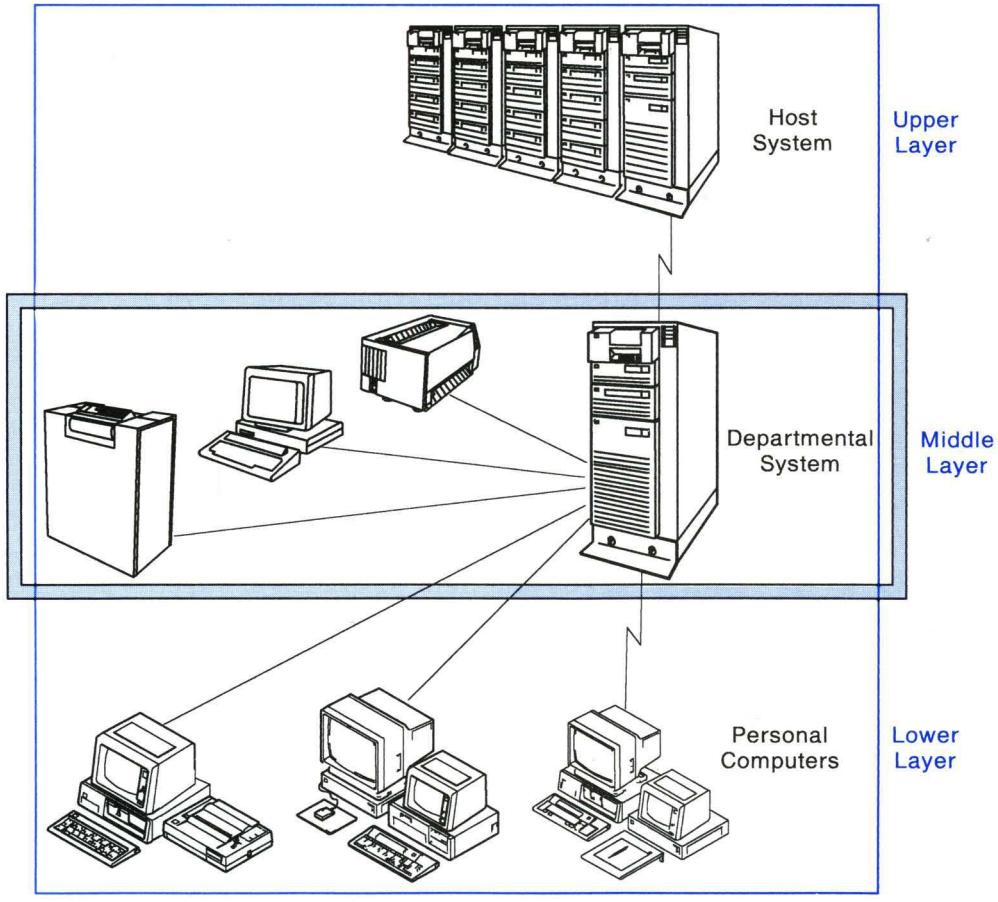

Figure 1-1. The 9370 System and its Environments

1 Highlights

How Easy It is to Use

The 9370 system gives you advanced computing functions without requiring a staff of data processing professionals:

- You can set up and customize your system with limited IBM on-site assistance (channel-attached devices have to be set up by IBM personnel). If desired, IBM will set up and customize your system for you. Installation time for a 9370 system is about one day.

- You do not need a data-processing department for daily start-up and operation of your 9370 system. You can start up and shut down your system (including your applications) automatically, without an operator – locally or remotely. After a power outage, the 9370 Processor automatically repowers and restarts your applications. This provides for considerable scheduling flexibility, especially in distributed data processing environments.

- Online menus and help information support the inexperienced system administrator. The experienced system administrator can bypass the menus using simple commands. System administrator menus and help information are available in several national languages.

  In the day-to-day operation of the system, the system administrator is responsible for starting the system and shutting it down, for doing administrative manual functions, and—in case of a system problem—doing simple online problem determination procedures.

How It Protects your Data

Both standard and optional facilities help the 9370 system protect your data, without reducing system performance. The standard security facilities of the system include functions to:

- Detect and correct storage errors in the 9370 Processor, the direct-access storage devices (DASD), and system tape devices.

- Check and correct parity errors in the system data paths.

- Prevent unauthorized access of data through access barriers such as keywords, passwords, and security keylocks on the racks and on the processor console.

Individual control programs provide additional data security through password protection and encryption.

What the 9370 System Can Do for You

You can use the 9370 system for applications such as:

- Office
- Commercial
- Engineering/scientific
- Industrial.

You can use the 9370 system to control a single application, such as an office application. Or you can use it to control a complementary set of applications, for example, an office application plus an engineering/scientific application.

Office Applications

You need office applications in all industries to deal with many forms of information. Two examples of widely used office applications are electronic mail and text processing.

- Electronic mail transmits messages and memos among computer terminal users. You can pass these messages and memos among users that use the same local system, or among users of remote systems connected through a network.

- Text processing prepares documents such as letters, internal publications, memos, and special forms.

Information management includes creating, filing, retrieving, viewing, printing, and distributing information.

What the 9370 System Can Do for You (Continued)

Commercial Applications

Commercial applications help you maintain and distribute information vital to business-decision making. Some examples include programs that help you to:

- Organize and prepare reports
- Manage resources and materials
- Develop schedules
- Enter data, perform calculations, and present output as charts and graphs
- Get information from data bases to help make business decisions
- Order, bill, and ship material.

Engineering/Scientific Applications

Engineers and scientists can use the 9370 system for computing and analysis. Examples include programs that help you do:

- Data acquisition and control/laboratory automation for radar, sonar, and seismic instruments
- Laboratory instrumentation, including clinical laboratory monitoring and analysis
- Statistics, such as demographic, social science, business/economics, physical science, mathematical and engineering
- Graphics/design, including developing and managing files with two- and three-dimensional drawings, and zooming, rotating, and printing output.

Industrial Applications

Industrial applications control manufacturing processes and support related management functions. Some examples include:

- Computer-aided design and manufacturing
- Program development and test
- Production planning
- Order tracking
- Cost accounting
- Inventory control.

Selecting Your System Components

The 9370 system is a computing system, which includes hardware and software. Hardware refers to the physical devices such as the processor, printers, and terminals. Software refers to the programs that control overall system operation and perform tasks or applications to do your work. It is important that the hardware and software complement each other for proper system operation and efficiency.

Hardware

The following hardware devices form the 9370 system:

- 9309 Rack
- 9370 Processor – which may be a 9373, 9375, or 9377 Processor – with Processor Console
- 9332 or 9335 Direct Access Storage Devices
- 9347 Magnetic Tape Drive
- A wide range of I/O devices (such as display stations, printers, and personal computers) to support your applications.

Selecting Your System Components (Continued)

Configuration Flexibility

The 9370 system offers you full flexibility in configuring your system. The core of any system is the processor. The 9370 system gives you the choice of three types of processors and a variety of I/O controllers that allow you to attach a wide variety of IBM and non-IBM I/O devices to your 9370 Processor. You can add or delete features to support your needs.

Before selecting a system, you must consider:

1. What applications you want to do with your computing system

2. The size of your operation and work load (amount of data, number of users, and more).

Your IBM marketing representative can assist you in selecting a system.

Software

The 9370 system runs under control of an operating system, which monitors and controls application programs. The operating system also provides services such as system resource allocation, job scheduling, input/output control, data management, and networking support.

You can use the following operating systems:

- Virtual Machine/System Product (VM/SP) and, as a companion product,
  - Interactive Executive for System/370 (IX/370)
- Virtual Storage Extended/System Package (VSE/SP)
- Multiple Virtual Storage/System Product (MVS/SP) — on the 9375 Model 60 and 9377 Processors.

Choosing an operating system is an important decision. You have to consider many factors, such as applications and hardware.

Your IBM marketing representative can provide more information and help you with this decision.

Packaged Offerings

A packaged software offering is an operating system with a group of common applications for routine data processing needs. You can always add your own application programs to a packaged offering. The packaged software offerings are generally easier to install and maintain than systems that you have to assemble entirely from separate products.

Chapter 5, "Software," describes the software packages available for the 9370 system.

Your IBM marketing representative can assist you in selecting your software and applications.

Hardware 2

This chapter describes the hardware components that make up the nucleus of the system. These include racks and processors.

2 Hardware

The 9370 system is a modular system with new technology, packaging, and I/O devices, specifically designed to fit into the office environment. The central processing unit, input/output controllers, and the system DASD and tape devices all mount in small-footprint racks. As the needs of your department or enterprise grows, you can easily expand your system by adding I/O controllers and DASD and tape devices in additional racks.

The basic hardware components of the 9370 system are:

- **9309 Rack**. Two models are available: the Model 1, which is 1.0 meter (39.3 inches) high, and the Model 2, which is 1.6 meters (62.9 inches) high. The racks hold the processor, along with the system DASD and tape devices.

- **9370 Processor**. This is the central processing unit of the 9370 system. The processor may be a 9373, a 9375, or a 9377 Processor. These processors primarily differ from one another in physical packaging, performance, and number of devices you can attach to each. I/O devices are attached to the processor through input/output controllers.

  Input/output controllers are cards that plug into the processor and/or into I/O card unit(s), depending on the type of processor you use. I/O controllers consist of one or more cards, depending on the type. They act as control units to allow direct attachment of I/O devices. (An exception is the System/370 Block Multiplexer Channel, which requires separate I/O control unit devices.)

  The processor comes complete with a **processor console**, which is necessary to install, operate, maintain, and support the 9370 system.

Figure 2-1 provides a *logical* overview of the 9370 system. The rest of this chapter describes the units that are highlighted in color in the overview.

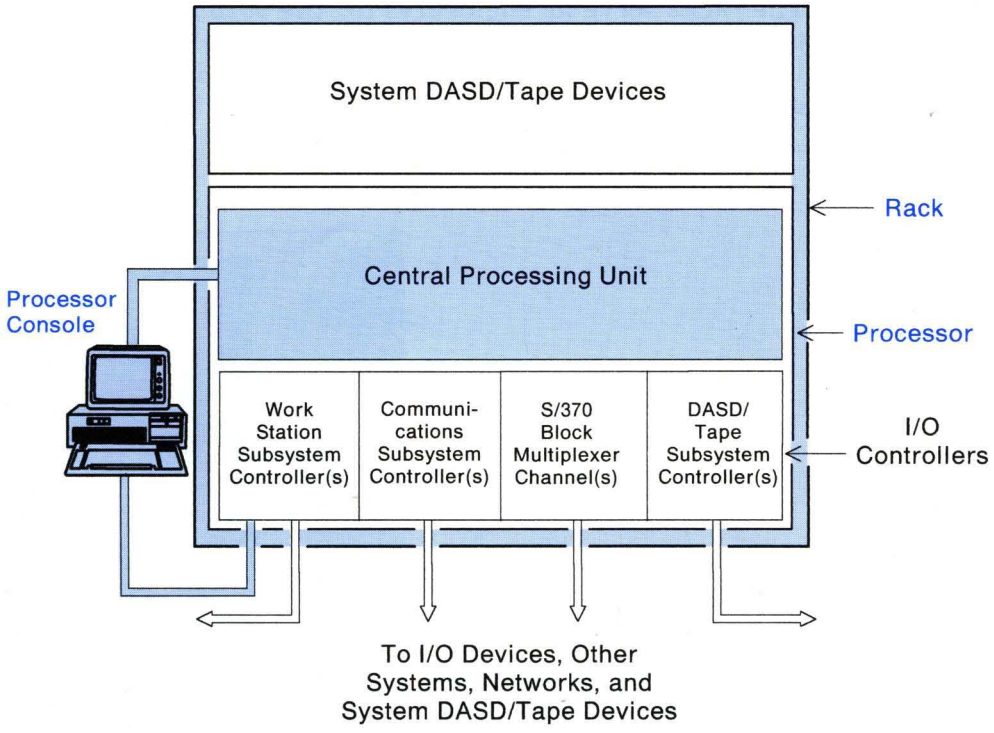

Figure 2-1. Overview of System Components Described in Chapter 2

9309 Rack

The 9309 Rack (see Figure 2-2) is available in two models:

Model 1 1.0 meter (39.3 inches) high
Model 2 1.6 meters (62.9 inches) high.

The racks serve as enclosures for the 9370 Processors and the system DASD and tape units. They hold Electronic Industries Association (EIA) standard RS-310-B equipment. The 9370 system devices meet this standard.

Figure 2-2. 9309 Rack — Model 1 and Model 2

Rack Characteristics

The racks reduce the floor space needed for the system and provide power for the system units. They have solid side, top, and bottom panels. The front is open for the installation of the electronic equipment. The rear is covered by a door, which may be removed when installation access requires it. All cables enter and exit through the rear of the 9309 Racks.

The racks also have:

- A power control compartment with six AC power outlets for distributing power to the units
- A unit-emergency power-off panel, which allows you to remove power from all racks in a system from any one rack
- An automatic/secure power control feature, which—together with the processor console—provides remote/external power-on, timed power-on, programmed power-off, and automatic restart after a power failure
- A four-position keylock that allows you to operate the rack in the following modes: normal, secure, manual, and automatic.

Rack Combinations

You can combine racks into larger configurations, depending on your data processing needs. The type and the number of rack models used depend on the type of processor you have and on your system configuration. The 9370 Processors can use either rack model.

In a system configuration, the rack that holds the 9370 Processor is called the primary rack, whereas any other rack in the system configuration is called the secondary rack.

9309 Rack (Continued)

Rack Capacities

The Model 1 can hold a total of 19 EIA units. The Model 2 can hold a total of 32 EIA units. (One EIA unit is equal to 44.45 mm (1.75 inches).) Refer to Figure 2-3 to see the number of EIA units each device requires.

Device	EIA Units
9373 Processor	8
9375 Processor	16
9377 Processor	16
9377 Processor I/O Card Unit	8
9335 A01 DASD Controller	3
9335 B01 DASD	6
9332 DASD	3
9347 Magnetic Tape Unit	5

Figure 2-3. Rack Space Required by System Components

9370 Processors

The 9370 Processors are a family of three machine types:

- 9373 Processor Model 20
- 9375 Processor Models 40 and 60
- 9377 Processor Model 90.

The 9370 Processors differ in physical packaging, performance, processor storage, number of internal I/O buses, and number of I/O controllers.

I/O controllers are attached to the 9370 Processors through internal I/O buses (see Figure 2-4). I/O bus, I/O controller, and attached devices appear as channel-attached I/O to the operating system. Multiple I/O buses operate independently of each other.

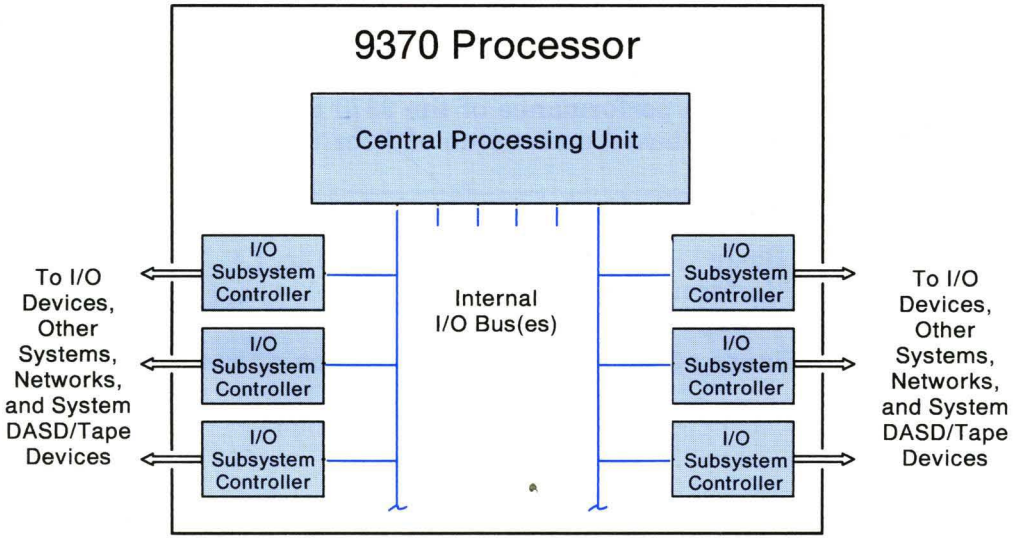

Figure 2-4. Basic 9370 Processor Structure

9370 Processors (Continued)

The **9373 Processor** is available in one Model, the 9373-20. It has one internal I/O bus that can accommodate up to four I/O controllers. The processor can have 4, 8, or 16 megabytes of processor storage.

The **9375 Processor** is available in two models, the 9375-40 and the 9375-60. Both models can have up to four internal I/O buses that, together, can accommodate up to 16 I/O controllers. The processor can have 8 or 16 megabytes of processor storage. The 9375-60 Processor offers improved performance over the 9375-40 Processor. The 9375-40 Processor can be field-upgraded to a 9375-60 Processor, and either model can be converted into a 9377 Processor.

The **9377 Processor** is available in one model, the 9377-90. It can have up to six internal I/O buses that, together, can accommodate up to 16 I/O controllers. The processor can have 8 or 16 megabytes of processor storage.

Relative performance of the 9370 Processors is basically as follows, based on a value of 1 for the 9373 Processor:

Characteristic	9373-20	9375-40	9375-60	9377-90
Basic Performance	1.0	1.0 to 1.4	2.2 to 3.0	4.5 to 5.2

Figure 2-5. Relative Performance of the 9370 Processors

9373 Processor

The 9373 Processor (see Figure 2-6) is the entry-level, base-performance processor of the 9370 system. It can reside in a 9309 Model 1 or Model 2 Rack.

The 9373 Processor is available in one model:

- 9373 Processor Model 20.

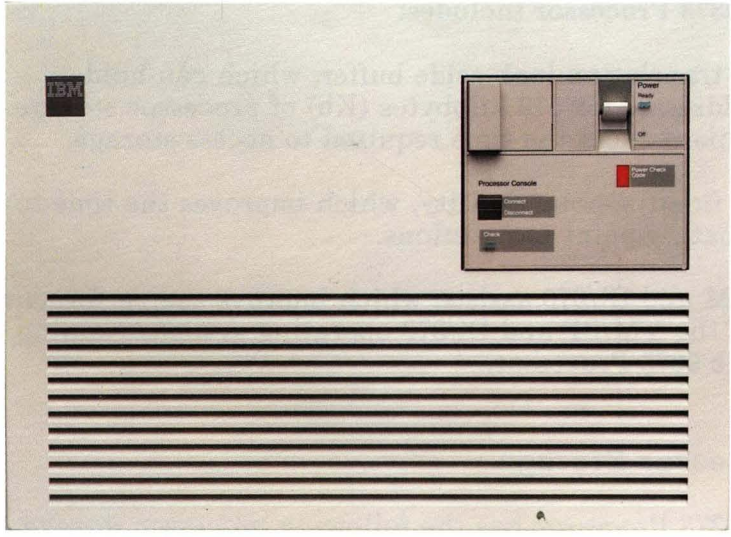

Figure 2-6. 9373 Processor

The 9373 Processor has one I/O bus that can accommodate a maximum of four I/O controllers. The 9373 can have the following I/O controllers:

- Up to two DASD/Tape Subsystem Controllers (they attach 9332 DASDs, 9335 DASDs, and 9347 Magnetic Tape Units)
- Up to two Work Station Subsystem Controllers (they attach intelligent and general-purpose work stations)

9370 Processors (Continued)

- Up to two communications subsystems controllers (four types of communications subsystems controllers are available, which attach either communication lines, ASCII[1] terminals, IBM Token-Ring Networks, or IEEE[2] 802.3 or Ethernet[3] Local Area Networks)

- One System/370 Block Multiplexer (BMPX) Channel (it attaches control-unit-attached display stations, tape units, and printers).

The actual combination of I/O controllers will depend on your system needs and on performance considerations.

Processor Characteristics

The 9373 Processor includes:

- A translation look-aside buffer, which can hold addresses for 512 kilobytes (Kb) of processor storage. This reduces the time required to access storage.

- A floating-point facility, which improves the time to do floating-point instructions.

- VM and IX/370 assists, which improve the performance of the VM/SP and IX/370 operating systems running on the 9373 Processor.

Processor Storage

The 9373 Processor has the following processor storage sizes:

4,194,304 bytes (4 megabytes)
8,388,608 bytes (8 megabytes)
16,777,216 bytes (16 megabytes)

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1 American National Standard Code of Information Interchange.

2 Institute of Electronic and Electrical Engineers.

3 Ethernet is a trademark of the Xerox Corporation.

Processor Card Enclosure

The 9373 Processor has one card enclosure (see Figure 2-7), which holds the processor logic, the storage, and the I/O controller cards. The card enclosure has seven slots for I/O controller cards. (Note that an I/O controller can consist of more than one card, depending on its type.)

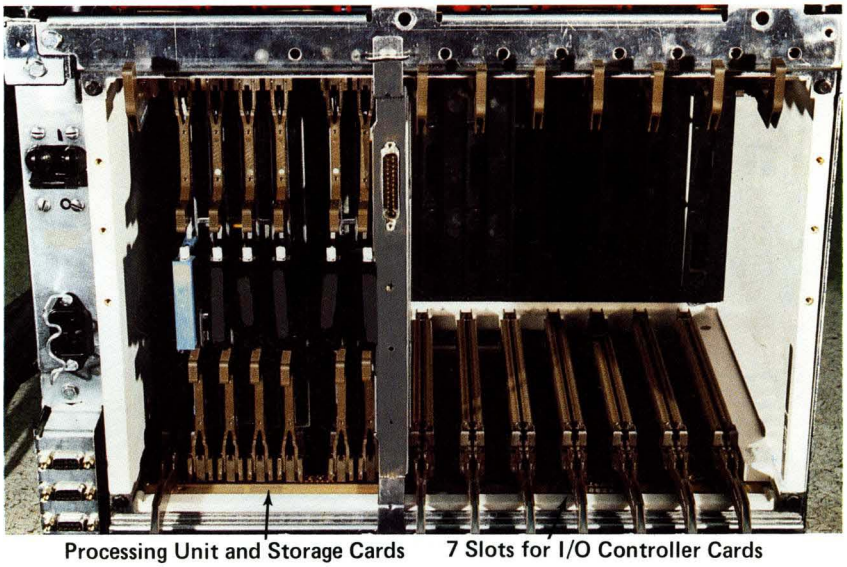


Figure 2-7. 9373 Processor Card Enclosure

9370 Processors (Continued)

9375 Processor

The 9375 Processor (Figure 2-8) is the intermediate-level processor of the 9370 system. It can reside in either rack.

The 9375 Processor is available in two models:

- 9375 Processor Model 40
- 9375 Processor Model 60.

The 9375-60 provides higher performance than the 9375-40. It also supports the MVS operating system, which the 9375-40 does not support.

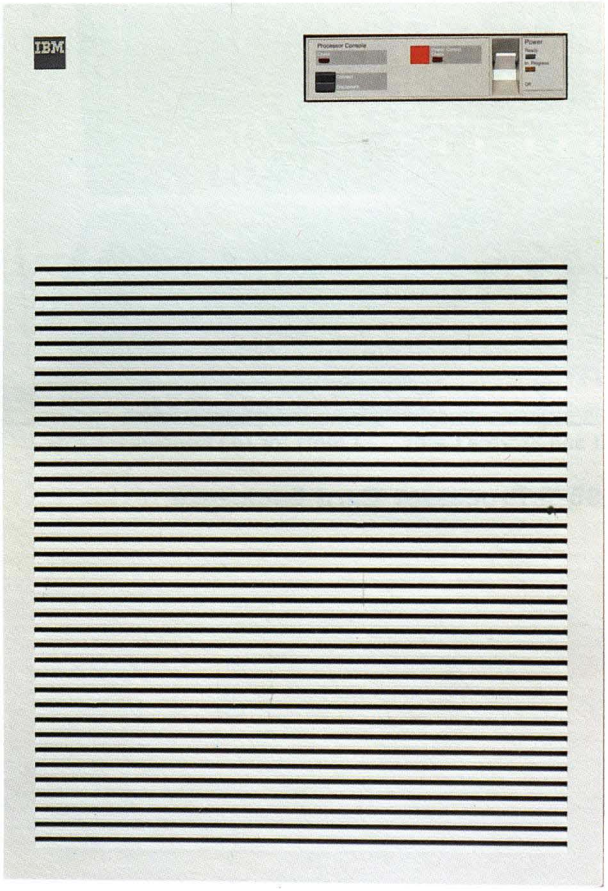


Figure 2-8. 9375 Processor

The 9375 Processor can have up to four I/O buses to which a maximum of 16 I/O controllers can attach. The 9375 supports the following I/O controllers:

- Up to four DASD/Tape Subsystem Controllers (they attach 9332 DASDs, 9335 DASDs, and 9347 Magnetic Tape Units)
- Up to six Work Station Subsystem Controllers (they attach intelligent and general-purpose work stations)
- Up to four communications subsystems controllers (four types of communications subsystems controllers are available, which attach either communication lines, ASCII terminals, IBM Token-Ring Networks, or IEEE 802.3 or Ethernet Local Area Networks)
- Up to two System/370 Block Multiplexer (BMPX) Channels (they attach control-unit-attached devices).

The combination of I/O controllers you use depends on your system needs and performance considerations.

Processor Model 40 Characteristics

The 9375 Model 40 is the base-performance processor. It includes:

- A translation look-aside buffer, which can hold addresses for up to 512 Kb of processor storage. This reduces the time required to access storage.
- A high-performance floating-point facility that improves performance of single and double precision floating-point operations. It contains eight 64-bit floating-point registers, and provides hardware for multiplication, division, and square root.
- VM and IX/370 assists, which improve the performance of the VM/SP and IX/370 operating systems running on the 9375-40.

9370 Processors (Continued)

Processor Model 60 Characteristics

The 9375 Model 60 provides improved performance. It includes:

- A translation look-aside buffer (same as the Model 40)
- A high-performance floating-point facility (same as the Model 40)
- A data storage unit that contains a high-speed buffer storage of 16 kilobytes (16,384 bytes). The high-speed buffer storage buffers data from processor storage, giving the processing unit faster access to data.
- A micro-instruction storage, which contains a translation look-aside buffer and a high-speed buffer storage of 16 kilobytes, which acts as a smaller and faster subset of processor storage.
- VM, IX/370, and MVS assists, which improve the performance of the VM/SP, IX/370, and MVS/SP operating systems running on the 9375-60.

Processor Storage

The 9375 has the following processor storage sizes:

8,388,608 bytes (8 megabytes)
16,777,216 bytes (16 megabytes).

Processor Card Enclosures

The 9375 Processor has two card enclosures (see Figure 2-9):

- A basic card enclosure, which holds the processor logic and storage cards and which has five card slots for I/O controller cards.
- An expansion enclosure below the basic card enclosure, which has 12 slots for I/O controller cards. This gives you a total of 17 slots for I/O controller cards.

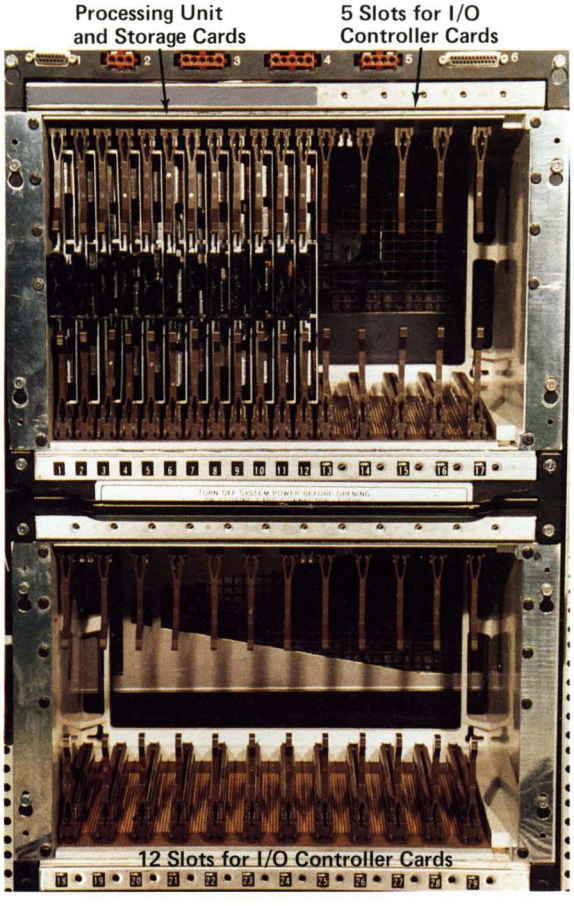


Figure 2-9. 9375 Processor Card Enclosures

9370 Processors (Continued)

9377 Processor

The 9377 Processor (Figure 2-10) is the high-performance processor of the 9370 system. It can reside in either rack.

The 9377 Processor is available in one model:

- 9377 Processor Model 90.

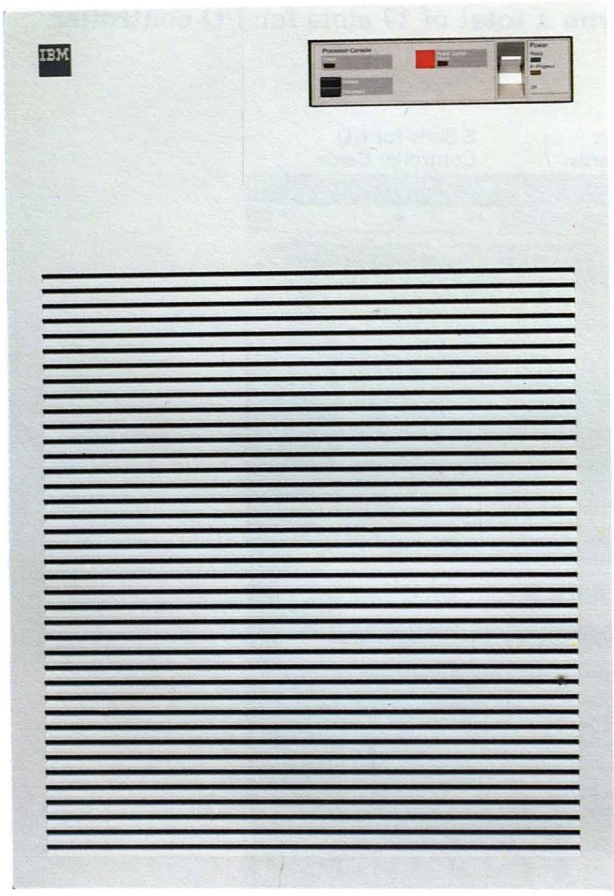


Figure 2-10. 9377 Processor

The 9377 Processor can have up to six I/O buses to which a maximum of 16 I/O controllers attach. The 9377 supports the following I/O controllers:

- Up to 12 DASD/Tape Subsystem Controllers (they attach 9332 DASDs, 9335 DASDs, and 9347 Magnetic Tape Units)
- Up to 12 Work Station Subsystem Controllers (they attach intelligent and general-purpose work stations)
- Up to 12 communications subsystems controllers (four types of communications subsystems controllers are available, which attach either communication lines, ASCII terminals, IBM Token-Ring Networks, or IEEE 802.3 or Ethernet Local Area Networks).
- Up to 16 System/370 Block Multiplexer (BMPX) Channels (they attach control-unit-attached devices).

The actual combination of I/O controllers will depend on your system needs and on performance considerations.

Processor Characteristics

The 9377 Processor includes:

- A high-speed buffer storage of 16 kilobytes (16,384 bytes), which acts as a smaller and faster subset of processor storage. The processor executes all user data and program instructions from high-speed buffer storage.
- A micro-instruction storage of 8 kilobytes (8,192 bytes) that holds complex and less frequently used micro-instructions. (Frequently used micro-instructions are executed directly in hardware.)
- A translation look-aside buffer, which can hold addresses for up to 128 Kb of processor storage.
- A high-performance floating-point accelerator, which improves the time to execute floating-point instructions by using high-speed multiplier logic.
- A high accuracy arithmetic facility, which consists of 20 arithmetic instructions in addition to the System/370 floating-point instruction set. These

9370 Processors (Continued)

instructions allow you to compute numbers with maximum accuracy and automatic verification of results.

- VM, IX/370, and MVS assists, which improve the performance of the VM/SP, IX/370, and MVS/SP operating systems running on the 9377 Processor.

Processor Storage

The 9377 has the following processor storage sizes:

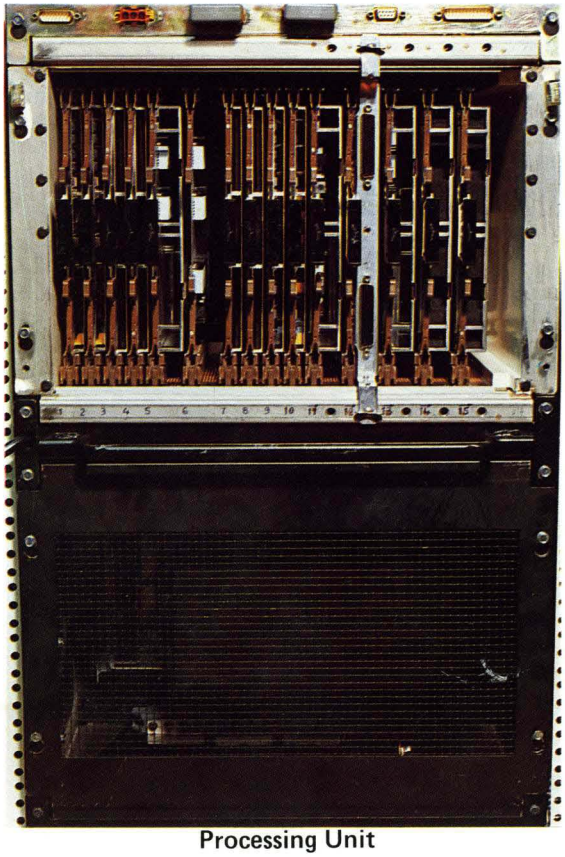
8,388,608 bytes (8 megabytes)
16,777,216 bytes (16 megabytes).

Processor Enclosure

The 9377 Processor (Figure 2-11) has one enclosure. The lower half holds the processor logic module. The upper half holds the I/O card unit connection and storage cards.

I/O controller cards are in separate I/O card units. I/O card units can be in the same rack as the processor or in another rack.

I/O Card Unit Connection and Storage Cards



Processing Unit

Figure 2-11. 9377 Processor Enclosure

9370 Processors (Continued)

Processor I/O Card Unit

The 9377 Processor has its I/O controller cards in one or more I/O Card Units.

The I/O Card Unit offers ample space for I/O controllers. It can accommodate even very large I/O controller configurations (see Figure 2-12).

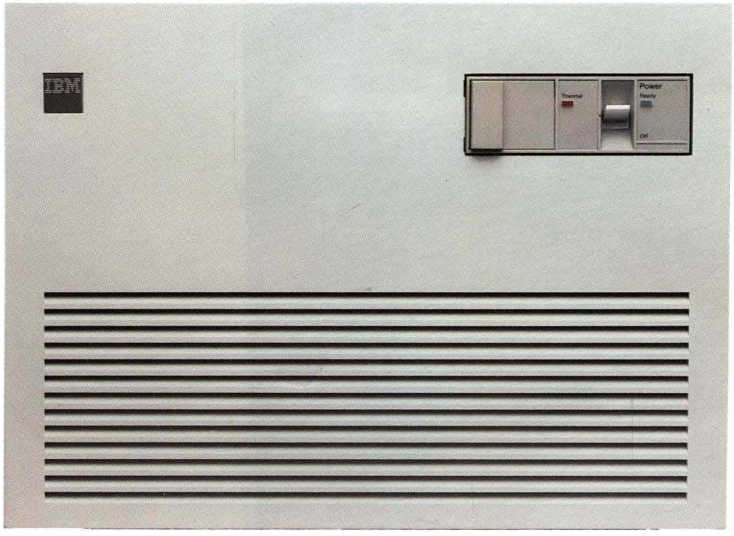


Figure 2-12. 9377 Processor I/O Card Unit

Two types of I/O card units are available:

- I/O Card Unit with one internal I/O bus
- I/O Card Unit with two internal I/O buses.

The maximum configuration of I/O card units for the 9377 Processor can be one of the following:

- One I/O Card Unit with two internal I/O buses, plus four I/O Card Units, each with one internal I/O bus
- Three I/O Card Units, each with two internal I/O buses
- Two I/O Card Units, each with one internal I/O bus, plus two I/O Card Units, each with two internal I/O buses.

I/O Card Unit With One I/O Bus

The I/O Card Unit with one internal I/O bus can hold 11 I/O controller cards. It supports the following types of I/O controllers:

- DASD/Tape Subsystem Controller
- Work Station Subsystem Controller
- Communications subsystems controller(s).

It cannot hold the S/370 Block Multiplexer Channel card.

You would use this type of I/O card unit for your 9377 Processor if you do not plan to attach a standard S/370 Block Multiplexer Channel to your system.

I/O Card Unit With Two I/O Buses

The I/O Card Unit with two internal I/O buses can hold 10 I/O controller cards. It supports the following types of I/O controllers:

- S/370 Block Multiplexer Channel
- DASD/Tape Subsystem Controller
- Work Station Subsystem Controller
- Communications subsystems controller(s).

You have to use this type of I/O card unit if you want to attach a standard S/370 Block Multiplexer Channel to your 9377 Processor. See Figure 2-13 on page 2-22, which shows an I/O Card Unit with two I/O buses.

9370 Processors (Continued)

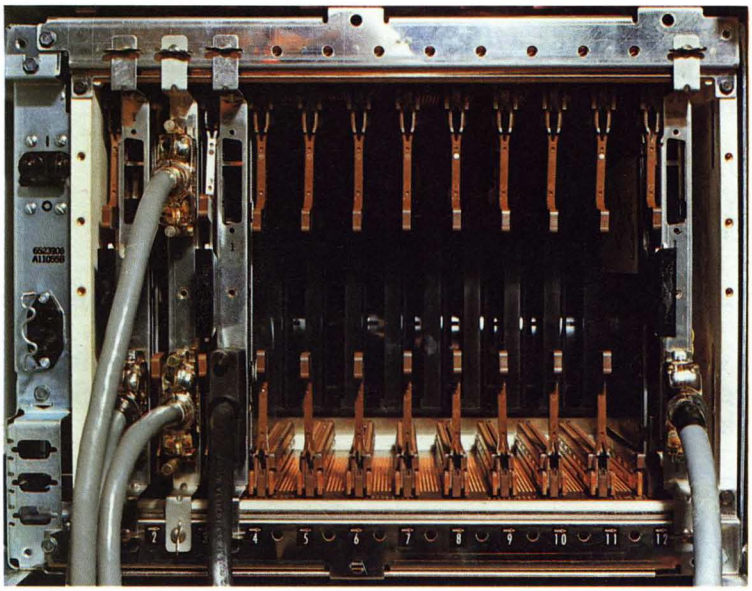


Figure 2-13. 9377 Processor I/O Card Unit With Two I/O Buses

9370 Processor Console

The 9370 Processor includes a processor console. The processor console is necessary to install, operate, and maintain the 9370 system.

The processor console is the principal device for the operator to communicate with the system. It lets the operator communicate with the processor itself, with an application program, or with the operating system.

The processor console attaches directly to the 9370 Processor through a cable.

The processor console serves as the microcode loading device for the 9370 system. The diskettes shipped with the system contain the microcode for all standard functions and optional features ordered, for system diagnostics and maintenance, and for the assist functions required to configure and install the system. During system installation, the contents of the diskettes will be loaded onto the processor console hard disk and onto the system DASD devices.

The processor console does the following:

- **Initializes the system**. It does basic hardware verification tests and loads microcode and data from the processor console disk into the processor during system start-up.
- **Monitors the system**. It automatically checks the system for errors and takes corrective actions should a malfunction occur.
- **Analyzes machine checks**. It collects and analyzes hardware failure information when a machine check occurs.
- **Handles errors**. It stores time-stamped, detailed error information and reference codes on the processor console disk to aid diagnosis should a malfunction occur.
- **Supports manual operations**. It allows the operator to do manual operations, such as display and alter storage contents, or set the time for automatic power on.

9370 Processors (Continued)

- **Supports problem determination**. It helps the operator to do online problem analysis. It provides the operator with detailed information on what to do in case of system malfunctions. It helps the operator to diagnose and solve certain problems before calling for service. When IBM service is necessary, the operator-supplied information allows the service representative to identify the suspected failing units remotely. This may eliminate on-site analysis and delay time for required parts, resulting in reduced system outage time.

- **Supports the automatic/secure power control feature of the 9309 Rack**. This allows the operator to (a) schedule automatic system start-up at a specific time, (b) start the system from a remote location through a telephone line, (c) shut down the system at a specific time under control of the operating system, and (d) automatically restart the system after a power utility outage.

- **Provides 3270 display emulation**. In addition to attaching the processor console to the 9370 Processor, you can also attach it to a Work Station Subsystem Controller or to a 3274 Control Unit on your 9370 system. In this case, you can use the processor console as a user work station.

- **Remote service/remote operation**. This lets a remote terminal operator perform the same operator functions that you can do at the local processor console. You can also use this to obtain remote service and problem determination from IBM.

Note: The processor console cannot be used to execute PC programs.

Summary of 9370 System Components

Figure 2-14 summarizes the different unit types and components that apply to a particular 9370 Processor.

Component	9373	9375	9377
9309 Rack	Model 1 Model 2	Model 1 Model 2	Model 1 Model 2
I/O Controller Slots	7	17	54 maximum using processor I/O card units
Processor Console	Standard	Standard	Standard
I/O Subsystem Controllers	DASD/Tape Communications Work Station S/370 BMPX Channel	DASD/Tape Communications Work Station S/370 BMPX Channel	DASD/Tape Communications Work Station S/370 BMPX Channel
System I/O Devices	9332 9335 9347 BMPX-Attached Devices	9332 9335 9347 BMPX-Attached Devices	9332 9335 9347 BMPX-Attached Devices
Operating Systems	VM/SP IX/370 VSE/SP	VM/SP IX/370 VSE/SP MVS/SP (9375-60 only)	VM/SP IX/370 VSE/SP MVS/SP

Figure 2-14. Summary of 9370 System Components

Input/Output Controllers 3

This chapter explains how various input/output devices attach to the system through I/O controllers. It describes each type of I/O controller and identifies the I/O devices that can be attached to an I/O controller.

This chapter also contains a general overview of the networks in which your system can operate and gives a summary of communication line characteristics.

3 Input/Output Controllers

I/O devices attach to the 9370 Processor through **I/O controllers**. I/O controllers are logic cards that act as control units and directly attach I/O devices without separate control units. I/O controllers plus the devices they control are referred to as **I/O subsystems**. An exception is the System/370 Block Multiplexer Channel card, which attaches control units.

The I/O controllers available on the 9370 system are the:

- DASD/Tape Subsystem Controller
- Work Station Subsystem Controller
- S/370 Block Multiplexer Channel
- Communications subsystems controllers:
  - Telecommunications Subsystem Controller
  - ASCII Subsystem Controller
  - IBM Token-Ring Subsystem Controller
  - IEEE 802.3 LAN Subsystem Controller.

You can have multiples of the same subsystem controller or of different subsystem controllers on one 9370 system.

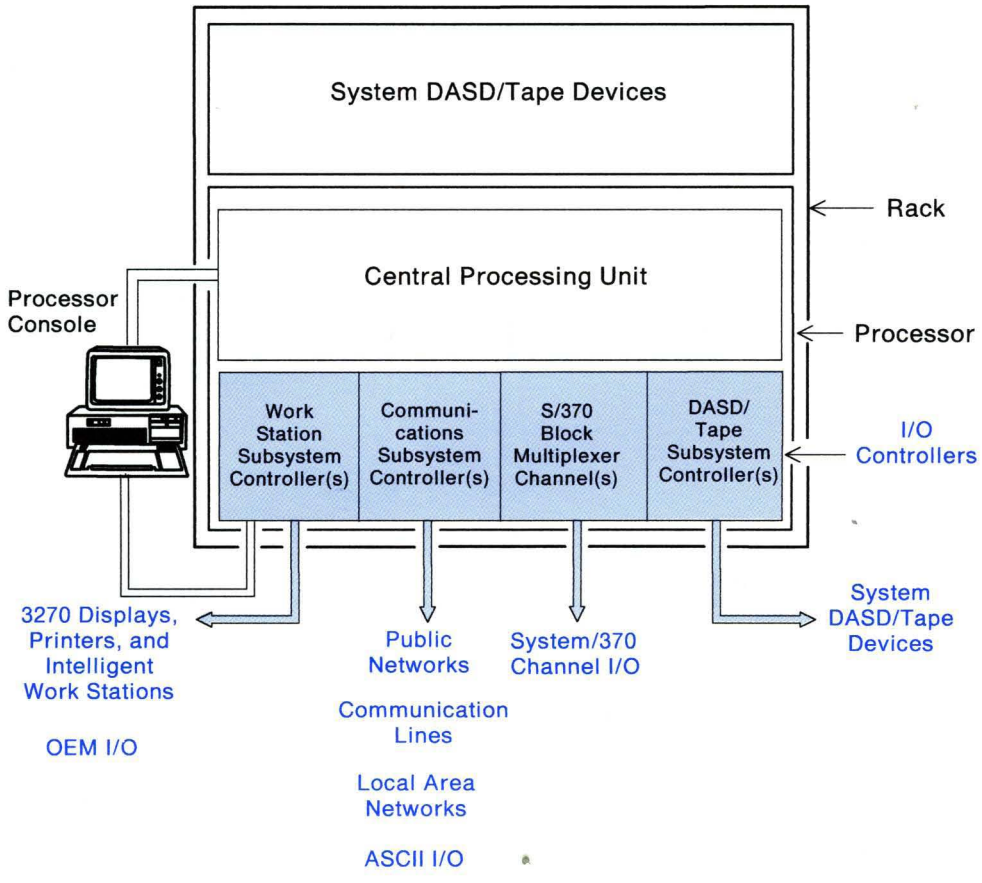
An I/O controller consists of two functional units:

- An I/O processor (IOP), which communicates with the central processing unit over the internal I/O bus
- An I/O adapter (IOA), which communicates with the device(s) over the respective external I/O interface.

The IOP and IOA may be combined on a single card, or they may be on multiple cards. Single-card I/O controllers combine the IOP and IOA functions on one card. Multiple-card I/O controllers have the I/O processor on one card and the I/O adapter(s) on one or more additional cards.

A 9373 Processor can have a maximum of four I/O controllers, including a S/370 Block Multiplexer Channel card. The 9375 Processor and the 9377 Processor can have a maximum of 16 I/O controllers, including S/370 Block Multiplexer Channel cards.

Figure 3-1 provides a *logical* overview of the 9370 system. The rest of this chapter describes the components that are highlighted in color in the overview.



OEM Original Equipment Manufacturer
ASCII American Standard Code for Information Interchange

Figure 3-1. Overview of System Components Described in Chapter 3

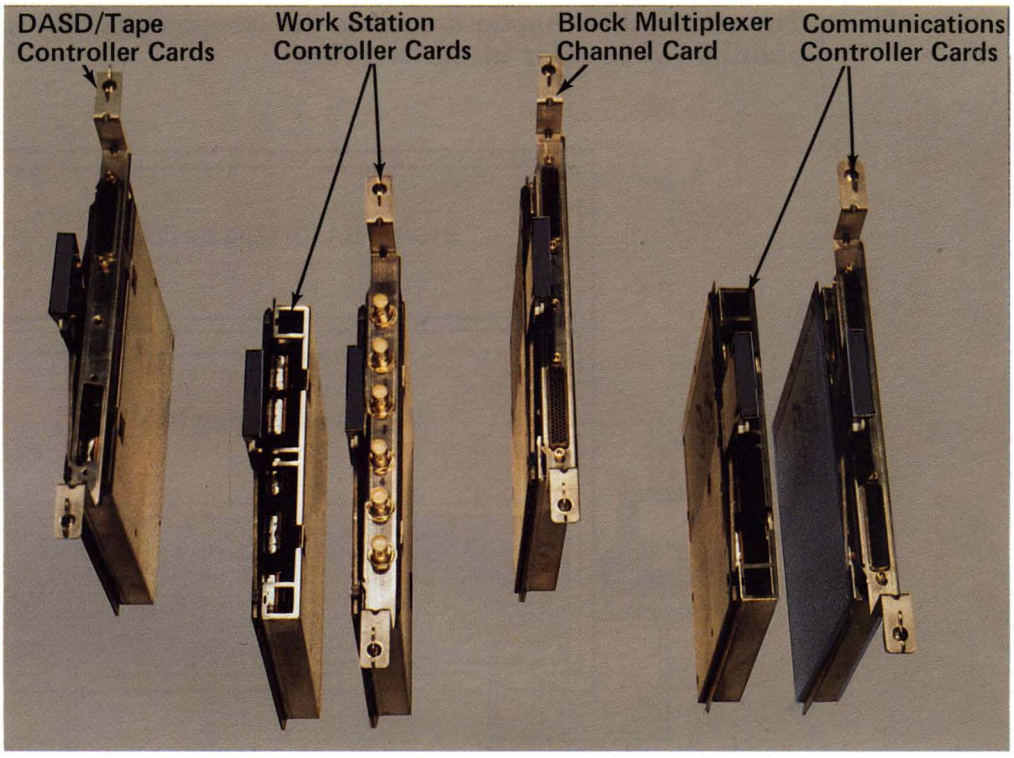


Figure 3-2. I/O Controller Cards

Figure 3-2 shows a selection of I/O controller cards.

The cards are flat, 10 cm by 15 cm by 2 cm or 4 cm (3.9 inches by 4.84 inches by 0.78 inches or 1.56 inches).

DASD/Tape Subsystem Controller

The DASD/Tape Subsystem Controller attaches 9332 DASDs, 9335 DASDs, and 9347 Magnetic Tape Units to the 9370 Processor (see Figure 3-3). It uses the IBM Intelligent Peripheral Interface (IPI) Level 3 standard interface, which is IBM's implementation of the American National Standards Institute (ANSI) standard for Intelligent Peripheral Interface – Level 3.

The DASD/Tape Subsystem Controller can be in the same rack as the units it attaches, or it can be in another rack.

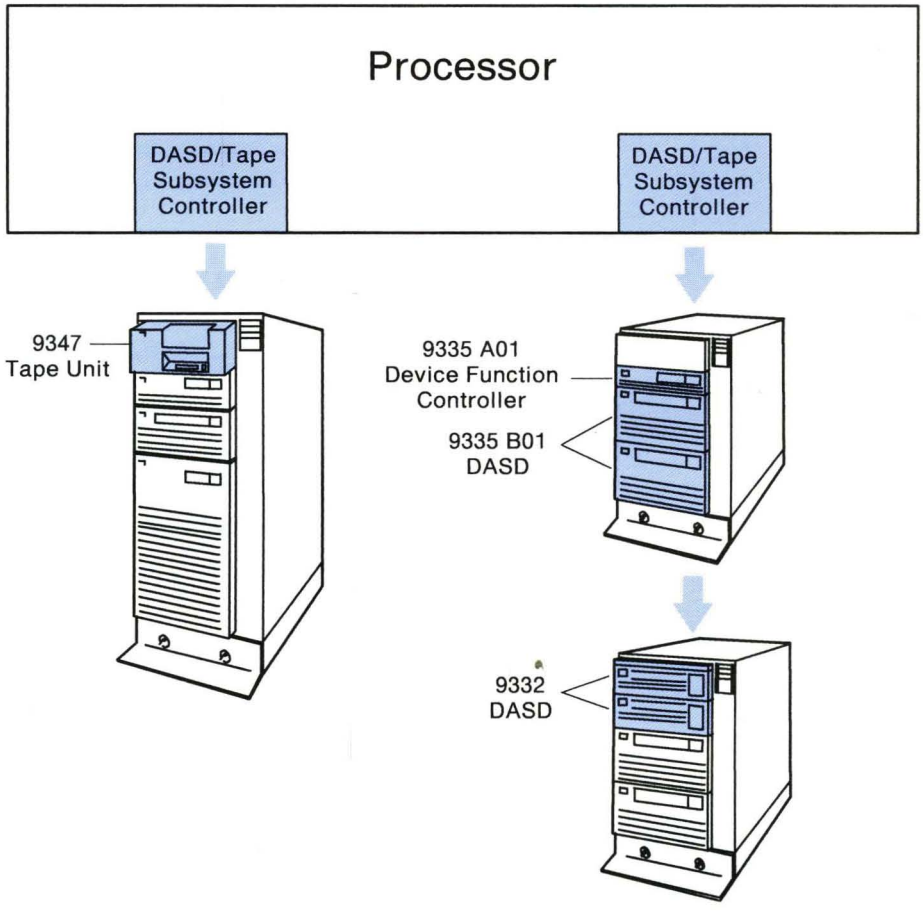


Figure 3-3. DASD/Tape Subsystem

DASD/Tape Subsystem Controller (Continued)

The DASD/Tape Subsystem Controller combines the IOP and IOA functions on one card (see Figure 3-4). You need at least one DASD/Tape Subsystem Controller when you have any I/O controller other than the S/370 Block Multiplexer Channel.

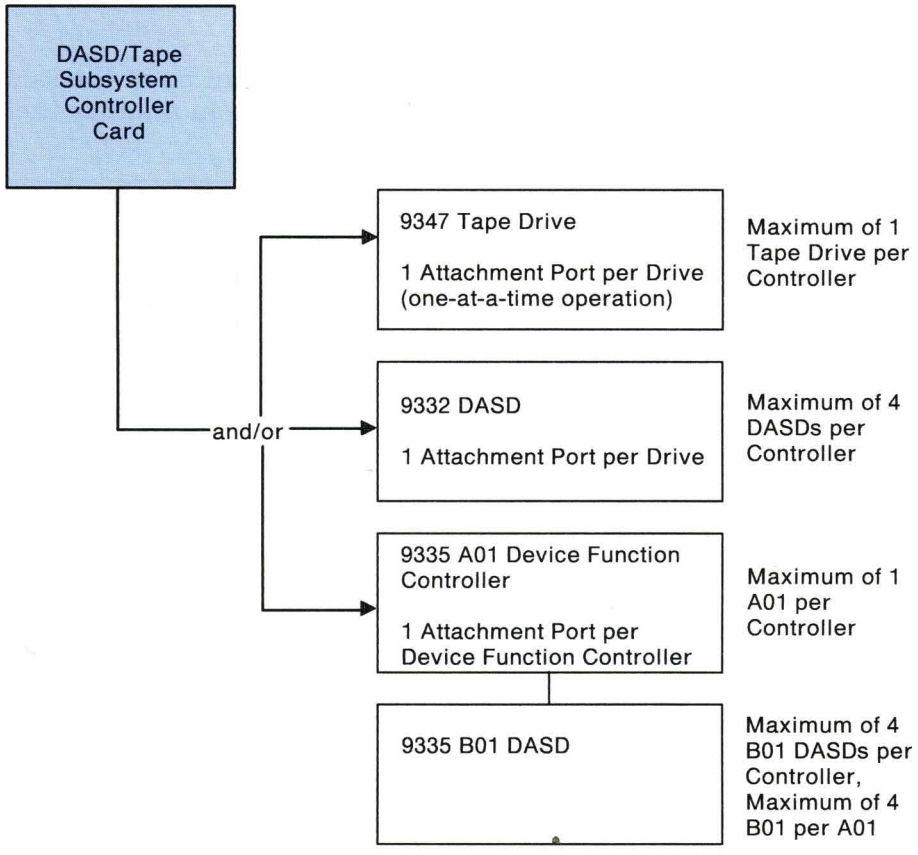


Figure 3-4. DASD/Tape Subsystem Controller – Configuration Summary

One DASD/Tape Subsystem Controller can attach one of the following:

- One to four 9332-400 DASDs
- One to four 9332-400 DASDs and one 9347 Magnetic Tape Unit
- One 9335 A01 and one to four 9335 B01 DASDs
- One 9347 Magnetic Tape Unit.

Operating System Support: The DASD/Tape Subsystem Controller is supported by VM/SP, VSE/SP, and IX/370.

Work Station Subsystem Controller

The Work Station Subsystem Controller lets you attach the following devices to the 9370 Processor (see Figure 3-5):

- 3270-type devices
- Original Equipment Manufacturer (OEM) devices.

These devices attach to the Work Station Subsystem Controller either directly or through 3299 Terminal Multiplexers.

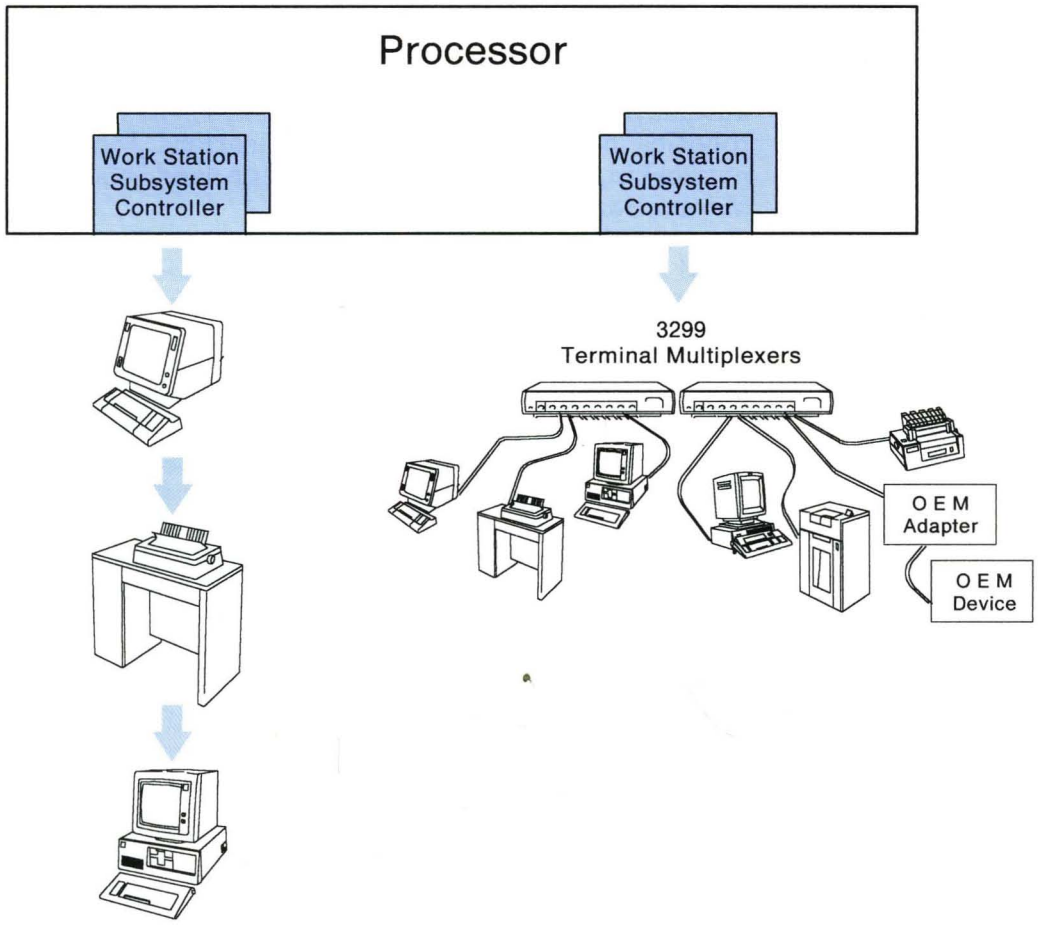


Figure 3-5. Work Station Subsystem

Work Station Subsystem Controller (Continued)

The devices that you can attach include:

- Intelligent and general-purpose **3270-type devices**, like personal computers, display stations, and printers for applications in the office environment. Devices you can attach include:

  - 3178, 3180, 3191, and 3278 Display Stations
  - 3179 and 3279 Color Display Stations
  - 5170 and 5371 3270-Personal Computers
  - 4224, 4234, 4245, and 4250 Printers.

- **Original Equipment Manufacturer (OEM) devices** for a variety of other applications, such as factory automation, data acquisition, measurement control, robotics, process control, communications, local area networking, medical instrumentation, and laboratory automation.

  OEM devices attach through an appropriate OEM adapter, which you must supply. The OEM adapter must do control functions and the protocol conversion between the Work Station Subsystem Controller and the appropriate industry standard. For example, Intel's Serial OEM Interface Subsystem Controller Board iSBC[1]561 provides compatibility between the Work Station Subsystem Controller and MULTIBUS[2]. The iSBC561 lets you attach MULTIBUS-compatible OEM devices or systems for the applications listed above. You can plug the iSBC561 in any standard Multibus cage.

Operating System Support: The Work Station Subsystem Controller is supported by VM/SP and VSE/SP. The Serial OEM Interface (SOEMI) is supported by VM/SP and VSE/SP through the IBM/Serial OEM Interface Access Method.

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1 iSBC is a registered trademark of the Intel Corporation. Information about the iSBC561 SOEMI Subsystem Controller Board is available from the Intel Corporation.

2 IEEE 796, also known as MULTIBUS, is a registered trademark of the Intel Corporation.

The Work Station Subsystem Controller consists of two cards (see Figure 3-6). One card contains the Work Station Processor, the second card contains the Work Station Adapter. Each installed Work Station Subsystem Controller needs two card slots.

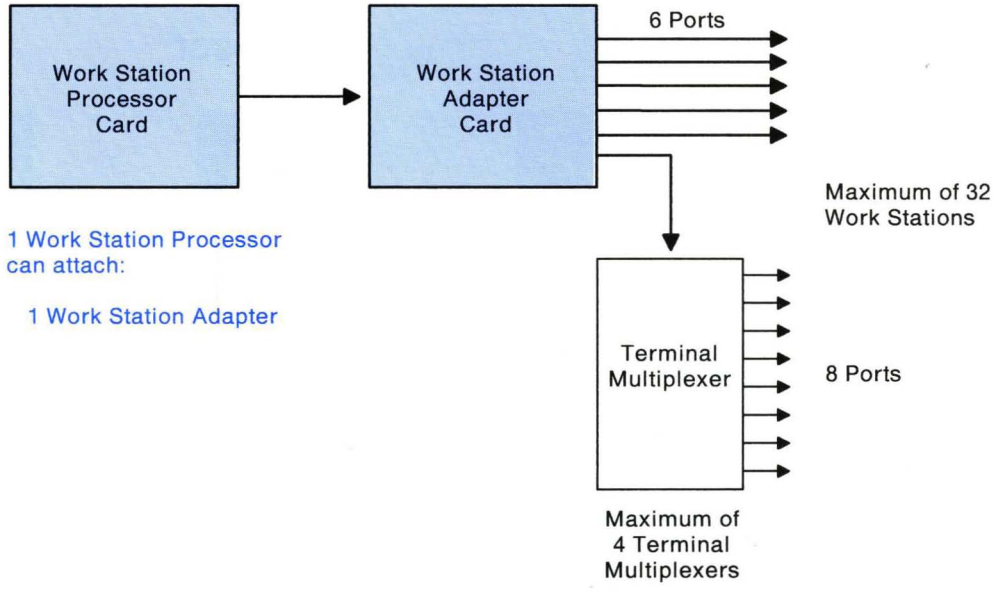

Figure 3-6. Work Station Subsystem Controller – Configuration Summary

The **Work Station Adapter** has six coaxial ports. Each port can connect to a local device, which may be a work station or an OEM adapter. This allows a maximum of six devices or OEM adapters that can be directly attached.

If you want to attach more devices or want longer cable lengths, you can connect terminal multiplexers to four of the ports. Using terminal multiplexers reduces the cable needs and provides greater cabling flexibility. To each terminal multiplexer, such as the 3299, you can attach up to eight devices and/or OEM adapters. However, if you connect four terminal multiplexers, you cannot use two of the six ports. A maximum of 32 devices or OEM adapters can attach to each Work Station Adapter. The maximum length of the coaxial cable attaching devices without terminal multiplexers is 1.5 kilometers (4,920 feet). With the 3299 Terminal Multiplexer, the maximum cable length increases to 3 kilometers (9,840 feet).

System/370 Block Multiplexer Channel

The Block Multiplexer Channel (BMPX) lets you attach one to eight control units for both IBM and non-IBM DASD, tape, display, printer, and other devices. Figure 3-7 shows some of the devices that attach to the BMPX.

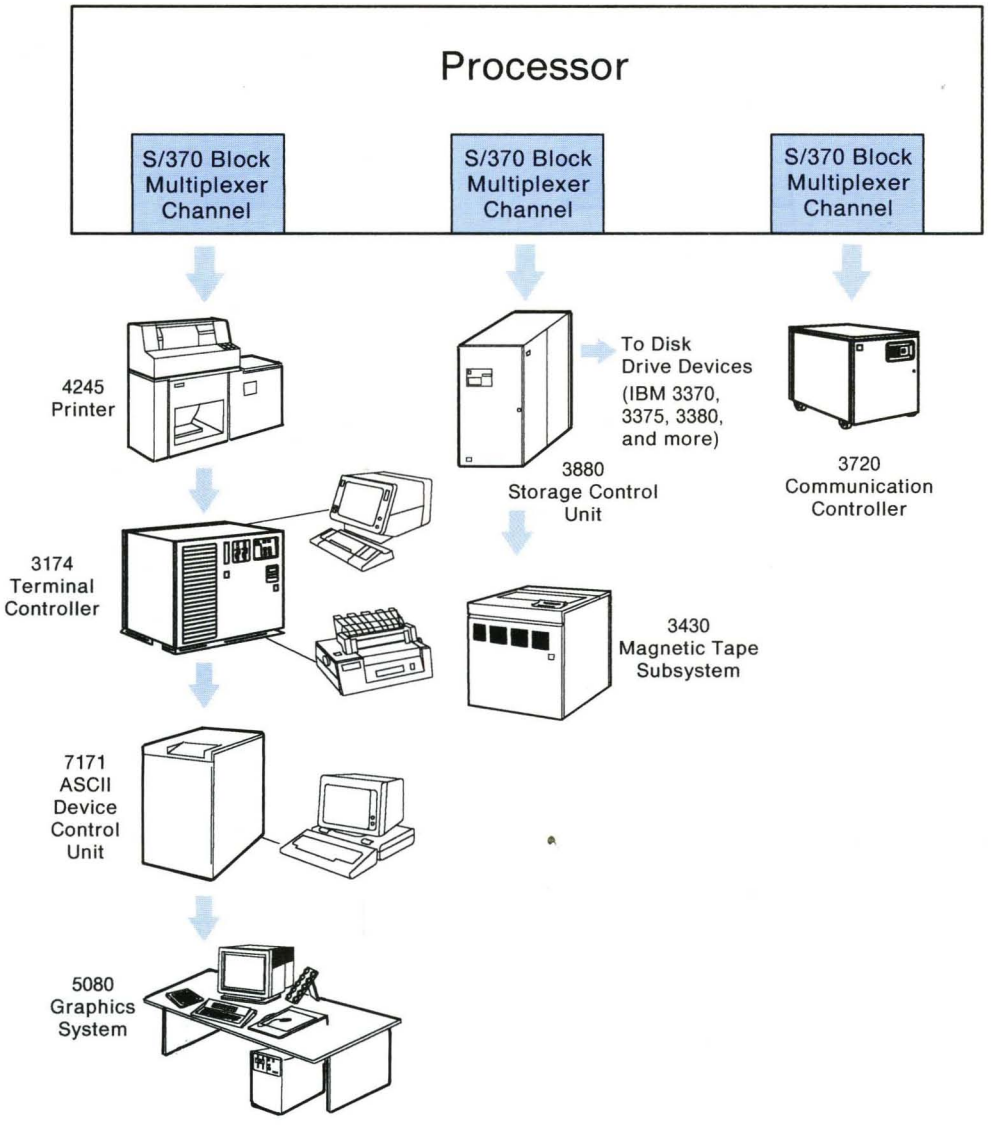

Figure 3-7. S/370 Block Multiplexer Channel and Attachable Devices

Channel I/O Devices

Many different I/O devices can attach to the S/370 BMPX.

Some products have separate control units, while others have a control unit built into the drive unit. For example, the 3370, 3375, and 3380 disk drives attach to the channel through the 3880 Storage Control Unit. The 3430 Magnetic Tape Subsystem has a Model A01 that contains a tape control unit and tape drive unit in a single frame.

The S/370 BMPX also attaches a variety of display stations and printers through control units such as the 3174 Display Control Unit and the 7171 Control Unit, which attaches ASCII devices.

Graphic display systems such as the 5080 can also attach to the channel. These systems consist of multiple devices. For example, the 5080 Graphic System consists of a 5081 Display, a 5085 Graphics Processor, a 5088 Graphics Channel Subsystem Controller, and a 5083 Tablet.

Many other control units connect to the channel to attach other types of devices.

Operating System Support: The S/370 Block Multiplexer Channel is supported by VM/SP, VSE/SP, IX/370, and MVS/SP.

System/370 Block Multiplexer Channel (Continued)

Channel Characteristics

The System/370 Block Multiplexer Channel (BMPX) is on one card (see Figure 3-8).

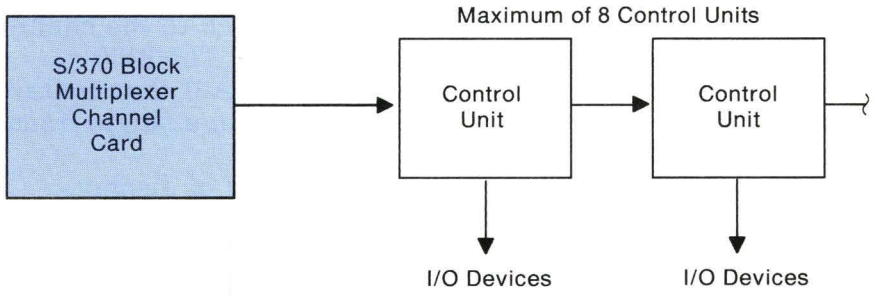

Figure 3-8. S/370 Block Multiplexer Channel – Configuration Summary

The System/370 Block Multiplexer Channel lets several I/O devices operate concurrently with high channel speed. Devices attached to the block multiplexer channel that cannot utilize block multiplexing will act as if attached to a selector channel. An example of such a device is the 3420 Tape Unit.

The channel can operate in *data streaming mode* for attaching high-speed DASD devices; for example, 3380 DASDs. Data streaming permits a data rate of up to 3 megabytes per second and cable lengths of up to 122 meters (400 feet) between the 9370 Processor and the last control unit.

Communications Subsystems Controllers

Four types of communications subsystems are supported:

- **Telecommunications Subsystem**. It is controlled by the Telecommunications Subsystem Controller, which lets you attach local communication lines to the 9370 Processor, or attach the 9370 Processor to public networks.

- **ASCII Subsystem**. It is controlled by the ASCII Subsystem Controller, which lets you attach ASCII devices to the 9370 Processor.

- **IBM Token-Ring Subsystem**. It is controlled by the IBM Token-Ring Subsystem Controller, which lets you attach the 9370 Processor to an IBM Token-Ring Network.

- **IEEE 802.3 Local Area Network (LAN) Subsystem**. It is controlled by the IEEE 802.3 LAN Controller, which lets you attach the 9370 Processor to an IEEE 802.3 or Ethernet[3] Local Area Network.

Multiples of the same subsystem controller or of different subsystem controllers can coexist on the same 9370 system.

This section describes these four controllers. It also contains a general overview of the networks that the 9370 system can operate in and a summary of communication line characteristics.

For more information on networks see:

- *IBM Data Communications Concepts*, GC21-5169.

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3 Ethernet is a trademark of the Xerox Corporation.

Communications Subsystems Controllers (Continued)

Telecommunications Subsystem Controller

The Telecommunications Subsystem Controller (see Figure 3-9) allows you to:

- Attach your 9370 system to **public networks**: nonswitched telegraph lines, public switched telephone networks, or nonswitched voice grade lines.
- Attach **TTC2 devices** to your 9370 Processor directly or through display controllers with ASCII support, such as the 3174 Terminal Controller.

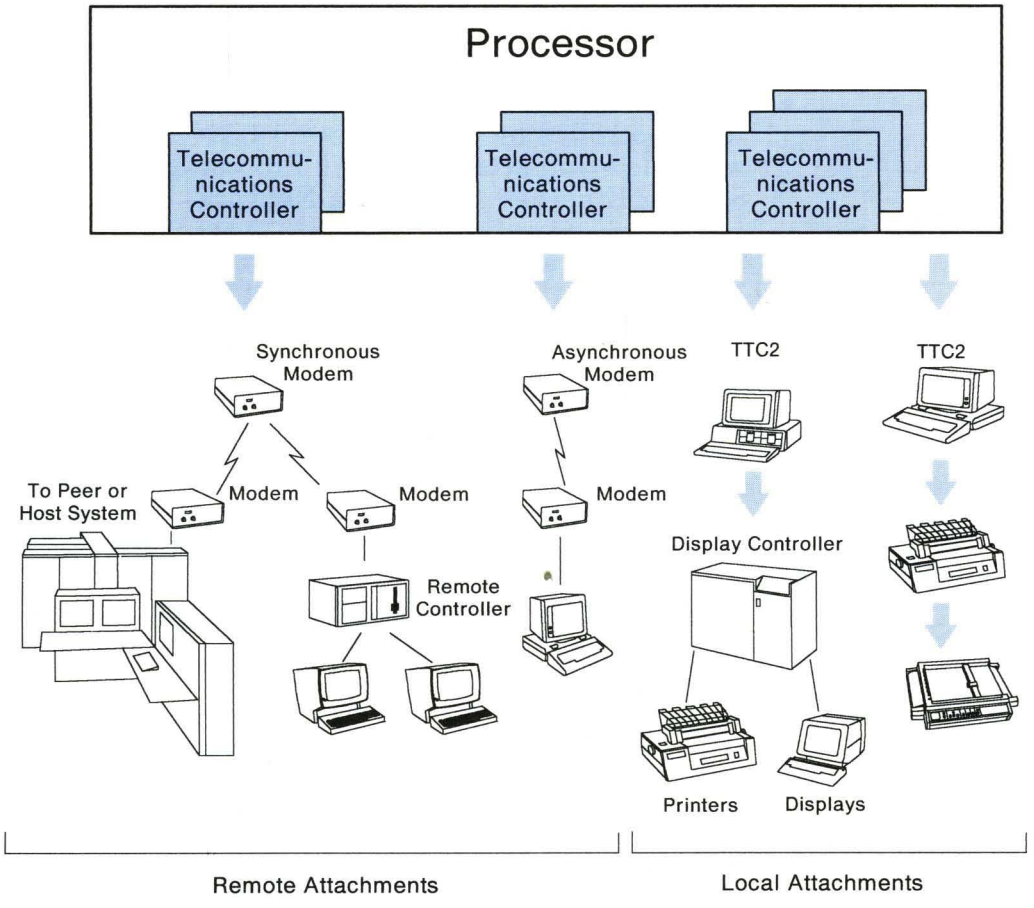

Figure 3-9. Telecommunications Subsystem

The Telecommunications Subsystem Controller consists of one Communications Processor plus up to three adapter cards (see Figure 3-10).

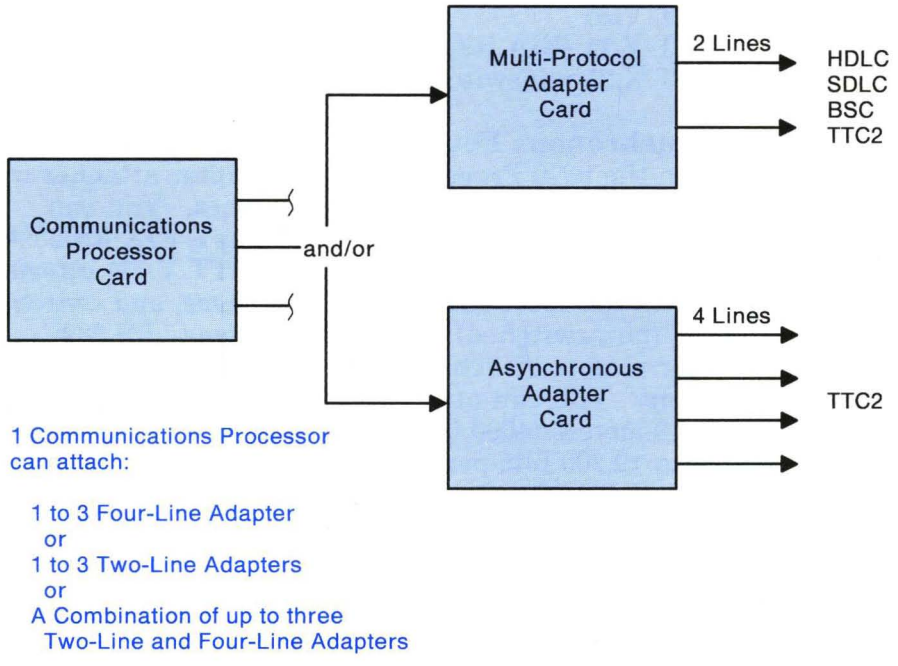

Figure 3-10. Telecommunications Subsystem Controller – Configuration Summary

The **Multi-Protocol Two-Line Adapter** attaches the 9370 Processor to public networks; it also attaches TTC2 devices to the 9370 Processor. The adapter supports standard synchronous and asynchronous line protocols:

- US Telegraph Terminal Control Type 2 (TTC2)
- Binary Synchronous Communication (BSC)
- Synchronous Data Link Control (SDLC)
- High-Level Data Link Control (HDLC), also called X.25 Level 2.

Communications Subsystems Controllers (Continued)

Each Multi-Protocol Adapter provides two communication lines. The standard line interfaces supported are:

- CCITT V.24/V.28 (EIA RS-232-C)
- CCITT V.25/V.28 (EIA RS-366-A) for one auto-call unit
- CCITT V.35
- CCITT V.11 (EIA RS-422-A) for local attachment
- CCITT X.21 nonswitched (EIA RS-422-A).

The **Asynchronous Four-Line Adapter** attaches TTC2 devices to the 9370 Processor. Each adapter attaches up to four asynchronous communication lines. You can attach to them any TTC2 device that has a EIA RS-232C (CCITT V.24/V.28) or EIA RS-422A (CCITT V.11) interface. You can attach local lines without modems, and switched or leased (non-switched) lines with modems. RS-232C allows for remote attachment; RS-422A allows for local attachment. You can attach devices locally at a distance up to 1219 meters (4000 feet). Transmission speed ranges from 50 to 19,200 bits per second (bps) for a line. Other than with the ASCII Protocol Subsystem Controller, device protocol conversion has to be done by application programs.

Operating System Support: The Telecommunications Subsystem Controller is supported by VM/SP and by VSE/SP.

ASCII Subsystem Controller

Function

The ASCII Subsystem Controller lets you attach a variety of asynchronous devices, such as display stations, printers, plotters, development systems, graphic equipment, and personal computers to the 9370 Processor in full duplex mode (see Figure 3-11). Devices you can attach include the IBM 3101 Display Terminal, the IBM 3161/3164 Display Terminals, the IBM 5150 Personal Computer, and a variety of OEM devices.

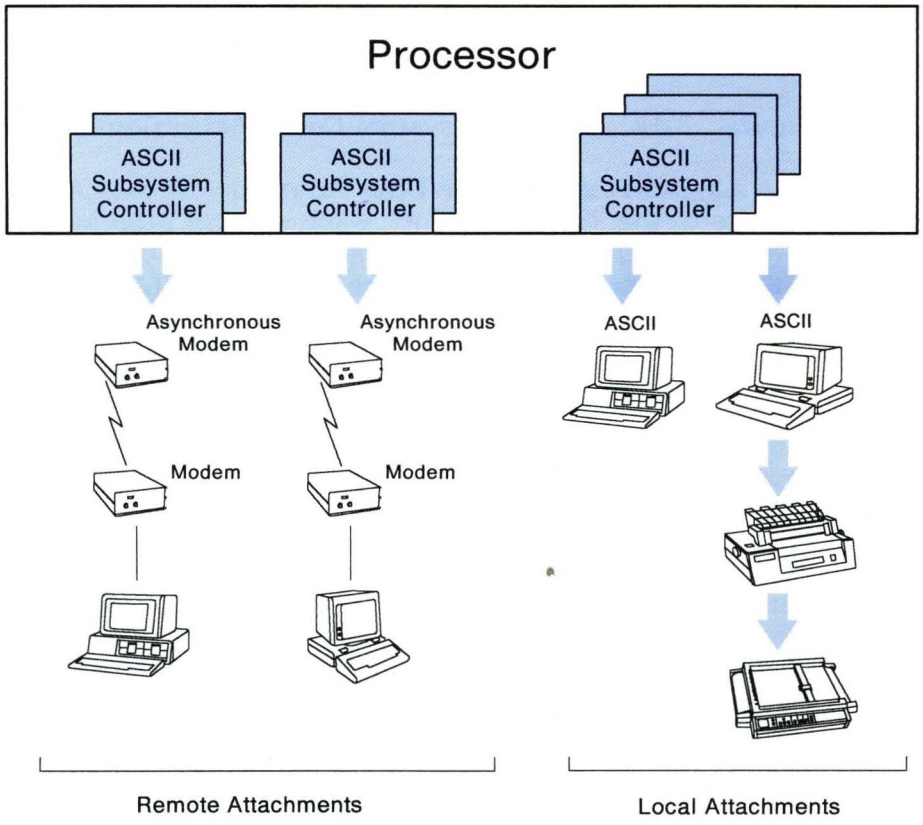

Figure 3-11. ASCII Subsystem

Communications Subsystems Controllers (Continued)

The ASCII Subsystem Controller consists of one Communications Processor plus up to four adapter cards (see Figure 3-12).

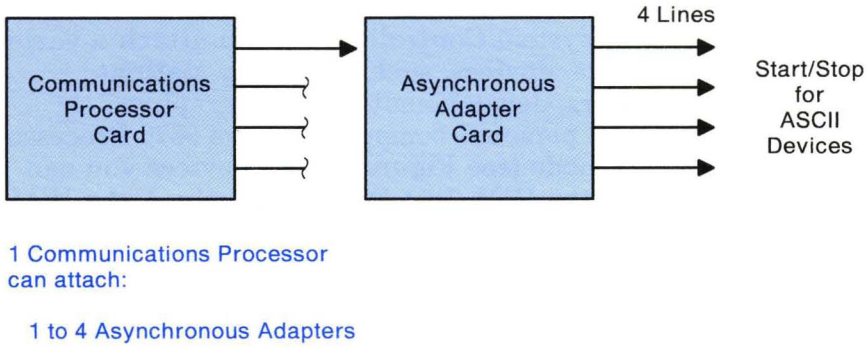

Figure 3-12. ASCII Subsystem Controller – Configuration Summary

The **Asynchronous Four-Line Adapter** attaches ASCII devices to the 9370 Processor. Each adapter attaches up to four asynchronous communication lines. You can attach to them any ASCII device that has a EIA RS-232C (CCITT V.24/V.28) or EIA RS-422A (CCITT V.11) interface with ASCII encoding. You can attach local lines without modems, and switched or leased (non-switched) lines with modems. RS-232C allows for remote attachment; RS-422A allows for local attachment. You can attach devices locally at a distance up to 1219 meters (4000 feet). Transmission speed ranges from 50 to 19,200 bits per second (bps) for a line. The aggregate data rate for each ASCII Protocol Subsystem Controller is 1800 characters per second (cps).

Connection to a ROLM[4] Computer Branch Exchange (CBX) is supported through a ROLM DataCom Module (DCM) or through a ROLM Data Terminal Interface (DTI). You can attach the ROLM terminals Cypress, Cedar, and Juniper through the ROLM CBX.

Operating System Support: The ASCII Subsystem Controller is supported by VM/SP, VSE/SP, and IX/370.

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4 ROLM is a registered trademark. Cypress, Cedar, and Juniper are trademarks of the ROLM Corporation.

Modes of Operation

The ASCII Subsystem Controller supports three modes of operation for ASCII terminals:

- **ASCII/3270 conversion mode** for applications that run on the VSE and VM operating systems
- **Transparent mode**, a submode of 3270 mode, for the transmission of graphic data
- **ASCII support mode** for applications that run on the IX/370 operating system (which runs as a guest on VM).

In **ASCII/3270 conversion mode**, the 9370 Processor regards the ASCII terminal as a normal 3270 device (for example, a 3178). The 9370 Processor translates the ASCII protocol so that any application or program that can communicate with a 3270 device can now communicate with the ASCII terminal. Terminal definition tables (which can be changed) let you attach most ASCII terminals, including OEM terminals, to the 9370 Processor.

In **transparent mode**, data is transmitted without translation, which provides transmission of graphic data to devices with graphic capability.

In **ASCII support mode**, you have the same functional capability that you have when working with UNIX[5]. ASCII printers, plotters, and graphic devices are supported as full duplex ASCII terminals, with full function of the device.

You can switch between ASCII/3270 conversion and ASCII support mode.

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5 UNIX is a trademark of the AT&T in the USA and in other countries. AT&T is the trademark of the American Telephone and Telegraph Company.

Communications Subsystems Controllers (Continued)

IBM Token-Ring Subsystem Controller

The IBM Token-Ring Subsystem Controller lets you attach your 9370 Processor to an IBM Token-Ring Network (see Figure 3-13).

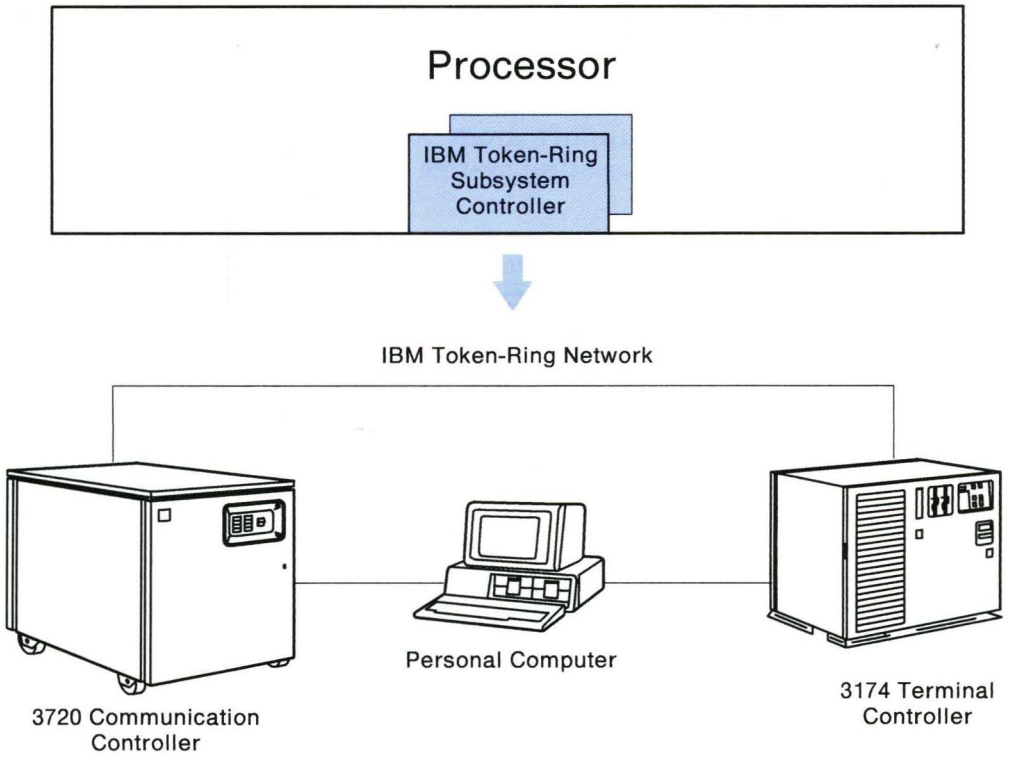

Figure 3-13. IBM Token-Ring Subsystem

The token-ring network provides high-speed communication among users in a single building or building complex. You can use the token-ring network to share storage and output devices among desk-top terminals and to transmit messages and data among them. (For a more detailed explanation of the IBM Token-Ring Network, see "Local Area Networks" on page 3-28.)

The IBM Token-Ring Subsystem Controller consists of one Communications Processor plus one adapter card (see Figure 3-14).

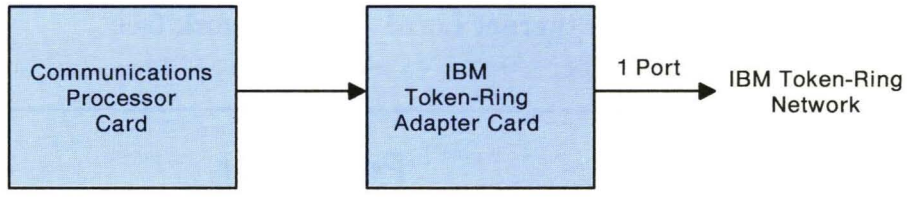

Figure 3-14. IBM Token-Ring Subsystem Controller – Configuration Summary

The **IBM Token-Ring Adapter** provides a physical link and access control to the IBM Token-Ring Network. The programming support must be an equivalent to the Open Systems Interconnection (OSI) Layer 3 and above. This lets you communicate with all token-ring-connected hosts, controllers, and work stations in IBM and non-IBM environments where matching protocols are available. Transmission speed is four million bps.

Operating System Support: The IBM Token-Ring Subsystem Controller is supported by VM/SP and Transport Control Protocol/Internet Protocol (TCP/IP).

Communications Subsystems Controllers (Continued)

IEEE 802.3 Local Area Network Subsystem Controller

The IEEE 802.3 Local Area Network (LAN) Subsystem Controller lets you attach your 9370 Processor to an IEEE 802.3 or to an Ethernet Local Area Network (see Figure 3-15).

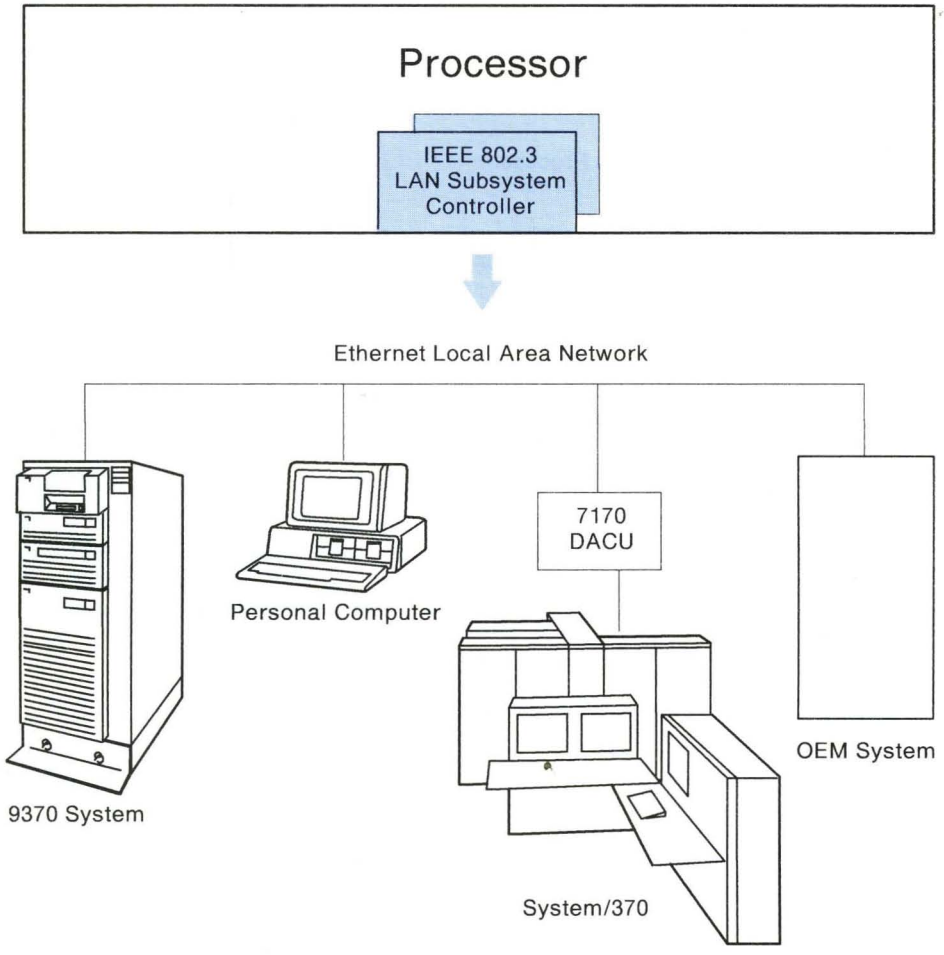

Figure 3-15. IEEE 802.3 LAN Subsystem

The local area network (LAN) provides high-speed communication among users in a single building or building complex. In the office environment, for example, you can use the LAN to share storage and output devices among desk-top terminals, and to transmit messages and data among the terminals. In a manufacturing plant, you can use the LAN to control assembly-line processes.

The IEEE 802.3 LAN Subsystem Controller consists of one Communications Processor plus one adapter card (see Figure 3-16).

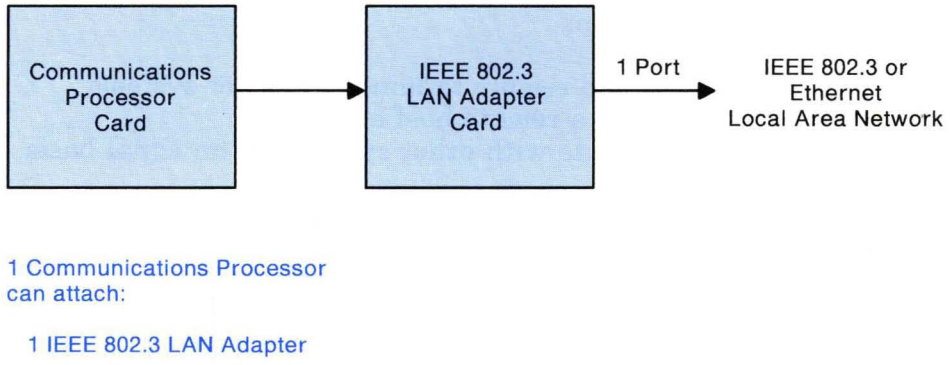

Figure 3-16. IEEE 802.3 LAN Subsystem Controller – Configuration Summary

The **IEEE 802.3 LAN Adapter** provides a physical link and access control to the IEEE 802.3 standard or the Ethernet Local Area Network. The programming support must be an equivalent to the Open Systems Interconnection (OSI) Layer 3 and above. This lets you communicate with all other LAN-attached hosts, controllers, and work stations in IBM and non-IBM environments where matching protocols are available. Transmission speed is 10 million bps.

Operating System Support: The IEEE 802.3 LAN Subsystem Controller is supported by VM/SP and Transport Control Protocol/Internet Protocol (VM TCP/IP).

Communications Subsystems Controllers (Continued)

The 9370 System in a Network

The 9370 system can connect to other systems in a communications network and share data with them. The 9370 system can:

- Be a host to remote terminals or other systems
- Connect to a remote host system
- Communicate with other systems on an equal basis.

A communications network consists of all devices and communication equipment used to transfer information from one point to another. The host system is normally referred to as the primary or control station and the remote station is the secondary or tributary station.

The 9370 system operates in the following types of networks:

- Switched
- Nonswitched
- Packet-switching
- Local area.

Switched and Nonswitched Networks

You use networks to establish connections among data processing equipment in different cities, towns, states, and countries. You can use these connections to exchange data (messages, programs, and files).

The most commonly used networks are the public telephone networks. These networks provide two major types of telephone lines:

- Switched
- Nonswitched (also called leased).

With **switched lines** (see Figure 3-17), you establish a temporary connection between your equipment and the remote system by dialing the computer's telephone number, then switching from talk mode to data mode for the data transfer. Switched line connections are electrical links between end users and are therefore called point-to-point. For switched lines, you pay the local or long-distance rates according to the time you maintain the connection, regardless of whether you transfer data or not.

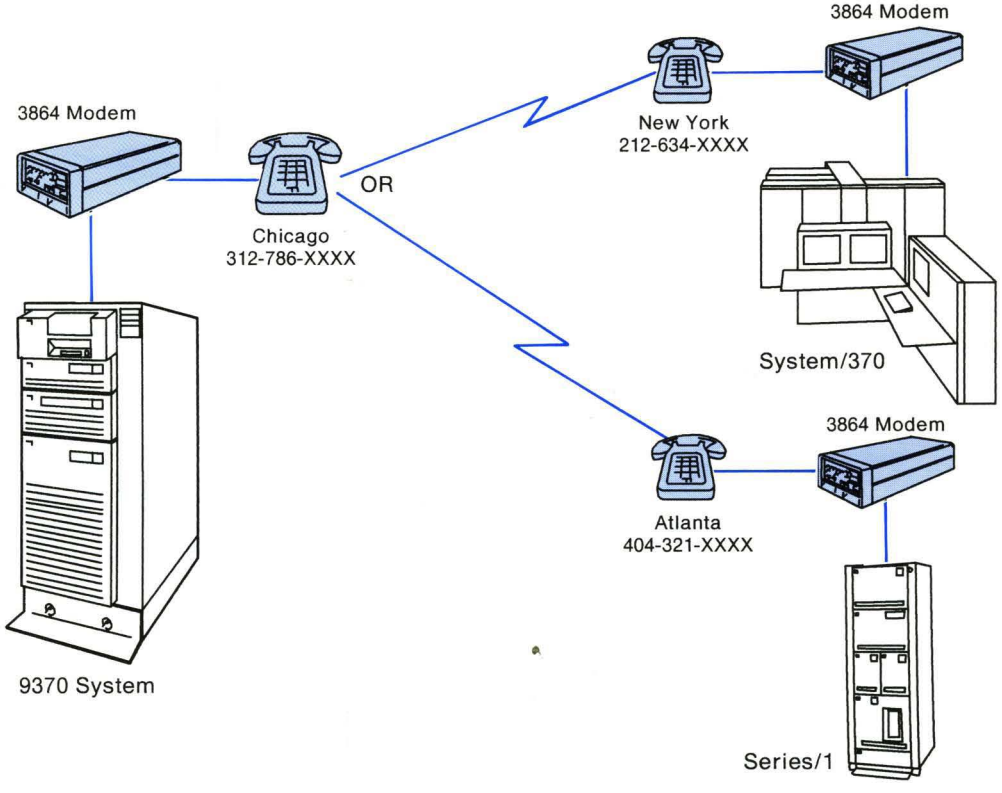

Figure 3-17. Example of a Switched Point-to-Point Network

Communications Subsystems Controllers (Continued)

With **nonswitched lines** (see Figure 3-18), you establish a permanent connection between your equipment and the remote system or systems. Nonswitched telephone lines are usually leased from the telephone company. They can be point-to-point connections, but you can also configure them in such a way that one system can send data to several terminals. Such a setup consists of a send line and a receive line, with all terminals, which are to receive the same data, connected to the same receive line. This configuration is called multipoint or multidrop. For nonswitched (leased) lines, you pay a fixed monthly rate to the telephone company (the common carrier).

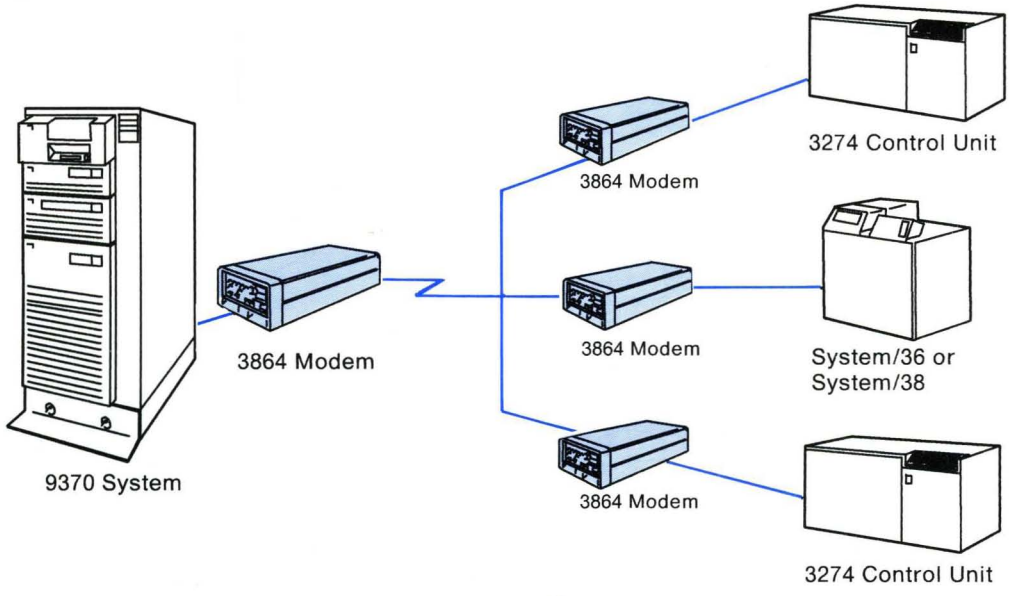

Figure 3-18. Example of a Nonswitched Multipoint Network

Packet-Switching Networks

Packet-switching networks (see Figure 3-19) are networks that accept packets of data from a subscriber and route these packets in the most efficient way to a specific end user, without establishing a direct electrical link between the end users. These networks are said to switch the information itself rather than the communication path. Packet-switching networks have been established in recent years in many countries.

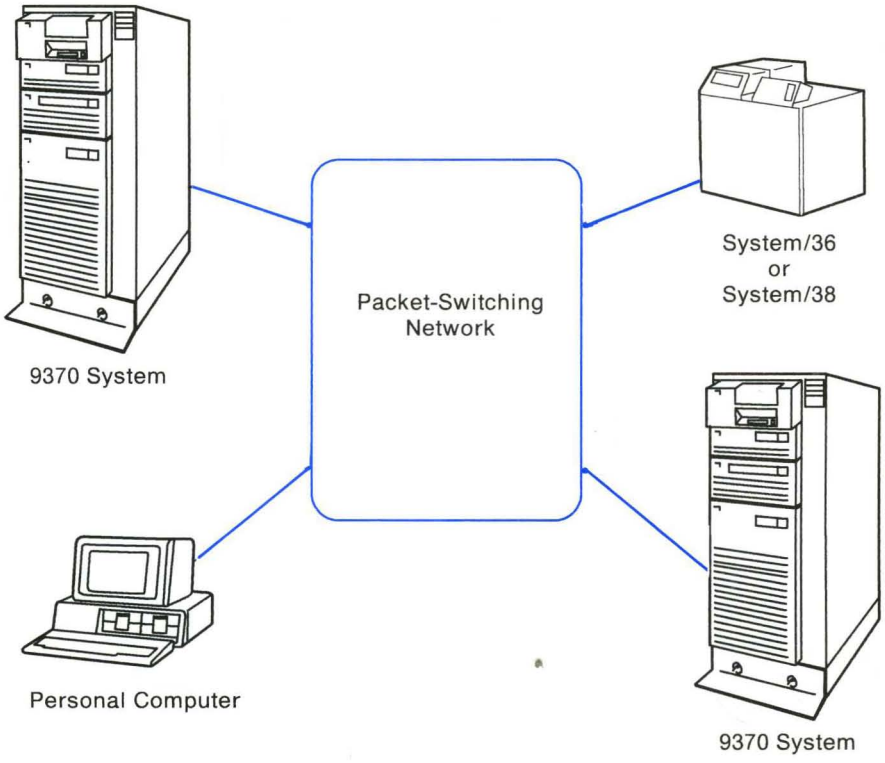

Figure 3-19. Example of a Packet-Switching Network

On packet-switching networks, you pay, for example, a small basic fee for the (permanent) connection to the network and additional charges for the number of information units (packets) that you actually send.

The 9370 Processor can connect to packet-switching networks. A packet-switching network operates with public network services that comply with the X.25 CCITT specifications.

Communications Subsystems Controllers (Continued)

Local Area Networks

Local area networks are networks that are limited to local environments, usually the premises of an office building or a plant. Physically, local area networks consist of coax cables or twisted-wire cables, which connect all participating terminals or data-processing devices.

The 9370 Processor can connect to an IBM Token-Ring Network or to an IEEE 802.3 Standard or Ethernet Local Area Network.

IBM Token-Ring Network

The IBM Token-Ring Network is a baseband token-ring local area network that is compatible with the IEEE 802.5 standard. It uses IBM Cabling System Type 3 media (telephone twisted pair), which allows you to use already installed cable or low-cost new cable. The devices in the network are cabled to one another in a logical ring.

Any connected terminal or system on the ring may transmit to any other connected terminal or system. Control is maintained by a token, a special message that circulates around the ring. A terminal or system may only transmit if it receives a free token. The terminal or system then makes the token busy and sends it out on the ring with the transmitted data and the address of the terminal or system to which the data is being sent. When the receiving terminal or system gets the data, it removes it from the ring. The data continues around the ring, and when the originating terminal or system receives it back, it removes the data from the ring and sends a free token out.

For more information, you can refer to the following publications:

- *IBM Token-Ring Network Introduction and Planning Guide*, GA27-3677
- *IBM Cabling System Planning and Installation Guide*, GA27-3361
- *Using the IBM Cabling System with Communication Products*, GA27-3620.

IEEE 802.3 Standard Local Area Network

The IEEE 802.3 standard local area network consists of 500-meter (1640-feet) sections of a special coax cable. The maximum distance to communicate between two stations is 1500 meters (4920 feet). The maximum number of stations on a network is 1024.

In the IEEE 802.3 standard local area network, all connected terminals and systems may transmit data to another terminal or system at any time. Transmission speed on the network is 10 million bps. The type of transmission control used is known as Carrier-Sense Multiple-Access with Collision Detection (CSMA/CD). Carrier-Sense means that each station "listens" to the data traffic on the cable before transmitting a packet of data. If some other station is already transmitting, the newcomer senses the presence of the carrier and waits until the cable is free. Multiple-Access means that all stations share the same cable. Every transmitted packet is "heard" by all stations on the network. The stations detect incoming packets by recognizing their addresses in the packets; other packets are discarded. If two or more stations transmit packets at the same time, a collision is detected. Each station can detect a potential collision and wait before trying to transmit the packet.

Ethernet is reflected in the Ethernet standard, also called DIX (DEC, Intel, Xerox) standard, and in the IEEE 802.3 standard.

Communication Line Characteristics

Communication Line Protocols

Protocol is the method used to control the transfer of data over a communication line. The protocol that you choose normally depends on the type of terminals your system communicates with. The types of protocol available on the 9370 Processor are:

- **US Telegraph Terminal Control Type 2 (TTC2)**: It is an asynchronous transmission mode and uses the 8-bit US ASCII transmission code. This protocol is suitable for terminals like Teletypewriter Exchange Service (TWX) Models 33/35/43, the 3101 Display

Communications Subsystems Controllers (Continued)

Terminal, and the 3161 and 3163 ASCII Display Stations.

- **Binary Synchronous Communication (BSC)**: It transfers all information as a string of bytes of any length. You use it to transmit EBCDIC or ASCII code.

- **Synchronous Data Link Control (SDLC)**: It transfers all information in frames. These frames begin and end with a special bit pattern known as a flag. You use it to transmit EBCDIC code.

- **High-Level Data Link Control, Link Access Procedure-Balanced (HDLC LAPB)**, also known as **X.25 Level 2**: It transfers information in packets. These packets contain all the data required for addressing and routing information through the packet-switching network. This technique allows simultaneous sending and receiving to/from several subscribers over a single line.

Communication Line Interfaces

Here is a brief description of the electrical interfaces that the Communications Controller supports:

- **EIA RS-232-C (CCITT V.24/V.28)**: It allows data communication over nonswitched telegraph lines, public switched telephone networks, or nonswitched voice grade channels at data rates from 50 to 19,200 bits per second (bps). It supports S/S (TTC2), BSC, SDLC, and HDLC line protocols.

- **EIA RS-366-A (CCITT V.25/V.28)**: It is used in combination with the RS-232-C (CCITT V.24/V.28) interface to provide an automatic calling connection to a switched network.

- **EIA RS-422-A (CCITT V.11)**: It allows local attachment of ASCII devices. Supported line protocols are TTC2, BSC, and SDLC.

- **CCITT V.35**: It allows high-speed communication over a nonswitched network. It supports SDLC and BSC line protocols. Transmission speeds are up to 64,000 bps for SDLC and 19,200 for BSC.

Input/Output Devices 4

This chapter gives you information about I/O devices that you can attach to the system. It describes the DASD and tape devices that mount in the racks and several display stations and printers that are recommended for use with your system. Each device is described at a general level, including information on device features, speeds, and capacities.

4 Input/Output Devices

The basic I/O devices of the 9370 system are the:

- **9335** and **9332 DASDs**. These are the large-capacity, high-performance disk devices.

- **9347 Magnetic Tape Unit**. The tape drive serves as a data exchange and as a load/offload device.

- **Display Stations and Printers**. Some of the devices recommended for use with the 9370 system include the:

  - 3191 Display Station
  - 3179 Model G Color Graphics Display Station
  - 3270 PC with 5371 System Unit
  - 4224 Printer
  - 4234 Dot Band Printer
  - 4245 Printer.

  This chapter describes these devices. You can, of course, attach a variety of other display stations, printers, and personal computers to the 9370 Processor.

The types and the number of system I/O devices vary from system to system, depending on your data processing needs.

The system DASDs and tape units reside in the rack. They attach to the 9370 Processor through the DASD/Tape Subsystem Controller.

The display stations and printers described in this chapter attach to the 9370 Processor locally and remotely through the Work Station Subsystem Controller, through control units, and through communication lines. The 3270 PC with the 5371 System Unit only attaches to the 9370 Processor through the Work Station Subsystem Controller or the 3174 Subsystem Control Unit.

9335 Direct-Access Storage Subsystem

The 9335 Direct-Access Storage Subsystem (see Figure 4-1) provides large-capacity, high-performance disk storage devices and associated control functions. The subsystem includes a controller and a DASD:

- Model A01 – Device Function Controller
- Model B01 – Direct-Access Storage.

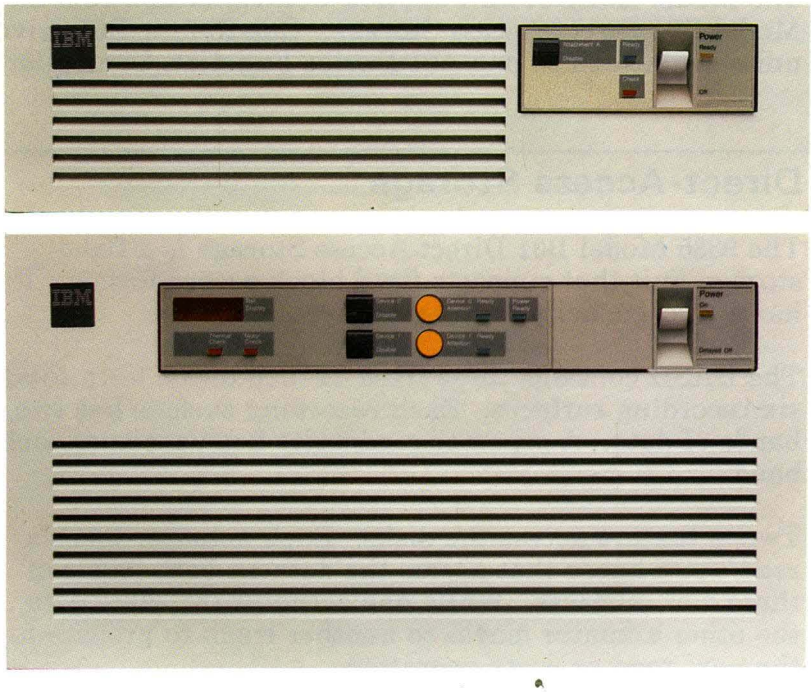

Figure 4-1. 9335 Direct-Access Storage Subsystem

9335 Direct-Access Storage Subsystem (Continued)

Model A01 Device Function Controller

The 9335 Model A01 Device Function Controller attaches to the 9370 Processor through the DASD/Tape Subsystem Controller. You can attach one Model A01 Device Function Controller to one DASD/Tape Subsystem Controller. The device function controller is 13.3 cm (5.25 inches) high and uses three EIA units in the rack.

The Model A01 Device Function Controller controls the Model B01 Direct-Access Storage. One to four B01 drive units can attach to one A01 Device Function Controller.

Model B01 Direct-Access Storage

The 9335 Model B01 Direct-Access Storage is a fixed storage unit that supports fixed-block record format. It has a user capacity of 824 megabytes.

The DASD contains three fixed 14-inch disks, for a total of six recording surfaces. Each recording surface has two bands of data. A separate read/write head accesses each band.

Two actuators access the disks. Each actuator has six read/write heads that access the data on both bands of three disk surfaces. While one actuator transfers data, the other actuator moves to another track to prepare for the next read or write operation.

The Model B01 Storage Unit is 26.7 cm (10.5 inches) high and requires six EIA units in the rack.

Specifications

The following table summarizes the 9335 DASD characteristics.

Data Storage Characteristics	
Type of Storage Unit	Fixed
Disk Diameter	35.6 cm (14 inches)
Number of Disks	3
Number of Recording Surfaces	6
Actuator Type	Rotary
Number of Actuators	2
Read/Write Heads per Actuator	6
Format	Fixed-Block Record Format
Track Allocation	
Bands per Surface	2
Data Tracks (Cylinders) per Band	1963
Sectors per Track	71 (+ 1 spare)
Data Bytes per Sector	512
Capacity	
Single Track	36,352 bytes
Cylinder	218,112 bytes
Total	855.9 megabytes
Available User Space on 9370	824 megabytes
Performance	
Rotational Speed	3623 rpm
Average Latency	8.28 milliseconds
Seek Times (with head change)	
• Track to Track	4.5 milliseconds
• Average	18.0 milliseconds
• Maximum	37.0 milliseconds
Data Transfer Rate (instantaneous)	3.0 megabytes per second

9332 Direct-Access Storage Device

The 9332 DASD (see Figure 4-2) provides a medium-capacity, high-performance disk storage device with an integrated device function controller. It attaches to the 9370 Processor through the DASD/Tape Subsystem Controller. You can attach one to four 9332 DASDs to one DASD/Tape Subsystem Controller.

The 9332 DASD is a fixed disk that supports fixed-block record format. It has a user capacity of 368 megabytes.

The 9332 DASD contains four fixed 21.0-cm (8.27-inch) disks for a total of eight recording surfaces. Each recording surface has one band of data.

Two actuators access the disk surfaces. Each actuator has four read/write heads. While one actuator transfers data, the other actuator moves to another track to prepare for the next read or write operation.

The 9332 DASD is 12.8 cm (5.1 inches) high and uses three EIA units in the rack.

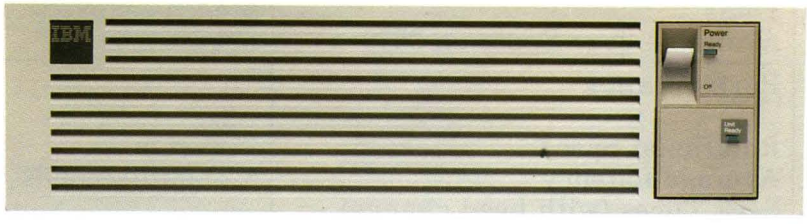

Figure 4-2. 9332 Direct-Access Storage Device

Specifications

The following table summarizes the 9332 DASD characteristics.

Data Storage Characteristics	
Type of Disk Drive	Fixed
Disk Diameter	21.0 cm (8.27 inches)
Number of Disks	4
Number of Recording Surfaces	8
Type of Actuator	Rotary
Number of Actuators	2
Read/Write Heads per Actuator	4
Format	Fixed-Block Record Format
Track Allocation	
Bands per Surface	1
Data Tracks (Cylinders) per Band	1349
Sectors per Track	74
Data Bytes per Sector	512
Capacity	
Single Track	37,888 bytes
Cylinder	303,104 bytes
Total	409.8 megabytes
Available User Space on 9370	368 megabytes
Performance	
Rotational Speed	3119 rpm
Average Latency	9.6 milliseconds
Seek Times (with head change)	
• Track to Track	3 to 5 milliseconds
• Average	23 to 25 milliseconds
Data Transfer Rate (instantaneous)	2.6 megabytes per second

9347 Magnetic Tape Unit

The 9347 Magnetic Tape Unit (see Figure 4-3) is an auto-loading magnetic tape unit with an integrated device function controller. It uses standard 12.5-mm (0.5-inch) wide magnetic tape. It is a streaming tape used for loading and offloading DASD volumes.

Note: To load/offload large DASD volumes, consider using the channel-attached, high-performance 3422 Tape Unit.

One 9347 Magnetic Tape Unit can attach to one DASD/Tape Subsystem Controller.

The 9347 Magnetic Tape Unit is 22.2 cm (8.75 inches) high and uses five EIA units in the rack.

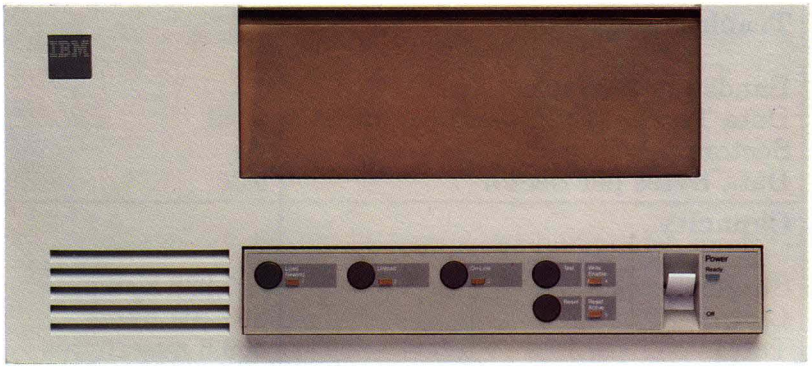

Figure 4-3. 9347 Magnetic Tape Unit

Specifications

The following table summarizes the 9347 Magnetic Tape Unit characteristics.

Data Storage Characteristics	
Media	Standard 12.5 mm (0.5 inch) tape 17.8, 21.6, or 26.7 cm (7, 8.5, or 10.5 inch) reel
Capacity	44 Mb at 1600 BPI
Recording Method	1600 BPI, phase encoded (ANSI)
Performance	
Tape Speeds	25 ips at 1600 BPI (non-streaming) 100 ips at 1600 BPI (streaming)
Data Transfer Rate (instantaneous)	40 Kb/sec at 25 ips 160 Kb/sec at 100 ips
Aggregate Data Transfer Rate	Depends on Software Activity

3191 Display Station

The 3191 Display Station (see Figure 4-4) is a general-purpose display station with a 1920-character, 12-inch monochrome video screen, which is available in the colors green or amber. Compared to its predecessors, the 3191 Display Station is lighter and smaller and offers many functional improvements.

The 3191 Display Station attaches to the 9370 Processor both locally and remotely.

Figure 4-4. 3191 Display Station

Models

Model A10 — 122-key Typewriter keyboard, green screen
Model B10 — 122-key Typewriter keyboard, amber screen
Model A20 — 102-key Enhanced keyboard, green screen
Model B20 — 102-key Enhanced keyboard, amber screen

Some Highlights

The following table summarizes the 3191 Display Station highlights.

Unit	Characteristics
Video Element	High-quality, high-resolution display with alphanumeric capability: • Bright, steady presentation of picture elements • Reduced light reflections • Reduced fingerprint smudges
Keyboard	• Typewriter keyboard (122 characters (124 for Katakana) with customer-replaceable keycaps With the keyboard definition facility in the 3191, you can define your own keyboard layouts. A keycap removal tool is standard so that keycaps can be changed conveniently. • Enhanced keyboard (102 characters (103 or 104 for Katakana))
Other Devices You Can Attach	None

For more information on the 3191 Display Stations see:

- *IBM 3191 Display Station Description*, GA18-2457.

3179 Model G Display Station

The 3179 Model G (see Figure 4-5) is a color display station with graphic (and alphanumeric) capabilities. It is an 8-color, 14-inch display station with bright colors and a smudge-resistant screen surface. It has very good graphics capabilities due to an all-points-addressable (APA) screen and its capability to attach the 3852 Model 2 Color Jet Printer for local screen copy.

Figure 4-5. 3179 Model G Color Graphics Display Station

The 3979 Expansion Unit provides auxiliary device ports to attach the 5277 Mouse and the 7371 or 7372 Color Plotters. The 3979 provides an alternative port for the 3852 Model 2 Color Jet Printer when the 3979 is attached to the 3179 Model G.

The 3179-G attaches to the 9370 Processor both locally and remotely.

Models

Model G1 — 122-key Typewriter keyboard
Model G2 — 122-key Typewriter/APL keyboard

Some Highlights

The following table summarizes the 3179 Model G Display Station highlights.

Unit	Characteristics
Video Element	High-quality, non-glare display with graphic and alphanumeric capability: • 14-inch color video element with customer-selectable screen (1920 or 2560 characters) • Eight colors (red, green, blue, white, yellow, turquoise, pink, black) • Vector to raster conversion, done by hardware, reduces host system processing and controller utilization
Keyboard	• 122-key Typewriter keyboard • APL keyboard
Other Devices You Can Attach	• Local screen copier color printer • Mouse • Plotter

For more information on the 3179 Model G Display Station see:

- *IBM 3179 G Color Graphics Display Station Description*, GA18-2261.

3270 PC With 5371 System Unit

The 3270 Personal Computer (PC) with graphic (G) or extended graphic (GX) capability (see Figure 4-6) is one of the most advanced work stations you can attach to the 9370 Processor. It is a powerful computer that can process alphanumeric information and manipulate and interact with graphic information. The various graphic capabilities include functions such as scaling, clipping, windowing, shading, superimposing of images, and many other functions. In addition, up to four host sessions can run concurrently with two private sessions. A mouse, drawing tablet, plotter, printer, and a 16-color, 19-inch color display further enhance application capabilities.

The 3270 PC/G and the 3270 PC/GX Work Stations attach to the 9370 Processor through the Work Station Subsystem Controller and through the 3174 Subsystem Control Unit.

Figure 4-6. 3270 PC with 5371 System Unit

Models

The 3270 PC/G and the 3270 PC/GX Work Stations consist of:

- One of the following system units:
  - 5371 System Unit Model 12
  - 5371 System Unit Model 14
  - 5371 System Unit Model 16
- One of the following displays:
  - 5279 Color Display (14-inch)
  - 5379 C01 Color Display (19-inch)
  - 5379 M01 Monochrome Display (19-inch)
- One of the following attachment units:
  - 5278 Display Attachment Unit
  - 5378 C01 Color Display Attachment Unit
  - 5378 M01 Monochrome Display Attachment Unit

3270 PC With 5371 System Unit (Continued)

Some Highlights

The following tables summarize the highlights of the 3270 PC with 5371 System Unit.

Unit	Characteristics
System Unit	• The 5371 System Unit Model 12 has: – 384K bytes of storage (can be increased to 640K) – Display unit adapter – Adapter for the keyboard, and tablet or mouse – One dual-sided diskette drive and adapter – Adapter for 5152, 5182, or 3852 printer – 3270 system adapter • The 5371 System Unit Model 14 has: – The Model 12 features plus – Second dual-sided diskette drive – Additional 128K storage (can be increased to 640K) • The 5371 System Unit Model 16 has: – The Model 12 features plus – One 10-megabyte fixed disk with adapter – Additional 192K storage (can be increased to 640K) All 5371 System Units have as optional features: • IEEE-488 adapter and cable • Asynchronous communications adapter and cable
Video Element	• 5279 Color Display with 5278 Attachment Unit: – All-points-addressable (APA) color display with bright, steady presentation of 720 x 512 picture elements – Customer-selectable screen (2560 or 3920 characters) – 8 colors in the graphics layer and 8 colors in the alphanumeric layer

Unit	Characteristics
Video Element (continued)	• 5379 Color Display with 5378 C01 Attachment Unit: – All-points-addressable display that provides higher performance and higher resolution than the 5279 – 1024 x 1024 picture elements in graphic layer – Alphanumeric layer with 4000 characters – 16 colors in the graphics layer and 8 colors in the alphanumeric layer • 5379 Monochrome Display with 5378 M01 Attachment Unit: – All-points-addressable display that provides higher performance and higher resolution than the 5279 – 1024 x 1024 picture elements in graphic layer – Alphanumeric layer with 4000 characters – 4 intensities in the graphics layer and 2 intensities in the alphanumeric layer
Keyboard	• APL keyboard • National language keyboards with customer-replaceable APL keycaps
Other Devices You Can Attach	• 5277 Mouse • 5083 Model 2 Tablet • Plotters • Printers • Tablet (with cursor or stylus) or mouse • Second screen (5379 only)

For more information on the 3270 PC/G and the 3270 PC/GX see:

- *Introducing the IBM 3270 Personal Computer/G and /GX Workstations*, GA33-3141.

4224 Printer

The 4224 Printer (see Figure 4-7) is a table-top matrix printer. It is a serial dot bi-directional impact printer for both local and remote attachment to the 9370 Processor.

Three print modes are standard: data processing (DP), DP text, and near letter quality (NLQ). These three levels of print quality, combined with forms handling options and extensive graphic capability, make the 4224 ideal for a variety of data processing and word processing applications.

Multiple models offer speeds up to 400 characters per second (cps) and color printing. The 4224 offers advanced print functions through the Intelligent Printer Data Stream (IPDS).

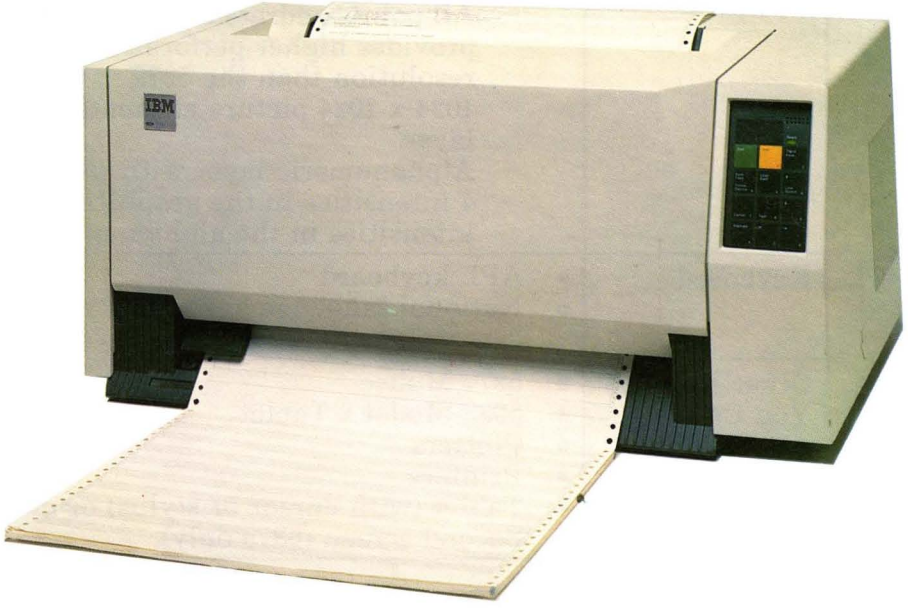

Figure 4-7. 4224 Printer

Models

Model 101 — 200 cps maximum
Model 102 — 400 cps maximum
Model 1E2 — 400 cps maximum, expanded storage
Model 1C2 — 400 cps max., color, expanded storage

Some Highlights

The following table summarizes the 4224 Printer highlights.

Function	Characteristics
Print Mode (all models)	• Data Processing (DP): – Density is 9 dots high, 10 dots wide – Maximum print speed is 200 cps for Model 101 – Maximum print speed is 400 cps for Models 102, 1EC, 1C2 • DP Text: – Density is double that of *Data Processing* mode – Maximum print speed is 100 cps for Model 101 – Maximum print speed is 200 cps for Models 102, 1EC, 1C2 • Near Letter Quality: – Density is double that of *DP Text* mode – Maximum print speed is 50 cps for Model 101 – Maximum print speed is 100 cps for Models 102, 1EC, 1C2
Color Printing (Model 1C2)	• 4 colors (black, red, blue, green) or • 8 colors (black, red, blue, green, yellow, pink, turquoise, brown)
Advanced Functions (through IPDS) (all models)	• Vector graphics • Resident bar codes • Optical character recognition (A & B) • Image storage (software-dependent)
Word Processing (all models)	• Proportional spacing • Sub/superscript • Various emphasis capabilities (software-dependent) • Print quality mode selected by either operator or software

For more information on the 4224 Printer see *IBM 4224 Printer Product and Programming Description*, GC31-2551.

4234 Dot Band Printer

The 4234 Dot Band Printer (see Figure 4-8) is a monochrome matrix line printer that utilizes a unique dot band technology. The printer is floor-standing, loads forms from the bottom, and prints at a maximum speed of 410 lines per minute. It is designed to operate in a semi-attended environment. Three print modes are standard: draft, data processing, and near letter quality. Customer-changeable print bands are available in three different dot sizes to give you flexibility in printing the multiple levels of quality.

Only one model is available for attachment to the 9370 Processor, the 4234 Model 001.

Figure 4-8. 4234 Dot Band Printer

Some Highlights

This printer gets its name from its flexible print band. By changing the print band, you can increase the dot density of the printer, improving the print quality. The following table summarizes the 4234 Dot Band Printer highlights.

Function	Characteristics
Print Mode	• Draft: – Horizontal printing uses 45 of 90 dots per inch (DPI); vertical printing uses 48 DPI – Uppercase only – Character height is 5 dots – Maximum print speed is 410 lines per minute • Data Processing: – Horizontal printing uses 45 of 90 DPI; vertical printing uses 72 DPI – Character height is 7 dots – Maximum print speed is 300 lines per minute • Near Letter Quality: – Horizontal printing uses 90 of 90 DPI; vertical printing uses 96 DPI – Maximum print speed is 120 lines per minute
Advanced Functions	You can change the dot size of the characters by changing the print band; consequently, you can optimize the print quality at various speeds.

For more information on the 4234 Dot Band Printer see:

- *IBM 4234 Dot Band Printer Product and Programming Description*, GC31-2554.

4245 Printer

The 4245 Printer (see Figure 4-9) is a high-speed line printer that uses an operator-exchangeable steel print band. Print speed is 1200 or 2000 lines of 132 characters per minute, depending on the model and the character set used. Standard features of the printer include optical character recognition (OCR) printing and a wide range of character sets.

Figure 4-9. 4245 Printer

Models

Model 12 — 1200 lpm maximum, channel-attached
Model 20 — 2000 lpm maximum, channel-attached
Model D12 — 1200 lpm maximum, directly-attached
Model D20 — 2000 lpm maximum, directly-attached

Some Highlights

The following table summarizes the 4245 Printer highlights.

Function	Characteristics
Forms to Use	• Margin-punched, pin-feed, continuous forms • Width of forms may range from 8.9 to 55.9 cm (3.5 to 22 inches) • Length of forms may range from 7.6 to 61.0 cm (3 to 24 inches)
Character Sets	• 48 • 48 OCR numerics only • 48 OCR alphanumeric • 52, 50/54/63/64, 94/116, 108/124/127
Print Speed	Depending on character set used: • 744 to 2000 lpm on Model 20 • 445 to 1200 lpm on Model 12
Advanced Functions	• OCR printing on both models: – Both 'A' and 'B' fonts available – 'A' font has OCR numerics and 3 special characters (hook, fork, and chair) – 'B' font has OCR numerics, 4 special characters (<, >, +, /) and extended alphabetics • Vacuum cleaning system constantly cleans the print band

For more information on the 4245 Printer see:

- *IBM 4245 Printer, Models 12 and 20 Information Manual*, GA33-1579.
- *IBM 4250 Printer, Models D12 and D20 Information Manual*, GA33-1586.

4245 Printer (Continued)

For More Information ....

For a list of other devices that attach to the 9370 Processor see:

- *Planning for Your IBM 9370 Information System*, GA24-4032.

For information on other devices that attach to the 9370 Processor see the following manuals:

- *IBM Input/Output Device Summary*, GA32-0039
- *IBM Data Communication Device Summary*, GA27-3185.

This chapter gives you an overview of the 9370 operating systems and some associated end-user software packages.

It also summarizes the hardware requirements of the software packages and provides a list of selected program products and applications available for VSE, VM, and MVS.

5 Software

Complementary software packages are available that match the flexible hardware packaging of the 9370 system.

The software packages and their underlying operating systems are designed to meet your requirements for interactive, transaction, and batch processing in areas such as:

- Business professional and office applications
- Commercial applications
- Engineering/scientific applications
- Industrial applications
- Application and end user tool development.

The software packages are designed to be installed and ready to run within a few hours, without requiring high data processing skills.

VM/Integrated System (VM/IS)

VM/IS, which uses VM/SP as underlying operating system, is the package most suited for interactive processing in departmental or work group environments. In addition to all the functions provided by VM/SP, VM/IS offers application packages for decision support and office work, engineering/scientific computing, and program development. It also provides a relational data base and support for intelligent work stations, networking, and communication controllers.

VSE/System Package (VSE/SP)

VSE/SP is a full-function operating system designed primarily for intensive batch and transaction processing. It is IBM's primary production system for intermediate systems, and well suited as an operating system base for distributed processing nodes. The major strength of VSE/SP is in commercial applications, such as payrolls, bills, orders, and more. As a departmental system, VSE/SP also provides business professional, decision support, office, and intelligent work station support.

IBM Interactive Executive for System/370 (IX/370)

IX/370 is an IBM-enhanced UNIX[1] implementation. UNIX is an interactive, multi-user, multiprocessing system, with a high level of portability. IX/370 provides most of the functions of the UNIX System V as defined by AT&T,[2] plus many IBM enhancements. IX/370 runs as a guest operating system on VM/SP.

Multiple Virtual Storage/System Product (MVS/SP)

MVS/SP is supported only by the 9375-60 Processor and the 9377 Processor. You would use MVS/SP on a 9370 system primarily where operating system compatibility with a central computer is a major requirement. This would allow you to transport application and program packages among the host and the distributed systems. MVS is not discussed in detail in this manual.

The following table summarizes the basic system support provided for the IBM 9370 Processors.

Operating System	9373-20	9375-40	9375-60	9377-90
VM/SP	Yes	Yes	Yes	Yes
VSE/SP	Yes	Yes	Yes	Yes
IX/370	Yes	Yes	Yes	Yes
MVS/SP	No	No	Yes	Yes

Figure 5-1. Operating Systems Supporting the 9370 System

For the release numbers of the operating systems that support the 9370 system, see your IBM marketing representative.

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1 UNIX is a trademark of AT&T in the USA and other countries.

2 AT&T is the trademark of the American Telephone and Telegraph Company.

Figure 5-2 shows an overview of the operating systems and their environments.

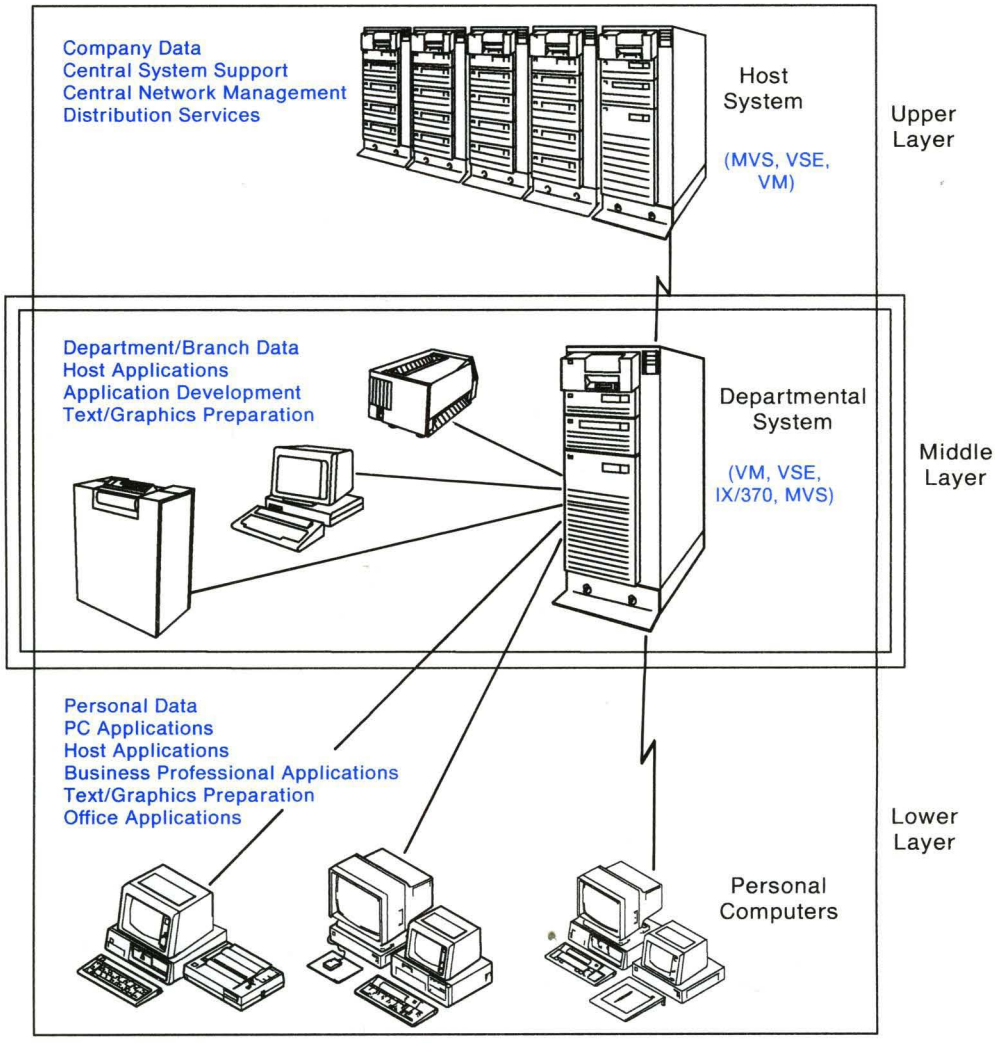

Figure 5-2. 9370 System, Operating Systems, and Environments

Figure 5-3 shows a small 9370 system in an office environment.

Figure 5-3. Small 9370 System in an Office Environment

VM/SP and VM/IS

Virtual Machine/System Product (VM/SP) is an interactive operating system that provides flexibility and ease of use support in central or distributed environments. VM/SP with its Conversational Monitor System (CMS) is IBM's primary end user interactive operating system for System/370. With its associated packages and products, a VM/SP system provides an attractive set of functional capabilities that can significantly improve the productivity of both end users and DP professionals.

VM/SP is available in two packages:

- VM/Integrated System (VM/IS)
- VM/SP System Offering.

Using VM/SP and VM/IS

VM/SP is an interactive operating system that allows many users to concurrently share the resources of a real computing system; therefore, people with different needs and abilities can do many different kinds of work.

VM/SP can run unattended, without the need for an operator. In a distributed environment, you can control operator functions remotely, including powering on/off the processor and controlling operator actions, such as responding to operator messages.

VM/SP is the operating system that is included in VM/IS, which is an easy to install, load and go, packaged system that includes a wide range of user applications. You can use VM/IS to support a single office application such as PROFS (PRofessional OFfice System). In addition, multiple application packages, such as engineering/scientific or general business applications can be combined.

Some Highlights

In addition to the traditional facilities of VM/SP, such as problem solving, editing and text creation, program development, operating system conversion or migration, and so forth, VM/SP offers a wide variety of other features, including the following:

- **Integrated Application Packages that are easy to install and use**. VM/IS provides sets of easily installed and operated packages with task-oriented menus that are designed to meet the needs of common types of work groups. Work environments include office, data base, business professional, engineering scientific, and commercial.

  The full function of VM/SP is included in VM/IS; however, the skill level required to install and support VM/IS is reduced by integrated system control menus, a remote system programming offering, and task-oriented publications.

- **Application Development Tools**. Fourth Generation Language support, relational data base, and facilities to rapidly develop menu-driven applications are available as application development productivity tools. They expedite the process of converting the needs of business and people into useful, flexible, maintainable programs. The interactive CMS interface and non-conflicting sharing of hardware are fundamental characteristics of VM/SP intended for development activity.

- **Communications**. The existing System/370 communications between 370 nodes are available with VM/SP as well as local area network communicaton for IBM and industry standard interfaces.

- **Compatible, Open-Ended Growth**. VM/SP runs in all System/370 environments, from the single-user IBM Personal Computer, to the departmental computer, to systems in a central computing facility. Applications designed for a System 9370 can be run on IBM's largest processors, like the IBM 3090. In addition, many applications designed to run on other System/370 processors can also be run on the System 9370 family of processors.

VM/SP and VM/IS (Continued)

VM/IS

VM/Integrated System (VM/IS) is a family of software offerings that provide general business, office, and engineering/scientific application solutions.

VM/IS is easy to install, easy to use, and easy to maintain. It is targeted to meet the needs of a departmental user without requiring the skills of a data processing professional. You would use VM/IS for a specific application requirement, for example support for an engineering design group. You can easily add other applications, such as text processing and office application support to the technical support and combine it into a sincle system, serving the diverse needs of a larger number of users. The System/9370 with its modular design gives you flexibility in tailoring your applications or expanding your system to meet the requirements of a growing department. The VM/IS offerings contain a complementary set of program products to satisfy various user needs. They are pre-generated and ready to run, but you can still add or delete programs to tailor the the system to the needs of your environment.

VM/IS consists of a base and optional packages, as described on the next page.

VM/IS BASE

The operating system component of VM/IS is known as VM/IS BASE. VM/IS BASE consists of a set of functions equivalent to the functions listed in see Figure 5-4. These functions provide for the basic operation of your system.

Function	Licensed Products
Basic system control and data management	• VM/SP (Virtual Storage/System Product)
Background execution	• VM Batch Subsystem
System administration	• VM DIRMAINT (VM Directory Maintenance)
User menus	• VM IPF (VM Interactive Productivity Facility) • VM/IS PF (VM/IS Productivity Facility)
Screen manager	• ISPF (Interactive System Productivity Facility)
User file sharing	• VM File Storage Facility
System performance optimization	• VM RTM (VM Real-Time Monitor) • VM MAP (VM Performance Monitor Analysis Program) • PL/I Transient Library
Text and graphics preparation	• DCF/FEF (Document Composition Facility/Foreground Environment Feature) • GDDM (Graphical Data Display Manager) • GDDM/PGF (Graphical Data Display Manager/Graphics Presentation Function)

Figure 5-4. Summary of VM/IS

VM/SP and VM/IS (Continued)

A more detailed description of the functions follows:

Basic System Control and Data Management:

- **VM/System Product (VM/SP)**. This function includes managing the real system resources of processor time, real storage, and I/O devices, making them available to all VM users at the same time. It provides a high-performance, interactive computing environment that is suitable for general problem solving and program development. It provides a state-of-the-art editor and interpretive language for developing and using interactive applications.

Background Execution:

- **VM Batch Subsystem**. This program offering allows you to submit a process, for example a program compilation, for execution without tying up your resources while waiting for the process to complete. it receives the programs.

System Administration:

- **VM Directory Maintenance**. This program product provides the system administrator with easy-to-use, efficient, and secure interactive facilities to manage the VM system directory.

User Menus:

- **VM Interactive Productivity Facility (IPF)**. This offering provides system operation menus that represent a simplified interface to the VM system. It reduces the learning time and reduces the skill required for system administrators, operators, and general users to manage and use the system. The product provides dialog support for those functions that are difficult for the inexperienced user to accomplish. It assists experienced users with tasks that they seldom do. The product also includes the interface that allows you to easily add your own or IBM programs to the system.

- **VM/IS Productivity Facility (VM/IS PF)**. This product provides end-user menus. They contain task-oriented, introductory, and navigational dialogs that lead to the functions of other programs in VM/IS. The task-oriented dialogs emphasize the VM/IS view of

the work activities of the general user. They include examples for most applications. These examples serve as a guideline and illustrate how you can use products together. You can tailor the dialogs to reflect added programs, or in other ways to reflect your specific needs. VM/IS PF makes use of the functions of underlying products like IPF, but does not duplicate or change them.

Screen Manager:

- **Interactive System Productivity Facility (ISPF)**. This is a dialogue manager. It controls the flow of the end-user interface provided by VM/IS. The application programmer can use it to produce interactive applications in the form of menu-driven dialogs and dialog functions that make the application easy to use by a non-DP user.

User File Sharing:

- **VM File Storage Facility**. This facility allows you to share data files with other VM users, store and retrieve files, rename and erase files, send files to other users, change passwords, and obtain status information on files.

System Performance Optimization:

- **VM Real-Time Monitor (RTM)**. This program offering reports on performance. It provides comprehensive performance monitoring and statistical analysis, which is presented in real time on any display supported by VM/IS. This information can help operators and installation management detect real-time problems, analyze system performance, measure the effects of system changes, and improve control of the entire VM system.

- **VM Performance Monitor Analysis Program (VM MAP)**. VM MAP provides reports and graphics on performance and utilization of a running VM system. System analysts can use this data for capacity planning and system tuning. It requires little previous knowledge of VM and should be of value to new and experienced VM users alike.

- **PL/I Transient Library**. Contains general support routines, which VM MAP requires.

VM/SP and VM/IS (Continued)

Text and Graphics Preparation:

- **Document Composition Facility/Foreground Environment Feature (DCF/FEF).** This program product is a valuable tool for producing text documents. You can use it to create text documents like reports, manuals, manuscripts, proposals, and more. DCF includes SCRIPT/VS control words and Generalized Markup Language (GML) tags to format the documents. When processed with the DCF formatter, you can print a document, display it on a terminal screen, or use it as input to other text documents.

- **Graphical Data Display Manager (GDDM).** GDDM is a host system program for creating, showing, and storing pictures. It handles graphics, images, and alphanumerics. It drives displays, printers, plotters, and scanners.

- **Graphical Data Display Manager/Graphics Presentation Function (GDDM/PGF).** GDDM/PGF is a member of the GDDM series of programs. It provides various methods of producing business and other charts. PGF includes the Interactive Chart Utility (ICU) and the Vector Symbol Editor (VSE).

The Optional Packages of VM/IS

VM/IS offers you several optional packages. Each optional package contains a specialized function set geared to a specific area of use. This modular design allows you to add any combination of these optional packages to your base. Thus the optional packages act as building blocks allowing you to select only those functions you need. The optional packages are listed in Figure 5-5.

Packages	Components
Text Office Support (TXTO)	• Displaywrite 370 • Host Displaywriter Document Interchange (HDDI) • OS/PL1 Resident Library • Professional Office System (PROFS) • 3812 Printer Support • IBM 6670 Preprocessor
Engineering/Scientific Problem Development Support (E/SPDS)	• High Accuracy Arithmetic Subroutine Library (ACRITH) • Composition Utilities (CompUtil) • Elementary Math Library (EML) • VS Formula Translation (VS FORTRAN) • VS FORTRAN Interactive Debug (VS FORTRAN IAD) • VS FORTRAN Utilities (FORT Util) • IBM 3277 Graphics Attachment Support Program (GASP) • Graphical Display Query Feature (GDQF) • Interactive System Productivity Facility/Program Development Facility (ISPF/PDF) • OS PL/1 Resident Library
APL Language Support (ALS)	• APL2
Problem-Solving Languages (PSL)	• BASIC • Pascal/VS
Data Base Query (DBQ)	• Database Edit Facility (DBEDIT) • OS PL/I Resident Library • Structured Query Language/Data System (SQL/DS)
Intelligent Workstation Support (IWS)	• Personal Computer/Virtual Machine Bond (PC BOND) • 3270 Personal Computer File Transfer Program (PC File Transfer) • VM/PC Host Server
Networking Support (NTWK)	• Cooperative Viewing Facility (CVIEW) • VM/Pass-Through Facility (PVM) • Remote Spooling Communication Subsystem (RSCS)
Communication Controller Support (COM)	• Advanced Communications Function/System Support Program (ACF/SSP) • IBM 3725 Emulation Package (EP3725)

Figure 5-5. Summary of VM/IS

VM/SP and VM/IS (Continued)

A more detailed description of the optional packages follows:

- **Text Office Support**. This package includes PROFS. PROFS provides improved office communication by helping you do tasks such as handling mail, scheduling appointments, preparing documents, memos, graphics, business forms, and reports. Also included in this package is support for the IBM 6670, an advanced laser printer, to obtain high-quality printed output.

- **Engineering/Scientific Problem Development Support**. This package aids the engineer and scientist in developing programs and in creating graphics. This package is available with or without FORTRAN language support.

  ISPF/PDF increases end user productivity by simplifying many frequently used tasks. It includes extensive help facilities and tutorials. ACRITH contains a set of routines for VS FORTRAN for the solution of standard problems in numerical analysis, interactive routines for training, and floating-point operations. These routines use techniques such as directed rounding and a precise scalar product. EML is a set of mathematical subroutines, which are used by FORTRAN programs using VS FORTRAN function names (square root, exponentiation, logarithm). VS FORTRAN is a general-purpose computer language well suited for large-scale mathematical and scientific application development. It is the preferred language of the engineering and scientific community. There are large libraries of engineering and scientific FORTRAN programs.

- **APL Language Support**. This package allows you to use the APL2 programming language. APL is a concise programming language with large libraries of mathematical and statistical functions.

- **Problem-Solving Languages**. This package provides programming languages for solving everyday business problems. The programming languages are IBM BASIC/VM and Pascal/VS. BASIC is a popular language for calculator-type functions and simple problems. Pascal is a programming language for supporting constructs for defining data structures. It is also well-suited for structured programming.

- **Data Base Query**. These products allow you to create and manage a relational data base. You can retrieve data, and create and print reports. Programmers can use it to develop or prototype applications with less time and effort. End users in business, engineering, and scientific disciplines can use it to directly get and combine the information they need from different sources.

- **Intelligent Work Station Support**. This package provides support for the IBM Personal Computer. The IBM PC user can take advantage of the features of a VM host system without having to learn VM/SP, and the VM/SP user can use the IBM PC as a stand-alone VM/SP system. With this optional package, you can transfer files between an IBM PC and a VM/SP system. However, to take advantage of this support, you do need additional PC programs (PC/VM Bond, VM/PC) for your IBM PC.

- **Networking Support**. This package provides computer network support for sending and receiving information between sites, and logging onto remote systems. RSCS Networking manages the data transfer among systems in a network. It controls the transfer of commands, messages, and files. This includes remote job entry and the printing of output on remote printers. CVIEW allows VM/SP users to share the same interactive session. Several teams of end users can conduct several sessions concurrently. In a network of systems, PVM allows VM users to log on to their system from another system in the network. This allows you to work with your own system over even very large network distances as if the terminal you are using were directly attached to your own system.

- **Communication controller support**. This package provides support for the IBM 37X5 Communication Controller.

For detailed information on VM/IS see:

- *Virtual Machine/Integrated System General Information*, GH24-5119.

VM/SP and VM/IS (Continued)

VM/Remote System Programming for VM/IS

VM/Remote System Programming (VM/RSP) is a support offering for the VM/IS. It is available in the United States only. VM/RSP provides VM/IS customers that do not have system programming staffs with the necessary system skills to maintain and use VM/IS. VM/RSP also provides VM/IS customers with a single point of contact for answering usage questions and resolving defects.

This offering includes the establishment of an IBM VM/RSP Support Center to assist customers in resolving IBM software-related questions and problems. The mission of the VM/RSP Support Center is to:

- Provide the customer with system skills required to support VM/IS.
- Serve as an interface between the customer and existing IBM support groups for base and optional feature products of VM/IS when additional assistance is required.

In addition, for an hourly fee service, the VM/RSP Support Center will:

- Perform system tasks required to support IBM hardware and software supported by VM/IS BASE, but not included as part of VM/IS.
- Perform system tasks needed to configure VM/IS, using standard product tailoring interfaces, to allow the customer to install hardware and software. Support for non-IBM products is not included.

The VM/RSP Support Center uses computer-to-computer communication links between IBM and the customer's system to answer customer questions, provide system configuration assistance, diagnose problems, and to apply corrective fixes.

VM/SP System Offering

The VM/SP System Offering is a VM package structured so you can easily install and customize it for larger 9370 systems. It consists of VM/SP and a set of optional feature program products. The optional programs include a wide selection of existing IBM program products, program offerings, installed user programs, and field-developed programs. The delivered system contains only the products you have specified through features.

All products within the System Offering are consistent in terms of common installation interface, standardized messages, common required files, and more. Additionally, all supported products have been tested with VM/SP on a synchronized service level to ensure proper functioning.

You would use VM/SP System Offering if you have to support a larger number of users and a wider range of applications; however, VM/SP System Offering requires a greater level of data processing expertise than VM/IS. Your IBM sales representative can help you determine which offering is appropriate for your installation.

With the exception of the DBEDIT and IBM 6670 preprocessor products, all of the products supported by VM/IS are also supported by VM/SP System Offering. Additional products available through VM/SP System Offering are listed below:

- Application Prototype Environment (APE)
- VM Backup Management System (VMBACKUP-MS)
- VM Tape Management System (VMTAPE-MS)
- Contextual File Search/370 (CFSearch/370)
- COBOL
- Cross System Product/Application Development (CSP/AD)
- CSP/Application Execution (CSP/AE)
- CSP/Query (CSP/Q)
- Development Management System/Conversational Monitor System (DMS/CMS)
- Font Library Service Facility (FLSF)
- GDDM-Interactive Map Definition (GDDM-IMD)
- IBM CMS Servers
- Info Center/1 (IC/1)
- Interactive Instructional Presentation System (IIPS)
- Advanced Communications Function/Network Control Program (ACF/NCP)

VM/SP and VM/IS (Continued)

- NetView
- Overlay Generation Language (OGL)
- Page Printer Formatting Aid (PPFA)
- Print Services Access Facility (PSAF)
- Print Services Facility (PSF)
- Query Management Facility (QMF)
- ACF/System Support Program (ACF/SSP)
- VM Tape Management System (VMTAPE-MS)
- VSE/Virtual Storage Access Method (VSE/VSAM)
- ACF/Virtual Telecommunications Access Method (ACF/VTAM)

These and other program products that are available through VM/SP System Offering are not described in detail here.

For more details on the VM/SP System Offering optional feature program products, see your IBM sales representative.

VM/SP Guest Operating Systems

The guest operating systems that VM/SP can accommodate include IX/370, VSE/SP, MVS/SP, and VM/SP itself. You can run new and old releases of these operating systems on VM. Some of the reasons for having other (guest) operating systems on a system are:

- Certain applications only run on certain operating systems. For example, if you have a VM system and want to run UNIX applications that need IX/370, you will run IX/370 plus the UNIX applications as a guest on your VM system.

- Due to its interactive capability, VM is an excellent tool for developing programs. System programmers, for example, can test multiple versions of operating systems during their normal working hours. This capability is extremely valuable when changing operating systems or testing new releases.

- You may run VM as a guest on VM if, for example, you want to test a new VM release on your system, without disturbing normal application processing on your system. Also, different end users may want to run different VM releases on the same system.

- VSE, on the other hand, is an excellent tool for transaction processing. So for commercial transaction processing, you may want to run VSE as a guest on VM while, at the same time, you can utilize VM CMS with its full support of the development center, the information center, and engineering/scientific computing.

Other Applications You Can Add

You can add your own or other IBM and non-IBM application programs to both VM/IS and VM/SP System Offering. Examples of programs you can add are:

- Computer-Graphics Augmented Design and Manufacturing (CADAM)[3] program
- Computer-Graphics Aided Three-Dimensional Interactive Application (CATIA)[4] program
- Computer-Aided Engineering Design System (CAEDS)[5] program
- Circuit Board Design System 2 (CBDS2) program
- Educational Computing Support System (ECSS) program
- Expert System Consultation Environment (ESCE) program
- Storage and Information Retrieval System (STAIRS) program.

For detailed information on optional programs you can use with VM, see your IBM sales representative. Information can also be found in *Useful Applications from Non-IBM Sources*, GY33-6951.

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3 CADAM is a registered trademark of CADAM, Inc.

4 CATIA is a registered trademark of Dassault Systems.

5 CAEDS is a registered trademark of Structural Dynamics Research Corporation.

VM/SP and VM/IS (Continued)

For More Information ....

For detailed information about VM/SP, see the following manuals:

- *Virtual Machine/System Product Introduction*, GC19-6200
- *Virtual Machine/System Product General Information*, GC20-1838

VSE/SP

Virtual Storage Extended/System Package (VSE/SP) is a full-function operating system designed primarily for **batch and transaction processing**. It is IBM's primary production system for intermediate systems and the operating system base for distributed processing nodes.

Using VSE/SP

You can use VSE/SP for a wide range of user applications. However, its major strength is in **commercial applications**, such as payrolls, bills, orders, inventory lists, general ledgers, accounts receivable, accounts payable, and more. VSE/SP is also well suited for business professional and office applications. With Decision and Information Support/VSE (DIS/VSE), you have an excellent tool that helps you with decision-making, query, "what if" projections, and more.

You can use VSE/SP on a host system in a computer center or on a departmental system in an office environment (see Figure 5-2 on page 5-4). You can use it on a stand-alone computer system or on computers connected in a network. VSE/SP provides excellent networking and remote operation facilities. For example, Distributed Systems Node Executive (DSNX) makes it well-suited for operation in a distributed data processing network. It requires only limited data processing skill for operation in a distributed data processing environment.

Some Highlights

VSE/SP is a pre-generated load-and-go system that you can order using one system number. It is easy to install, easy to use, and easy to maintain.

Even though VSE/SP is pre-generated, you can still tailor the basic system control and interactive control functions to fit the specific kind and size of work you want to do. You can also easily add VSE optional products and your own applications to the pre-generated system.

VSE/SP (Continued)

The major highlights of VSE/SP include:

- **Task-Oriented Menus**. This feature provides a unified interface that lets you work easily and productively with the various functions of the system. You can tailor the task-oriented dialogs to each user so that he or she sees only the functions belonging to his or her job. The task-oriented menus contain, for example, a set of dialogs that help to install, operate, and service VSE/SP in a distributed data processing network. It also contains menus that help to identify and correct online transaction failures.

- **Intelligent Work Station Support**. This feature supports IBM Personal Computers and IBM 3270 Personal Computers for applications in the area of "what if" analysis, problem solving, graphics, and report writing. Applications for these areas include Decision and Information Support/VSE (DIS/VSE) and other popular business applications like the Visicalc[6] and Lotus[7] products. The work station support provides menu-driven support for accessing host applications, retrieving host data for processing in a work station, transferring data from work stations to host files, and exchanging data between work stations.

- **Virtual Address Extension**. This feature provides up to three virtual address spaces for up to 40 megabytes of virtual storage. This gives you enough room for applications in the areas of office functions, query, graphics, and more. Applications you can choose include Document Management/VSE (DM/VSE), Decision and Information Support/VSE (DIS/VSE), Data Language/One (DL/I), and more.

- **System Start-Up and Remote Operation Control**. These features provide for considerable scheduling flexibility, especially in the distributed data processing environment. They allow for unattended operation of departmental systems.

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6 Visicalc is a trademark of Visicorp. Inc.

7 Lotus is a trademark of Lotus Development Corp.

VSE/SP Components

The VSE/System Package is a program package that provides the functions shown in Figure 5-6

Function	VSE/SP Components
Basic system control	• VSE/AF (Advanced Functions)
Work station and network control	• ACF/VTAM (Advanced Communications Function/ Virtual Telecommunications Access Method) • BTAM-ES (Basic Telecommunications Access Method-Extended Support)
Interactive system control and transaction processing	• VSE/ICCF (Interactive Computing Control Facility) • CICS/DOS/VS (Customer Information Control System)
Spooling, networking, and remote job entry control	• VSE/POWER (Priority Output Writers, Execution Processors, and Input Readers)
Data management	• VSE/VSAM (Virtual Storage Access Method) • VSE/VSAM Space Management Feature
Utilities	• VSE/VSAM Backup and Restore Feature • VSE/Fastcopy • DITTO (Data Interfile Transfer, Testing and Operations Utility)

Figure 5-6. Components of VSE/SP

The programs in the VSE/System Package are also available individually. You can also install and generate your own VSE system using the VSE Generation Feature. This allows you to create your own system environments.

A more detailed description of the VSE/SP components follows:

- **VSE/AF** (Advanced Functions). This program provides **basic system control** functions. It controls processing, coordinates I/O activities, and interfaces to the system hardware.

VSE/SP (Continued)

- **ACF/VTAM** (Advanced Communications Function/Virtual Telecommunications Access Method), **BTAM-ES** (Basic Telecommunications Access Method – Extended Support). These two programs provide for **work station and network control**. They support the attachment of local and remote work stations and processors. VTAM also supports channel-to-channel attachment.

- **VSE/ICCF** (Interactive Computing Control Facility) and **CICS/DOS/VS** (Customer Information Control System). ICCF provides for **interactive system control**. It makes the system available to multiple terminal users at the same time. CICS supports **transaction processing**. It controls the online communication between terminal users and a data base. CICS has an interface to spool output from CICS applications to the POWER/VSE spool file for printing on either local or remote terminal printers. This allows you to replace a channel-attached system printer with a low-cost terminal printer.

- **VSE/POWER** (Priority Output Writers, Execution Processors, and Input Readers). This program provides for **spooling, networking, and remote job entry control**. It makes better use of the system's I/O devices, thus improving system performance. It simplifies system operation in single- and multi-systems installations. It also provides for job transmission from remote work stations and job output to remote stations. An interface is provided so that POWER spool files can be used by CICS.

- **VSE/VSAM** (Virtual Storage Access Method), **VSE/VSAM Space Management Feature**. These programs provide for **data management**. They control data storage and access to DASD and manage DASD space.

- **VSE/VSAM Backup and Restore Feature**, **VSE/Fastcopy**, **DITTO** (Data Interfile Transfer, Testing and Operations Utility) for VSE and VM. These are **utilities** that provide for easy file handling, for backup and restoration of files, and more.

VSE/SP Optional Programs

These are program products that complement VSE/SP according to your specific needs in the areas listed in Figure 5-7. All optional programs have been tested on a synchronized service level with VSE/SP to ensure proper functioning.

Function	Program Products
Business professional and office applications	• DISOSS (Distributed Office Support System) • PS/370 (Personal Services/370) • DW/370 (DisplayWrite/370) • DM/VSE (Document Management/VSE) • DISPF/VSE (Decision and Information Support Productivity Facility/VSE) • DS/VSE (Decision Support/VSE) • ID/VSE (Information Development/VSE) • DIS/VSE (Decision and Information Support/VSE) • GDDM (Graphical Data Display Manager)
Application development	• CSP/AD (Cross System Product/Application Development) • CSP/AE (CSP/Application Execution) • CSP/Q (CSP/Query) • DOS/VS COBOL (DOS/VS Common Business-Oriented Language) • DOS PL/I (DOS Programming Language/One) • DOS/VS RPGII (DOS/VS Report Program Generator II)

Figure 5-7 (Part 1 of 2). Summary of VSE/SP Optional Programs

VSE/SP (Continued)

Function	Program Products
Application development (continued)	• ISPF (Interactive System Productivity Facility) • ISPF/PDF (ISPF/Program Devleopment Facility) • SDF/CICS (Screen Definition Facility/CICS)
Data base management and query	• DL/I DOS/VS (Data Language/One DOS/VS) • SQL/DS (Structured Query Language/Data System) • QMF/VSE (Query Management Facility/VSE) • DOS/VS Sort/Merge II
Systems networking and distributed data processing support	• DSX (Distributed Systems Executive) • VSE/DSNX (Distributed Systems Node Executive) • FTP (File Transfer Program) • ACF/NCP (Advanced Communications Function/Network Control Program) • ACF/SSP (ACF/System Support Programs) • NCCF (Network Communications Control Facility) • NLDM (Network Logical Data Manager) • NPDA (Network Problem Determination Application)

Figure 5-7 (Part 2 of 2). Summary of VSE/SP Optional Programs

A more detailed description of the program products follows:

Business Professional and Office Applications:

- **DISOSS** (Distributed Office Support System). This program product assists managers, professionals, secretaries, and support personnel with their office work. It helps them to retrieve and file job-related documents and information stored at a main system, and to send and receive messages to/from other users. DISOSS is for communication in a network of systems and work stations. With its multi-host implementation, it can provide distribution services across even the largest organizations.

- **PS/370** (Personal Services/370). This program product assists technical and non-technical business professionals with their office work. It operates with the 3270 Information System or the 3270 PC display terminal as a CICS/VS application. When PS/370 is used with DISOSS, the document distribution and library services functions of DISOSS are extended to 3270 users.

- **DW/370** (DisplayWrite/370). This program product provides professional end users with word processing functions. It includes a full-screen editor/formatter that allows to create, revise, and print documents. In addition, DW/370 provides multi-language linguistic support for automatic hyphenation, spelling verification and correction, and more.

- **DM/VSE** (Document Management/VSE). This application program (which includes Display Write/370) assists managers, professionals, and secretaries with their office work. It helps them to type text, edit documents, send/receive correspondence, and store/retrieve information in an easy-to-understand language. It also provides a bridge to the Personal Manager program offering, which allows to schedule meetings and make appointments. DM/VSE is for communication within one system only.

- **DISPF/VSE** (Decision and Information Support Productivity Facility/VSE). This program provides the operating base for the following three functional packages:

VSE/SP (Continued)

- DS/VSE (Decision Support/VSE)
- ID/VSE (Information Development/VSE)
- DIS/VSE (Decision and Information Support/VSE)

DISPF/VSE includes installation and operation support for these packages. It also complements and expands the intelligent work station support of VSE/SP.

DS/VSE, **ID/VSE**, and **DIS/VSE** are functional packages that give decision-making and application generation support to the business professional. The packages help with query, report writing, business graphics, "what if" projections, and decision-making. The packages also provide panels and helps for function selection, which are available in several national languages.

DS/VSE is primarily for accounts that will, or have grown, into a relational data base environment. It supports the licensed programs:

- Query Management Facility (QMF/VSE)
- Structured Query Language/Data System (SQL/DS)
- Graphical Data Display Manager (GDDM).

Data from SQL data bases can be reformatted to data formats acceptable to many Personal Computer applications.

ID/VSE is primarily for application development and supports the following licensed programs:

- Cross System Product/Query (CSP/Q)
- Cross System Product/Application Development (CSP/AD)
- Cross System Product/Application Execution (CSP/AE)
- Graphical Data Display Manager (GDDM).

DIS/VSE is a combination of DS/VSE and ID/VSE. It supports all programs supported by those two packages, except CSP/Q.

Application Development:

- **CSP/AD** (Cross System Product/Application Development). This is a program product for developing applications interactively. Using a simple question-and-answer technique, it lets both data processing professionals and personnel with limited data processing skill generate applications.

- **CSP/AE** (Cross System Product/Application Execution). This program product allows you to run any program developed under CSP/AD.

- **CSP/Q** (Cross System Product/Query). This program product is a query/report writer for the Cross System Product set. It allows you to view the results of a query (in tabular or graphic format) at the terminal or in hardcopy form.

- **DOS/VS COBOL** (Common Business-Oriented Language). This is an English-like programming language for writing commercial applications.

- **DOS PL/I** (Programming Language/One). This is a multi-purpose programming language for writing commercial and scientific applications. It is also well suited for systems programming.

- **DOS/VS RPGII** (Report Program Generator II). This is a programming language for writing commercial applications. It provides an efficient, easy-to-use technique for developing programs.

- **ISPF** (Interactive System Productivity Facility). This is a dialog manager. An application developer may use ISPF to produce interactive applications in the form of menu-driven dialogs and dialog functions that make the application easy to use by a non-data processing user.

- **ISPF/PDF** (ISPF/Program Development Facility). This is a screen manager that provides special application development services to both the data processing and non-data processing professional. You can use it to create and maintain source programs and text data. ISPF/PDF provides interfaces to many system facilities through easy-to-use menus, relieving users of the need to know the specific command syntax

VSE/SP (Continued)

of the interactive system they are using. ISPF/PDF requires ISPF.

- **SDF/CICS** (Screen Definition Facility/CICS). This is an online development tool for programmers.

Data Base Management and Query:

- **DL/I DOS/VS** (Data Language/One DOS/VS). This is a hierarchical data base management control system. It reduces application program and file maintenance while, at the same time, allowing more sharing of data by multiple programs and users. For VSE users, DL/I is the recommended data base management system for large-volume operational applications.

- **SQL/DS** (Structured Query Language/Data System). This is a relational data base management system with online query and report-writing facilities. The data processing professional can use it to develop applications with less time and effort. Data processing professionals and end users in business, engineering, and scientific disciplines can use it to directly get and combine the information they need from different sources. SQL addresses environments, such as planning and prototyping, where data and application requirements change frequently. For VSE users, SQL is the recommended data base management system for analytical applications when spontaneous query and report writing is important.

- **QMF/VSE** (Query Management Facility/VSE). This program helps non-data processing professionals to access the SQL/DS data base. It provides a simple set of commands for the display of data on the terminal screen and the preparation of reports.

- **DOS/VS Sort/Merge II**. This program product provides high-performance support for sorting and merging multiple files of logical records.

Systems Networking and Distributed Data Processing Support:

- **VSE/DSX** (Distributed Systems Executive). This is a network program for VSE- or MVS-based host systems. It helps the central site to plan, schedule, and track the distribution of data and software among nodes in an SNA network. DSX allows efficient distribution and collection of data to and from remote systems. It allows control over the maintenance of software installed at remote sites.

- **DSNX** (Distributed Systems Node Executive). This is a network program for VSE-based systems. Together with its companion product DSX (Distributed Systems Executive) running on an MVS- or VSE-based host system, it assists the user in distributing software and data in a distributed data processing (DDP) network. DSX/DSNX is a valuable tool for customers who want to centralize network and DDP services and operational responsibilities at the host site. It minimizes system training and skill requirements for the remote site and provides centralized control.

- **FTP** (File Transfer Program). This general-purpose program transfers all sizes of sequential and VSAM files among VSE- and MVS-based systems in an ACF/VTAM communication network. It supports distributed data processing and the increasing demand of powerful file transfer capabilities with high performance and ease of use.

- **ACF/NCP** (Advanced Communications Function/Network Control Program). ACF/NCP provides support for local and remote IBM 37X5 communications controllers. It resides in the 37X5 Communication Controller and manages the communications network. It controls attached lines and terminals, does error recovery, and routes data through the network. It communicates with the host system through ACF/VTAM or additionally, in case of a remote 37X5, through another ACF/NCP. ACF/NCP operates in single-host environments or in multi-hosts (both local and remote) environments.

- **ACF/SSP** (ACF/System Support Programs). This is a set of programs that provide generation and utility functions for ACF/NCP.

VSE/SP (Continued)

- **NCCF** (Network Communications Control Facility). NCCF operates as an application program under ACF/VTAM. It provides the network operator with functions for controlling a communications network. NCCF also provides services for IBM or user-written network management programs.

- **NLDM** (Network Logical Data Manager). This is an NCCF application that extends IBM's network problem determination capabilities. It collects SNA session-related information and makes it available for display at an NCCF operator station. By collecting activity in progress at the time of or just prior to a failure, NLDM is useful in identifying and isolating network problems that otherwise do not provide error messages.

- **NPDA** (Network Problem Determination Application). This is a tool for doing network problem determination. NPDA and NLDM are complementary products.

For more programs you can use with VSE/SP, see "Software Products for VSE, VM, MVS" on page 5-38. For detailed information on optional programs you can use with VSE, see your IBM sales representative.

For more information about VSE/SP, see the following manual:

- *General Information VSE/System Package*, GC33-6176.

IBM Interactive Executive for System/370

IBM Interactive Executive for System/370 (IX/370) is an IBM-enhanced UNIX implementation. UNIX is an interactive, multi-user, multiprocessing system, with a high level of portability. IX/370 provides most of the functions of the UNIX System V as defined by AT&T, plus many IBM enhancements. IX/370 runs as a guest operating system on VM/SP.

IX/370 uses standard ASCII code for all data and text files.

IX/370 Functions—Same as in UNIX System V

The major IX/370 (and UNIX) highlights are:

- **Multitasking**. This is the ability to run a number of independent or interrelated tasks (or processes) simultaneously. IX/370 also allows communication among users on the same IX/370 system or on different IX/370 systems. In addition, IX/370 users can easily interact (exchanging files and data) with other UNIX systems, such as PC/IX.

- **Portability**. Most applications written to run on other UNIX systems can be made to run on IX/370 with a minimum of effort. Most existing UNIX applications will run under IX/370 without requiring any changes except those dictated by differences in machine architectures.

- **Program-development environment**. IX/370 provides the full set of UNIX programmer-productivity tools, such as a source-code control system (SCCS), a program-build facility (*make*), a compiler-compiler (*yacc, lex*), symbolic debugger (*sdb*), and more.

- **Text-processing tools**. IX/370 provides the full set of UNIX editing and formatting tools.

- **Inter-user and inter-machine communications**. IX/370 supports the UNIX System V functions *mail* and *uucp* to communicate within and among UNIX systems for message and file transfer.

IBM Interactive Executive for System/370 (Continued)

IX/370-Specific Functions

The major enhancements provided by IX/370 include:

- **Virtual storage support**. Unlike many other UNIX System V implementations, IX/370 supports virtual storage and paging.

- **File system**. The nature, structure, and implementation of the UNIX file system are generally the same for IX/370. The structure of directories and file descriptions and the file system primitives have been retained. However, the blocksize of IX/370 files has been increased to 4096 bytes (compared to 512 or 1024 bytes in most other UNIX implementations). One significant function that has been added to IX/370 is a lock mechanism for users sharing files. The new system call *lockf* provides (at both file and record level) the ability to prevent data updates from different sources at the same time.

- **Multiple UNIX systems**. You can run multiple IX/370 subsystems under one IX/370 master system. The subsystems operate independently of one another. Some advantages of using multiple subsystems are isolation of users or projects, and increased security and integrity.

- **Printer support**. IX/370 supports virtual line printers. Data written to a virtual printer turns into a VM spool file, which can be routed not only to any desired printer, but also to any desired userid in an RSCS network.

- **Mail and networking facilities**. The program INmail[8] plus its extension INnet is an electronic mail facility for communication among computers in a network.

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8 INmail and INnet are trademarks of the Interactive Systems Corporation.

- **Local/remote file transfer support**. This support allows IX/370 users to send files to and receive files from other users in an RSCS network. In particular, this support allows an IX/370 user to receive files sent by a CMS user, an MVS/TSO (Time Sharing Option) user, or any other IX/370 user. Similarly, an IX/370 user may send files to any other user accessible through the RSCS network.

For detailed information about IX/370, see the following manual:

- *IBM Interactive Executive for System/370, General Information*, GC33-6208.

Multiple Virtual Storage/System Product

You would use Multiple Virtual Storage/System Product (MVS/SP) in a 9370 system primarily where operating system compatibility with a central computer is a major requirement. This would allow you to transport application and program packages between the host and the distributed systems.

MVS/SP does not support fixed-block architecture DASDs as the 9332 and the 9335, and does not support any of the integrated I/O controllers. All I/O devices must be attached through standard S/370 Block Multiplexer Channels and control units.

For detailed information about MVS/SP, see the following manual:

- *MVS/System Product, Version 1 General Information Manual*, GC28-1025.

Hardware Needs for VSE, VM, and IX/370

This section summarizes the hardware requirements of the major 9370 system operating systems. Besides the hardware required by the software, you may need additional hardware (DASD space, processor storage, work stations) for your applications.

VSE/SP and VM/SP, as well as VM/IS, each require at least the following hardware:

- One 9370 Processor
- Processor storage (see Figure 5-8)
- One system console
- One local display terminal
- One magnetic tape
- One printer
- DASD space (see Figure 5-8).

IX/370, which runs as a guest on VM/SP, needs the hardware required by VM/SP plus the hardware listed in Figure 5-8.

For VM/SP, the requirements depend on the mix of products you select. You may need processor storage in addition to the 512 kilobytes (Kb) listed in Figure 5-8. You may also need additional DASD actuators for some products (refer to the individual product documentation for specific requirements).

For performance reasons, most operating systems need two actuators. However, on the DASD space associated with one actuator, you may still have room for user applications, depending on the type of DASD you use.

Hardware	VSE/SP	VM/SP	VM/IS BASE	VM/IS Opt. Packages	IX/370
9335 Actuators (412 Mb/actuator)	2 *Note 1*	2 *Note 3*	2	2	1 *Note 5*
9332 Actuators (184 Mb/actuator)	2 *Note 2*	2 *Note 3*	3 *Note 7*	3	1 *Note 5*
Processor Storage	1 Mb *Note 4*	512 Kb *Note 4*	4 Mb	4 Mb *Note 8*	2 Mb *Note 6*

Figure 5-8. Number of DASD Actuators and Processor Storage Required by Software

Notes:

1. *Standard VSE/SP system layout.*

2. *VSE/SP system layout, specifically designed for 9332 DASD.*

3. *The numbers of actuators may increase, depending on how many optional program products you install.*

4. *This is a minimum requirement. The requirements increase, depending on the optional program products installed in addition to VM/SP.*

5. *Minimum dedicated DASD required. For details, contact your IBM sales representative.*

6. *The minimum processor storage required for IX/370. This includes the storage required for VM/SP.*

7. *Only two actuators are required for the minimum 9373 Processor software deliverable.*

8. *This is the minimum requirement and includes VM/IS BASE.*

Software Products for VSE, VM, MVS

This section shows *selected* IBM software products and the operating systems that support these products. See your sales representative for an explanation of these software products and for other System/370 applications available from IBM and non-IBM sources.

Caution: The following list shows *products*, not *functions*. In a number of cases, functions provided by one product for one operating system are provided by a different product for another operating system.

Information Delivery Software

Cross-Industry Programs

PROGRAM/TOOL	VSE	VM	MVS
Financial Management System	Yes	No	Yes
Industrial Systems	Yes	Yes	Yes
Interactive Financial System (IFS)	Yes	No	Yes
Planning, Control, and Decision Evaluation (PLANCODE/I)	Yes	No	Yes
Communications Oriented Production Information and Control System (COPICS)	Yes	No	Yes

Expert Systems/Artificial Intelligence

PROGRAM/TOOL	VSE	VM	MVS
LISt Programming (LISP/VM)	Yes	No	No
Expert System Consultation Environment (ESCE)	No	Yes	Yes
Intellect (TM Artificial Intelligence Corp.)	Yes	No	No

Engineering/Scientific Programs

PROGRAM/TOOL	VSE	VM	MVS
High Accuracy Arithmetic Package (ACRITH)	Yes	Yes	Yes
VM/SP End-User Software Support System (ES(3))	No	Yes	No
Interactive Composition and Editing Facility (ICEF)	No	Yes	No
SCRIPT Mathematical Formula Formatter (SMFF)	No	Yes	Yes
Conversational and Interactive Project Evaluation and Control (CIPREC)	Yes	Yes	Yes
Project Analysis and Control System (PROJACS)	Yes	Yes	Yes
Mathematical Programming System Extended/370 (MPSX/370)	Yes	Yes	Yes
Dynamic Simulation Langugage (DSL/VS)	No	Yes	Yes
LISt Processing/VM (LISP/VM)	No	Yes	No
Pascal/VS	No	Yes	Yes
VS/FORTRAN (Formula Translation)	Yes	Yes	Yes
Engineering and Scientific Subroutine Library (ESSL)	No	No	Yes
Project Management System IV (PMS IV)	No	No	Yes

Software Products for VSE, VM, MVS (Continued)

Information Center Tools

PROGRAM/TOOL	VSE	VM	MVS
Info Center/One	No	Yes	Yes
Application Prototype Environment	No	Yes	Yes
Application System (AS)	No	Yes	Yes
BASIC (Beginner's All-Purpose Symbolic Instruction Code)	No	Yes	Yes
APL2 (A Programming Language 2)	No	Yes	Yes
Decision and Information Support Productivity Facility/VSE (DISPF/VSE)	Yes	No	No
Decision and Information Support/VSE (DIS/VSE)	Yes	No	No

Development Center Tools

PROGRAM/TOOL	VSE	VM	MVS
Conversational Monitor System (CMS)	No	Yes	No
Information Development/VSE (ID/VSE)	Yes	No	No
Graphical Data Display Manager (GDDM)	Yes	Yes	Yes
Screen Definition Facility/Customer Information Control System (SDF/CICS)	Yes	No	Yes
Cross System Product (CSP) Set	Yes	Yes	Yes
PL/I (Programming Language/One)	Yes	Yes	Yes
COBOL (Common Business-Oriented Language)	Yes	Yes	Yes
RPGII (Report Generator II)	Yes	Yes	Yes

Host-Based Office Systems

PROGRAM/TOOL	VSE	VM	MVS
Distributed Office Support System (DISOSS)	Yes	No	Yes
Professional Office System (PROFS)	No	Yes	No
Advanced Text Management System III (ATMSIII)	Yes	No	Yes
Storage and Information Retrieval System (STAIRS)	Yes	Yes	Yes
Document Composition Facility (DCF)	Yes	Yes	Yes
Display Write/370 (Component of DM/VSE)	Yes	Yes	Yes
Personal Services/370 (PS/370)	Yes	No	Yes
Integrated Processing of Text and Data (IPDT)	Yes	No	Yes
Document Management/VSE (DM/VSE)	Yes	No	No

Application Support Software

Data Systems

PROGRAM/TOOL	VSE	VM	MVS
Structured Query Language/Data System (SQL/DS)	Yes	Yes	No
DL/I (Data Language/One)	Yes	No	No
DL/I Query	Yes	No	No
Query Management Facility (QMF)	Yes	Yes	Yes
INTELLECT (Trademark of Artificial Intelligence Corporation)	Yes	Yes	Yes
Data Base/Data Communication (DB/DC) Data Dictionary	Yes	No	No
The Information Facility (TIF)	No	Yes	Yes
Data Base 2 (DB2)	No	No	Yes

Software Products for VSE, VM, MVS (Continued)

PROGRAM/TOOL	VSE	VM	MVS
Data Extract (DXT)	No	No	Yes
Information Management System/VS Data Base Facility (IMS/VS-DB)	No	No	Yes
DBPROTOTYPE II	No	No	Yes

Transaction Processing

PROGRAM/TOOL	VSE	VM	MVS
Customer Information Control System (CICS/VS) and Associated Products (Component of VSE/SP) *Note:* For VM, single-user test environment possible under CMS (CICS/CMS).	Yes	*Note*	Yes
CICS Report Controller	Yes	No	No
Information Management System/VS Data Communication (IMS/VS-DC) and Associated Products	No	No	Yes
Batch Terminal Simulator	No	No	Yes

Interactive

PROGRAM/TOOL	VSE	VM	MVS
Conversational Monitor System (CMS)	No	Yes	No
VSE Interactive Computing and Control (VSE/ICCF) (Component of VSE/SP)	Yes	No	No
Interactive System Productivity Facility (ISPF)	Yes	Yes	Yes
Time Sharing Option (TSO)	No	No	Yes

Information Systems Management

PROGRAM/TOOL	VSE	VM	MVS
VM Performance Planning Facility (VMPPF)	No	Yes	No
VM Realtime Monitor (VM/RTM)	No	Yes	No
VM Performance Monitor Analysis Program (VM MAP)	No	Yes	No
The System for Generalized Performance Analysis Reporting (GPAR)	Yes	No	Yes
VTAM Performance Analysis and Reporting System II (VTAMPARS II)	Yes	Yes	Yes
VSE Performance Tool (VSE/PT)	Yes	No	No
Teleprocessing Network Simulator (TPNS)	No	Yes	Yes
Resource Access Control Facility (RACF)	No	Yes	Yes
Information/System	No	Yes	Yes
Relational Design Tool	Yes	Yes	No
Job Control Language (JCL) Conversion Aid	Yes	No	Yes
Generalized Trace Facility Performance Analysis Reporting System (GTFPARS)	No	No	Yes
Service Level Reporter (SLR)	No	No	Yes
Operations Planning and Control (OPC)	No	No	Yes
Information/Library	No	No	Yes
Database 2 Performance Reporting Tool	No	No	Yes
Capacity Planning Extended (CPX)	No	No	Yes

Software Products for VSE, VM, MVS (Continued)

System Control Software

Operating System Control

PROGRAM/TOOL	VSE	VM	MVS
Operator Communication Control Facility (OCCF) (Not the same functions in VSE and MVS)	Yes	No	Yes
VSE/Access Control - Logging and Reporting	Yes	No	No
VSE/Virtual Storage Access Method (VSE/VSAM) (Component of VSE/SP)	Yes	Yes	No
VM Realtime Monitor (VM/RTM)	No	Yes	No
VM Performance Monitor Analysis Program (VM MAP)	No	Yes	No
VM Performance Planning Facility (VMPPF)	No	Yes	No
Extended Recovery Facility (XRF)	No	No	Yes
Resource Measurement Facility (RMF)	No	No	Yes
System Modification Program Extended (SMP/E)	No	No	Yes
Transaction Processing Facility (TPF)	No	No	Yes

Data Access and Control

PROGRAM/TOOL	VSE	VM	MVS
Graphical Data Display Manager (GDDM)	Yes	Yes	Yes
Data Facility Hierarchical Storage Manager (DFHSM)	No	No	Yes
Data Facility Data Set Services (DFDSS)	No	No	Yes
Data Facility Product (DFP)	No	No	Yes
Data Facility Sort (DFSORT)	No	No	Yes
Direct Access Storage Device (DASD) Migration Aid	No	No	Yes

Network Control and Distributed Data Processing

PROGRAM/TOOL	VSE	VM	MVS
Advanced Communications Function/Virtual Telecommunications Access Method (ACF/VTAM) (Component of VSE/SP)	Yes	Yes	Yes
Network Communications Control Facility (NCCF)	Yes	Yes	Yes
VTAM Node Control Application (VNCA)	No	No	Yes
Network Logical Data Manager (NLDM)	Yes	Yes	Yes
Network Problem Determination Application (NPDA)	Yes	Yes	Yes
Network Management Productivity Facility (NMPF)	No	No	Yes
NetView (Includes NCCF, NLDM, NPDA, VNCA, NMPF)	No	Yes	Yes
ACF Network Control Program (ACF/NCP)	Yes	Yes	Yes
Network Design and Analysis (NETDA)	No	Yes	No
Non-SNA Interconnection	Yes	Yes	Yes
Network Terminal Option (NTO)	Yes	Yes	Yes
X.25 NCP Packet-Switching Interface (X.25 NPSI)	Yes	Yes	Yes
Distributed Systems Executive (DSX)	Yes	No	Yes
Distributed Systems Node Executive (DSNX)	Yes	No	No
File Transfer Program (FTP)	Yes	No	Yes
Remote Spooling Communications Subsystem (RSCS) Networking	No	Yes	No
RSCS Systems Network Architecture for VM/SP (RSCS/SNA)	No	Yes	No
VM/Pass-Through Facility	No	Yes	No
VM/VTAM Communications Network Application (VM/VCNA)	No	Yes	No
SNA Application Monitor (SAMON)	No	No	Yes
Network Performance Monitor (NPM)	No	No	Yes

Software Products for VSE, VM, MVS (Continued)

PROGRAM/TOOL	VSE	VM	MVS
Routing Table Generator (RTG)	No	No	Yes
Cryptographic Subsystem	No	No	Yes

System Requirements and Support 6

This chapter tells you what to expect in planning for, setting up, and using your system. It also explains the support IBM provides.

Planning For Your System

Hardware Planning

If you decide to order a 9370 system, your IBM marketing representative will provide you with a 9370 system planning package. The planning package contains the following items in a convenient binder:

- Two manuals:
  - *Planning for Your IBM 9370 Information System*, GA24-4032
  - *IBM 9370 Information System Installation Manual—Physical Planning*, GA24-4031
- A packet of planning forms, GX24-4093
- Planning templates.

The first manual, *Planning for Your IBM 9370 Information System*, GA24-4032, helps you select your system components and features. Planning forms help you verify that you have selected a proper configuration. This phase of the planning activity helps you organize and place your order. The planning activity that you do here will be used in both your site planning and system setup.

The second manual, *IBM 9370 Information System Installation Manual—Physical Planning*, GA24-4031, provides information, schedules, and procedures that help you prepare your site so that you can install your system immediately upon its arrival. Planning activities include:

- Drawing a floor plan or layout to ensure adequate space and determine the length of the required S/370 cables
- Ensuring adequate power is available
- Providing proper environmental conditions for the system, such as temperature and humidity control.

The planning manual also provides a schedule to assist in the timely execution of these planning activities.

Software Planning

Similar to the hardware planning, publications are available to help you select and order an operating system. Your IBM sales representative can provide you with the appropriate software planning information.

Setting Up Your System

IBM tests your 9370 system and installs all system components and devices in the rack(s) before shipping the system. This allows you to easily unpack and set up the system, using simple step-by-step procedures. During the setup process you will test each device as it is set up, and test overall system operation when all components are connected.

The installation time for a 9370 system is from four to eight hours for a rack that holds the 9370 Processor and about one hour for a rack that holds I/O and other units but no 9370 Processor.

An **installation support program** is provided with the system microcode diskettes. This program is used to generate and update the system hardware configuration data set. This data set is called a topology record and contains the placement of:

- I/O devices within the rack(s)
- I/O controller cards within the card enclosures.

The topology record is included with the system. A copy of the configuration record is necessary for any system upgrade.

Warning: You should **never** add, remove, or change card locations without following the plugging instructions, which this program generates for you.

To complete your hardware installation, you must only provide a number of setup parameters, such as work station language(s), time-of-day, and more.

Setting Up Your System (Continued)

If you prefer, you may have IBM set up your system for a service charge. However, you are responsible for moving the system components from your receiving area to the operating area.

You also have to install software on your system. Similar to hardware setup, publications are available to assist you. Your IBM sales representative can provide you with the appropriate software installation information.

Maintaining Your System

Your new 9370 system comes with a 12-month warranty. During this warranty period, IBM will fix hardware problems without charge. Toward the end of the warranty period, IBM recommends that you make arrangements for continued service on your system.

IBM offers an IBM maintenance agreement, which helps to minimize the causes of downtime and shifts maintenance responsibility from you to IBM.

For more information about an IBM maintenance agreement, call your IBM National Service Division branch office, or your IBM marketing representative.

Personnel Requirements

In department-level and small-business-type installations, a business professional or clerk may act as system administrator and/or as operator. The hardware and software can be installed by someone with limited DP skill. The system administrator must be familiar with the basic functions and structure of the hardware and the software. Integrated dialogs, online help information, and task-oriented documentation reduce the skill requirements for handling the system.

For complex data processing tasks, such as installation and customization of hardware and software in a networking environment, complex online application installation and development, or critical error situations, the system administrator will require the remote or on-site

assistance of a skilled DP professional. A number of powerful functions and tools like remote operator console support are available to provide support for complex system operation tasks. The skill required of the DP professional varies depending on the complexity of the hardware configuration and the software.

Analyzing System Problems

The 9370 system allows you to assist with problem analysis. This results in improved system availability.

By following simple online problem determination procedures, you can determine the type of corrective action and initiate it without delay. If the problem is caused by something that you can correct, you can take action immediately. If the problem is intermittent or is isolated to an area or device that is not critical to operation, you can restore operations until the problem is fixed. If a device is the source of a problem, the system directs you to provide information so that the service representative can bring the replacement parts.

Your system operator or administrator can perform problem determination. There is no special skill or training required beyond that needed for normal system operation.

IBM Customer Assistance Group

An IBM Customer Assistance Group is available to help you with problem determination and resolution. Directions are provided for you to contact the assistance group to initiate a service call or help you with problem determination. The assistance group can help you identify problems by leading you step-by-step through extended problem determination activity, which requires trained service personnel to interpret results.

Analyzing System Problems (Continued)

Remote Service

With the SDLC communications adapter in your processor console, you can attach an external modem to provide data link communications with IBM. This facility, when installed and authorized, allows communication with a remote IBM service system. Remote IBM service personnel can perform online diagnosis of your system as if they were at your site. Logout data stored on your processor console disk can be transferred and saved at the remote IBM support site for later offline analysis. IBM support personnel can also apply microcode corrections to your system from the remote site.

This glossary includes terms and definitions from the *IBM Vocabulary for Data Processing, Telecommunications, and Office Systems*, GC20-1699.

A

AC. Alternating current.

actuator switch. A feature that allows two actuators on the same DASD device to transfer data at the same time.

address. A name, label, or number that identifies a location in storage, a device in a network, or any other data source.

alphabetic. Pertains to the characters A through Z and sometimes includes the special characters #, $, and @.

alphanumeric. Consisting of both letters and numbers and often other symbols, such as punctuation marks and mathematical symbols.

ANSI (American National Standards Institute). An organization sponsored by the Computer and Business Equipment Manufacturers Association for establishing voluntary standards.

APA. All-points-addressable.

APL (a programming language). A general purpose language for diverse applications such as commercial data processing, system design, mathematical and scientific computation, data base applications, and the teaching of subjects such as mathematics.

ASCII (American National Standard Code for Information Interchange). The code developed by ANSI for information interchange among data processing systems, data communications systems, and associated equipment. The ASCII character set consists of 7-bit coded characters (8 bits including parity bit).

application. The use to which a data processing system is put; for example, a payroll application, an airline reservation application, a network application.

application program. A program used to perform an application.

asynchronous transmission. In data communication, a method of transmission in which the bits included in a character or block of characters are transferred during a specific time interval. However, the start of each character or block of characters can occur at any time during this interval. Contrast with synchronous transmission.

auto-answer. In data communication, the ability of a station to respond automatically to a call that it receives over a switched line.

auto-call. In data communication, the ability of a station to initiate a call automatically over a switched line.

auto-loading. Positioning of a magnetic tape at the beginning of the recording area without operator action.

auxiliary storage. Data storage other than main storage; usually, a direct access storage device.

B

backup copy. A copy of information, usually on a diskette, that is kept and can be used if the original information is lost or unintentionally destroyed.

band. A group of tracks on one side of a magnetic disk.

BASIC (beginners all-purpose symbolic instruction code). An easy-to-use problem-solving language that lets you write programs in English-like statements.

batch processing. A processing method in which a program or programs process data

with little or no operator interaction. Contrast with interactive processing.

binary. Pertains to a system of numbers to the base of two; the binary digits are 0 (zero) and 1 (one).

bit. In binary notation, either the characters 0 or 1.

BMPX. See block multiplexer channel.

BPI. Bytes per inch.

bps. Bits per second.

binary synchronous communication (BSC). A form of communication line control that uses transmission control characters to control data transmission over a communication line.

block multiplexer channel. A channel that transmits blocks of data to/from more than one device by interleaving the record blocks. Contrast with selector channel.

block multiplexing. The transmission of data to/from multiple I/O devices by interleaving of records in block form.

BSC. See binary synchronous communication.

bus. One or more conductors used for transmitting signals or power.

business communications. Informal communications such as messages, notes, and memoranda.

byte. (1) In System/370, eight adjacent bits that are operated upon as a unit and that constitute the smallest addressable unit in the system. (2) The amount of storage required to represent one alphanumeric character.

C

CCITT. The International Telegraph and Telephone Consultative Committee.

centimeter (cm). 0.39 inch.

channel. A path along which signals can be sent, for example, input/output channel.

coaxial cable. A cable consisting of one conductor, usually a small copper tube or wire, within and insulated from another conductor of large diameter, usually copper tubing or copper braid.

command. An order to a machine.

communication. See data communication.

communication line. A line that is used to transmit data between computers and/or remote devices.

communications controller. A hardware feature that lets you attach either communication lines, ASCII devices, or a local area network to the processing unit.

configuration. The devices and programs that make up a system, subsystem, or network. The term configuration may refer to a hardware configuration or a software configuration.

configure. To describe to the system the devices and optional features installed on the system.

control program. A computer program that schedules and supervises the execution of programs in a computer system.

controller. See input/output controller.

control unit. Circuitry or a device used to coordinate and control the operation of one or more I/O or storage devices and to synchronize the operation of such devices with the operation of the computer system as a whole.

conversational monitor system (CMS). That part of VM/SP that lets users interactively run applications from a terminal.

cps. characters per second.

cross-industry system. A set of application programs used in more than one industry. Cross-industry applications include office systems, data entry, BICARSA/GLAPPR (billing, inventory control, accounts receivable, sales analysis/general ledger, accounts payable, payroll), query/report writing, business graphics, and more.

customer setup (CSU). The unpacking, setup, and checkout of IBM CSU-designed machines by user personnel, according to a sequence of instructions provided by IBM, without the use of tools or the assistance of IBM personnel.

customize. To change a data processing installation or network to meet the needs of particular users.

D

DACU. Device Attachment Control Unit.

DASD. See direct access storage device.

data communication. The transmission and reception of data between computers and/or remote devices according to appropriate protocols.

data exchange. The use of data by more than one program or system.

data management. The computer programs that provide access to data, perform or monitor storage of data, and control input/output devices.

data streaming. The transmission of data over a block-multiplexer channel at high speed. Data streaming is initiated by the control unit. It permits higher data rates (up to three megabytes per second) and longer cable lengths (122 meters (400 feet) between processor and control unit).

data system. Refers to the storage and retrieval of data, its transmission to terminals, and controls to provide adequate protection and ensure proper usage.

decision support. Support that assists and improves the decision-making process of managers and professionals. Examples of decision support include sales analysis, expense-to-revenue analysis, quality control statistical analysis, investment option modeling, debt analysis, and portfolio management.

development center. A support function that focuses on improving the productivity of application development professionals. It is a combination of (a) hardware dedicated to application development, (b) selected software tools, and (c) a support staff.

DFT. See distributed function terminal.

diagnostics. Microcode that provides functions to detect and isolate hardware malfunctions.

direct access storage device (DASD). (1) A storage device in which the location of each data record can be directly addressed. (2) A device in which the access time is effectively independent of the location of the data. (Restriction: Does not refer to diskette drive.)

directory. In VM/SP, a control program disk file that defines each user's normal configuration: the userid, password, normal and maximum allowable disk space, and more.

distributed data processing. Data processing in which some or all of the processing, storage and control functions, in addition to input/output functions, are situated in different places and connected by transmission facilities.

distributed function terminal (DFT). Same as intelligent work station.

distributed system. See distributed data processing and interconnected systems.

DL/1. Data language/one.

DPI. Dots per inch.

duplex. Pertains to communication in which data can be transmitted and received at the same time. Same as full duplex. Contrast with half-duplex.

E

edit. To interactively make changes, additions, or deletions to a file that is on a disk. You use the edit function also to create a new disk.

EIA (Electronic Industries Association). One EIA unit is equal to 44.45 mm (1.75 inches).

encryption. The scrambling or conversion of data, prior to transmission, to a secret code that masks the meaning of the data to any unauthorized recipient.

engineering/scientific computing. Any use of a computer by or for an engineer, scientist, or technical professional. Usually an application with a significant amount of mathematical computation is also considered engineering and scientific computing.

EPO. Emergency power off.

F

fixed-block architecture (FBA) device. A disk storage device that stores data in blocks of fixed size; these blocks are addressed by block number relative to the beginning of the particular file.

fixed disk drive. A non-removable disk drive.

feature. A particular part of an IBM product that can be ordered separately.

foot (ft). 12 inches, or 30.48 centimeters (cm).

FORTRAN (formula translation). A mathematically oriented high-level programming language, useful for applications ranging from simple problem solving to large-scale numerical systems using optimization techniques.

G

GDDM. Graphical data display manager.

general-purpose work station. A work station that needs a processing unit (for example, a 3274 Information Display Control Unit) to do functions like key stroke decoding, text formatting on the screen and more. A general-purpose work station may therefore also be referred to as control unit terminal (CUT). Contrast with intelligent work station.

guest operating system. In VM, an operating system that runs in a virtual machine. Using an operating system in a virtual machine is much like using that operating system in a real machine.

H

half-duplex. Pertains to communications in which data can be transmitted in only one direction at a time. Contrast with duplex.

hardware. The equipment, as opposed to the programs, of a computer system.

HDLC. See high-level data link control.

help. One or more displayed messages that provide explanation of a given subject.

hexadecimal. Pertains to a system of numbers to the base sixteen; hexadecimal

digits range from 0 (zero) through 9 (nine) and A (ten) through F (fifteen).

high-level data link control (HDLC). A form of communications line control that uses a specified series of bits rather than control characters to control data transmission over a communication line.

high-speed buffer storage. A storage that holds frequently used blocks of data or instructions. The processor can access data more quickly from high-speed buffer storage than from processor storage.

host system. The primary or controlling computer in a network.

I

IEEE. Institute of Electronic and Electrical Engineers.

inch (in). 0.083 feet, or 2.54 centimeters (cm).

information center. An organization within a company that provides non-data processing end users (business professionals) with the tools, packages, techniques, and assistance that will allow them to access their data and functions on a host, departmental, or personal computer in the three areas decision support, business communications, and professional support.

initial microcode load (IML). The process of loading the system microcode and preparing the system for initial program load.

initial program load (IPL). The process of loading the system control programs and preparing the system to run jobs.

initialize. To prepare for use.

input. Data to be processed.

input/output (I/O). (1) Pertains to a device or to a channel that may be involved in an input process, and, at a different time, in an output process. (2) Pertains to a device whose parts can be performing an input process and an output process at the same time. (3) Pertains to either input or output, or both.

input/output channel. In a data processing system, a functional unit, controlled by the processing unit, that handles the transfer of data between main storage and peripheral equipment.

input/output adapter (IOA). A functional unit of an input/output controller that allows you to attach I/O devices directly, without separate control units.

input/output controller (IOC). A feature of the processing unit that acts as control unit and allows direct attachment of I/O devices to the computer.

input/output processor (IOP). A functional unit of an input/output controller that controls one or more input/output adapters.

instruction. A statement that specifies an operation to be performed by the computer and the locations in storage of all data involved in that operation.

intelligent printer data stream (IPDS). A type of printer control that allows you to present text, raster images, vector graphics, bar codes, and previously stored overlays at any point on a page.

intelligent work station. A work station that does functions that were previously done by the processing unit, such as key stroke decoding, text formatting on the screen, and other more complex tasks. Same as distributed function terminal (DFT). Contrast with general-purpose work station.

interactive processing. A processing method in which each operator action causes a response from the program or system. Contrast with batch processing.

interconnected systems. Systems linked together in local and/or remote networks. The exchange of data between systems in a network is through standard channels or through communication lines.

Communication between interconnected systems normally occurs without manual intervention; it is provided by combined hardware and software supporting the interconnection.

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

IOA. See input/output adapter.

IOC. See input/output controller.

IOP. See input/output processor.

IPDS. See intelligent printer data stream.

IPI. Intelligent peripheral interface.

IPL. See initial program load.

ips. Inches per second.

ISO. International Standards Organization.

IX/370. Interactive Executive for System/370.

interactive system. A system with the terminal-oriented facilities needed for engineering/scientific systems, office systems, the development center for data processing professionals, and the information center for business professionals.

I/O. See input/output.

J

job. A unit of work to be done by a system. May consist of more than one program.

job networking. The routing of jobs through a network of processors under control of a job entry subsystem.

job step. A unit of work represented by a single program.

K

Kb. See kilobyte.

keyword. (1) A predefined word in an artificial language. (2) A significant and informative word that causes a predefined action in a computer.

kilobyte. 1,024 bytes.

kilometer (km). 1000 meters, or 0.62 U.S. miles.

L

LAN. See local area network.

LAPB. Link access procedure balanced.

lpm. Lines per minute.

load. To move data or programs into a storage.

load/offload device. A device, for example a tape unit, that you can use to move data or programs into and out of a storage, such as a fixed DASD device. Used for data security reasons.

local. Pertains to a device that is connected directly to the computer without using a communication line. Contrast with remote.

local area network (LAN). A network that is limited to a small area, for example the premises of an office building or plant.

log. To record; for example, to log error information on the system diskette.

M

manual operations. The actions you can do manually to control the system (or the way the system operates).

matrix printer. A printer in which each character is represented by a pattern of dots. Same as dot printer.

Mb. See megabyte.

main storage. The part of the processing unit where all user programs are executed.

megabyte. 1,048,576 bytes.

menu. A displayed list of items from which you can make a selection.

message. Information sent to a user from a program or another user.

meter (m). 39.37 inches.

microcode. Hardware instructions that control the processor.

mile (mi). 1.609 kilometers.

millimeter (mm). 0.04 inch.

minidisk. A physical disk storage device (or part of one) that has its own address, consecutive storage space for data, and an index or description of the stored data so the data can be accessed.

mode. A method of operation.

modem. A device that converts data from the computer to a signal that can be sent over a communication line, and converts the signal received to data for the computer.

monitor. To supervise, control, and verify the operations of a system.

mouse. In computer graphics, a locator device operated by moving it on a surface.

multipoint. In data communication, pertains to a network that allows two or more stations to communicate with a single system on one line.

multiprocessing. Pertains to the simultaneous execution of two or more computer programs.

MVS. Multiple virtual storage.

N

network. A collection of data processing products connected by communication lines for data processing or information interchange.

network control. In a network, the establishment, authorization, and maintenance of logical and physical connections between stations and applications, plus the synchronisation, routing, integrity, and recovery of data transmitted during the established connections.

networking. Communication between stations in a network.

nonswitched line. In data communication, a connection between computers or devices that does not have to be established by dialing. Contrast with switched line.

numeric. Pertains to any of the digits 0 (zero) through 9 (nine).

O

OEM. See original equipment manufacturer.

office system. A set of applications that provide support in the areas decision support, text services, electronic mail, data base access, and professional support. They integrate text, data, graphic and image processing.

offline. Not controlled directly by or not communicating with a computer. Contrast with online.

offload. To move data or programs out of a storage.

online. Being controlled directly by or directly communicating with a computer. Contrast with offline.

open systems interconnection (OSI). Standardized procedures that make the interconnection of data processing systems in a network possible.

operate. To do a defined action, such as adding or comparing, performed on one or more data items.

operating system. Same as control program.

original equipment manufacturer (OEM) device. A device produced by a manufacturer other than IBM.

OSI. See open systems interconnection.

output. Data that has been processed.

P

packet switching. The process of routing and transferring data by means of addressed packets so that a communication path is occupied only during the transmission of a packet. On completion of the transmission, the communication path is made available for the transfer of other packets.

parity. The state of being either even-numbered or odd-numbered. A parity bit is a binary digit appended to a group of binary digits to make the sum of the digits either all odd (odd parity) or all even (even parity).

Pascal. A high-level programming language that is effective for system development and technical problem solving.

password. A special word or set of characters that must be given to satisfy security needs.

PC. IBM Personal Computer.

performance. That part of the system that is basically evident in elapsed time. Performance is largely determined by three factors: throughput, response time, and availability.

picture element (PEL, PIXEL). In computer graphics, the smallest element of a display space that can be independently assigned color and intensity.

plotter. An output device that presents data in the form of a two-dimensional graphic representation.

point-to-point. In data communication, pertains to a communication line that connects a single remote station to a computer.

port. An access point for data entry and exit.

portability. The ability to use data sets or files with different operating systems.

problem determination. The process of identifying the source of a problem; for example, a program component, a machine failure, telecommunication facilities, user or contractor-installed programs or equipment, an environment failure such as a power loss, or a user error.

processing unit. The part of the system that does the processing and contains processor storage.

processor. Same as processing unit.

processor console. The work station from which an operator can control and observe system hardware operation and do hardware service operations. See also system console.

processor storage. (1) The storage in a processing unit. (2) In virtual storage systems, synonymous with real storage.

PROFS. Professional office system.

professional support. Support that helps you manage your work. It includes calendaring, reminders and to-do lists, directories, document preparation, and personal record-keeping. Examples of document preparation are business proposals, technical evaluations, and business reports. Personal record-keeping, performed with simple file management systems or spreadsheet packages, can cover anything from sales prospect dossiers to office equipment inventories.

program. Sequence of instructions for a computer.

program product. An IBM-written, licensed program. A program product performs functions related to processing information.

protocol. In data communication, the rules for transferring data.

R

read/write head. a magnetic head capable of reading and writing.

real machine. The actual processor, channels, storage, and input/output devices. Contrast with virtual machine.

real time. Pertains to the actual time during which a physical process transpires.

record. A collection of fields that is treated as a unit.

reference code. An error indication, displayed on the processor console screen, that refers the operator to a corrective action.

remote. Pertains to a computer or device that is connected to another computer or device over a communication line. Contrast with local.

resource allocation. The assignment of system facilities to get a job done; for example, the assignment of main storage or input/output devices.

robot. An easily reprogrammable, computer-controlled device that can physically manipulate its surroundings.

RPQ. Request for price quotation.

RSCS. Remote spooling communications subsystem.

RS-.... EIA communications standard interface.

S

schedule. To select jobs that are to be dispatched for processing.

SDLC. See synchronous data link control.

sec. Second.

security keylock. A feature on a device that allows you to prevent the device from doing input functions.

selector channel. An I/O channel that operates with only one I/O device at a time. Once, the I/O device is selected, a complete record is transferred one byte at a time. Contrast with block multiplexer channel.

session networking. Communication between a terminal or application program and an application in one of the processors of a network for the duration of the communication by logging on and logging off.

SNA. See systems network architecture.

SOEMI. Serial original equipment manufacturer interface.

spooling. When the system writes the output data streams onto auxiliary storage devices.

stand-alone system. A system that runs applications independently of another system. The exchange of data files or applications

with another system is done manually, through portable media like disk or tape. Contrast with interconnected systems.

start/stop (S/S). A form of asynchronous communication line control that uses start elements and stop elements to control the transfer of data over a communication line. Each group of signals representing a character is preceded by a start signal and followed by a stop element.

station. A computer or device that can send and receive data over a communication line.

storage. (1) A device, or part of a device, that can hold data. (2) The action of placing data into a storage device.

string switch. A feature that allows a storage device, for example a DASD, to be shared by two storage controllers on the same processor or on different processors.

stylus. In computer graphics, a pointer that you operate by placing it in a display space or a tablet; for example, a light pen, a sonic pen, a voltage pencil.

subsystem. A part of a system that does defined functions.

processor console. The processor that provides overall system control. It initializes the system, monitors it during operation, analyzes and handles system malfunctions, and supports the operator in determining problems.

switched line. In data communication, a connection between computers or devices that is established by dialing. Contrast with nonswitched line.

synchronous data link control (SDLC). A form of communication line control that uses commands to control data transfer over a communication line.

synchronous transmission. In data communication, a method of transmission in which the sending and receiving of characters is controlled by timing signals. Contrast with asynchronous transmission.

system. The computer and its associated devices and programs.

system console. The work station from which you can control system software operation and do software service functions. See also processor console.

system diskette. Diskette that contains microcode to control the processing unit. Additionally, it contains microcode that does certain error diagnostic functions.

systems network architecture. A set of rules for controlling the transfer of information in a data communications network.

S/S. See start/stop.

T

tablet. In computer graphics, a locator device with a flat surface and a mechanism that converts indicated positions on the surface into coordinate data.

telecommunication. Communication over a distance, as by telegraph or telephone. Same as data communication.

terminal. Same as work station.

terminal multiplexer. A device that permits two or more terminals to share one coaxial cable as data transmission path.

track. The portion of a disk that is accessible to a given read/write head position.

transaction. An item of business. The handling of customer orders and billing are examples of transactions.

transaction networking. The routing of transactions (messages) through a network to the appropriate application on the basis of routing information in the message itself.

transaction processing. In batch or remote batch processing, the processing of a job or job step. In interactive processing, an exchange between a terminal and another device that does a particular action; for example, the entry of a customer's deposit and the updating of the customer's balance.

TTC2. US telegraph terminal control type 2.

TWX. Teletypewriter exchange service.

U

upgrade. To add features to a system.

userid. A predefined set of one to eight characters that uniquely identifies a user to the system.

V

virtual machine (VM). The functional simulation of a computer and its associated input/output devices. Contrast with real machine.

virtual storage (VS). An addressing scheme that allows external disk storage to appear as internal processor storage.

VM. See virtual machine.

VM/SP. Virtual machine/system product.

VM/370. Virtual machine/370.

VS. See virtual storage.

VSE/SP. Virtual storage extended/system package.

W

work station. A device that lets you transmit information to or receive information from a computer, or both, as needed to perform a job; for example, a display station or a printer.

X

X. ... CCITT communications standard interface.

- *IBM Data Communications Concepts*, GC21-5169
- *Planning for Your IBM 9370 Information System*, GA24-4032
- *IBM 9370 Information System Installation Manual—Physical Planning*, GA24-4031
- *IBM Input/Output Device Summary*, GA32-0039
- *IBM Data Communication Device Summary*, GA27-3185
- *IBM Token-Ring Network Introduction and Planning Guide*, GA27-3677
- *IBM Cabling System Planning and Installation Guide*, GA27-3361
- *Using the IBM Cabling System With Communication Products*, GA27-3620
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- *IBM 4224 Printer Product and Programming Description*, GC31-2551
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- *IBM 4245 Printer, Models 12 and 20 Information Manual*, GA33-1579
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- *Virtual Machine/System Product Introduction*, GC19-6200
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- *General Information VSE/System Package*, GC33-6176
- *IBM Interactive Executive for System/370*, GC33-6208
- *MVS/System Product, Version 1 General Information Manual*, GC28-1025

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Numerics

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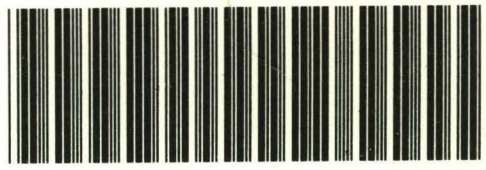

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