

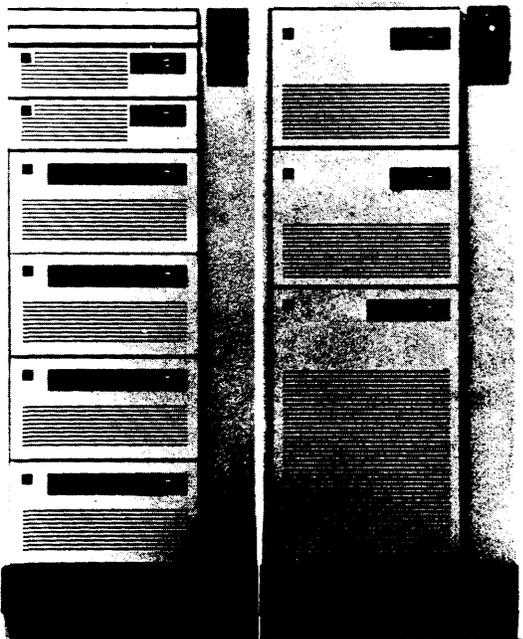
IBM 9370 Information System

MANAGEMENT SUMMARY

UPDATE: Since Datapro's last report on the 9370, IBM has extended its range of systems support and the product's flexibility and distributed processing capabilities. The company introduced products such as Advanced Communication Function/Virtual Telecommunications Access Method (ACF/VTAM) Version 3, NetView Release 3, and NetView Network Definer, which allow peer-to-peer communications and centralized network management. The addition of high-performance, high-capacity Direct Access Storage Device (DASD) devices and high-performance DASD controllers also enhances the price/performance and functionality of the 9370.

Introduced in October 1986, the 9370 Information System is IBM's strategic departmental processing system. It arms IBM with a more competitive product for office and departmental computing.

The 9370 delivers mainframe-class performance in a low-cost, compact package. It offers greater price/performance than the company's office systems that are not part of the System/370 family—the IBM System/36 (S/36) and System/38 (S/38)—and is more powerful and less costly than the 4361, IBM's previous office-level System/370 (S/370)-architecture system. Additionally, the 9370 is less costly than the IBM 4381, the entry point for high-performance S/370 computing.



IBM's 9377 Model 90, the top-of-the-line 9370 Information System, rivals the lower end IBM 4381 systems in processing power. It supports the new 7.6G-byte 3380 DASDs and accommodates up to 384 local workstations.

The IBM 9370 is a compact, office-environment system that maintains full compatibility with IBM System/370 architecture-based systems. It offers a higher level of price/performance and cost-effectiveness than other entry-level S/370 systems. Designed for use as a departmental system, the 9370 is primarily intended to run VM/SP, IBM's primary end-user, interactive operating system for S/370 machines. Also, the 9370 supports Ethernet, IBM Token-Ring, and SNA networks, making the system suitable for departmental computing.

MODELS: 9373 Model 20, 9375 Model 40 and Model 60, and 9377 Model 90.

CONFIGURATION: From 4M bytes to 16M bytes of main memory, one to six I/O buses, 368M bytes to 120G bytes of disk storage, and up to 384 workstations.

COMPETITION: Digital Equipment Micro-VAX and VAX 8000, Data General Eclipse MV family, and Unisys 2200/200.

PRICE: \$31,000 to \$190,000 (base system prices).

CHARACTERISTICS

MANUFACTURER: International Business Machines Corporation, Old Orchard Road, Armonk, New York 10504. Contact your local IBM representative.

CANADIAN ADDRESS: IBM Canada Ltd., Markham, 3500 Steeles Avenue East, Markham, Ontario L3R 2Z1. Telephone (416) 474-2111.

DATA FORMATS

BASIC UNIT: An eight-bit byte. Each byte can represent one alphanumeric character, two BCD digits, or eight binary bits. Two consecutive bytes form a "halfword" of 16 bits, while four consecutive bytes form a 32-bit "word."

FIXED-POINT OPERANDS: Can range from 1 to 16 bytes (1 to 31 digits plus sign) in decimal mode or 1 halfword (16 bits) or 1 word (32 bits) in binary mode.

FLOATING-POINT OPERANDS: One word, consisting of 24-bit fraction and 7-bit hexadecimal exponent, in "short" format; two words, consisting of 56-bit fraction and 7-bit hexadecimal exponent, in "long" format; or four words, in "extended precision" format.

INSTRUCTIONS: Two, four, or six bytes in length, specifying 0, 1, or 2 memory addresses, respectively.

The 9370 processors employ the System/370 Universal Instruction Set. The instruction set includes complete arithmetic facilities for processing variable-length decimal and fixed-point binary operands, as well as instructions which handle loading, storing, comparing, branching, shifting, editing, radix conversion, code translation, logical opera-

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➤ Besides delivering better cost-effectiveness and greater price/performance than IBM's other departmental and distributed processing solutions, the 9370 provides greater functionality. For example, the 9370 supports several types of data base management systems; in contrast, the S/36 cannot support a DBMS. Furthermore, the 9370 communications architecture is much improved over other IBM departmental computers such as the S/36 and S/38. The 9370 supports the IEEE 802.3-recommended Ethernet Local Area Network (LAN), the IBM Systems Network Architecture (SNA), and the IBM Token-Ring LAN that provides a common communications path among distributed IBM and non-IBM information systems and workstations. At present, the S/36 and S/38 are equipped only with SNA and Token-Ring LAN communications facilities, thus limiting distributed processing functionality. The de facto industry-standard Ethernet network supports more systems from various vendors than the Token-Ring network. By not supporting Ethernet, the S/3X products cede ground to the 9370.

One of the most significant advantages of the 9370 is its software compatibility with IBM S/370-architecture systems such as the 4381 superminicomputers and 3080 and 3090 mainframes, in selected environments such as VM. The S/3X systems do not offer S/370 compatibility, thus placing them at a disadvantage in terms of application development and distributed processing within the host-based S/370 environment. IBM is counting on the 9370 to provide the top-to-bottom, entry-level-to-mainframe application portability and distributed processing needed to challenge competitors such as Digital Equipment Corporation that have seriously cut into IBM's share of the medium-scale systems marketplace.

Even though the 9370 has just now become generally available, IBM is making moves to ensure its success within the mid-range system marketplace. Significant communications and networking enhancements include the following: a new release of Advanced Communication Function/Virtual Telecommunications Access Method (ACF/VTAM), a new release of NetView, the introduction of VM/Distributed Systems Node Executive (DSNX), the introduction of NetView Network Definer, IBM Token-Ring Local Area Network (LAN) enhancements, and X.25 support. These enhancements add connectivity and network management functions that were previously missing in the IBM distributed systems networking solution.

The presence of ACF/VTAM Release 3 enhances cross-system connectivity and makes it easier to implement and manage distributed applications. ACF/VTAM Release 3 provides peer-to-peer communications among SNA Physical Unit Type 2.1 (PU2.1) devices. It enables distributed IBM VM-, MVS-, and VSE-based S/370-architecture systems to communicate with one another; with distributed IBM S/3X, Series/1, and System/88 minicomputers; with distributed PC and PS/2 microcomputers; and with other non-IBM SNA-compatible systems without host assistance.

➤ tions, packing, and unpacking. In addition, a group of "privileged instructions," usable only by the operating system, handles input/output and various hardware control functions.

Also standard are extended-precision floating-point, dynamic address translation, and Virtual Telecommunications Access Method (VTAM) instructions.

INTERNAL CODE: Extended Binary-Coded Decimal Interchange Code (EBCDIC).

MAIN MEMORY

STORAGE TYPE: Information unavailable from the vendor.

CAPACITY: The 9373 supports 4M bytes, 8M bytes, or 16M bytes of main storage; the 9375 and 9377 models support either 8M bytes or 16M bytes.

CYCLE TIME: Information unavailable from the vendor.

CHECKING: Single-bit errors are detected and corrected automatically, and multiple-bit errors are detected.

RESERVED STORAGE: Similar to that in the System/370. Main memory is reserved for interrupt routines, program status words, CPU timer logout area, machine-check interrupt code, and register save area.

Key-controlled storage protection provides both store and fetch protection, preventing unauthorized access or modification of information in central storage. Store protection prevents the contents of main storage from being altered by storage addressing errors in programs or input from I/O devices. Fetch protection prevents the unauthorized fetching of data and instructions from main storage. Up to 15 programs and their associated main storage areas can be protected at one time. A seven-bit storage key, acting as a security lock, protects each 4K-byte block of storage. Key-controlled protection is standard on all 370-based machines.

CENTRAL PROCESSOR

The four 9370 processors support the performance enhancements of Extended Control Program Support (ECPS) for the Virtual Machine/System Product (VM/SP) operating system (ECPS:VM), as well as assists for the IX/370 operating system (IXA). The 9375 Model 60 and the 9377 Model 90 processors also support ECPS:MVS, for the Multiple Virtual System/System Product (MVS/SP) operating environment.

The 9370 processors differ from one another primarily in physical packaging, performance, and number of attachable devices. Each processor is a rack-mountable, modular unit. Memory and integrated I/O controllers are packaged on logic cards. On the 9373 and 9375 processors, these cards fit into slots inside the processor unit. On the 9377 processor, the memory cards fit into slots inside the processor unit, but the integrated I/O controllers reside in slots in a separate I/O card unit, which may be mounted in the same or an adjacent rack enclosure. The cards are flat—7.64 inches by 8.12 inches by 0.64 or 0.68 inch (191 mm. by 203 mm. by 16 or 27 mm.) and are enclosed in protective casings.

The entry-level 9373 Model 20 includes a floating-point facility to speed execution of floating-point instructions.

The two models (40 and 60) of the 9375 processor are the intermediate systems in the 9370 family. In both 9375 models, a high-performance arithmetic unit provides hardware support for single- and double-precision floating-point operations. This facility contains eight 64-bit floating-point

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TABLE 1. SYSTEM COMPARISON

MODEL	9373 Model 20	9375 Model 40	9375 Model 60	9377 Model 90
SYSTEM CHARACTERISTICS				
Date announced	October 1986	October 1986	October 1986	October 1986
Date first delivered	3rd quarter 1987	4th quarter 1987	3rd quarter 1987	4th quarter 1987
Field upgradable to	Not applicable	9375 Model 60	Not applicable*	Not applicable
Relative performance	1.0	1.0 to 1.4	2.2 to 3.0	4.5 to 5.2
Number of processors	1	1	1	1
Cycle time, nanoseconds	90	90	90	90
Word size, bits	—	—	—	—
Operating systems	VM/SP, IX/370, VSE/SP	VM/SP, IX/370, VSE/SP	VM/SP, IX/370, VSE/SP, MVS/SP	VM/SP, IX/370, VSE/SP, MVS/SP
MAIN MEMORY				
Type	1M-bit	1M-bit	1M-bit	1M-bit
Minimum capacity, bytes	4M	8M	8M	8M
Maximum capacity, bytes	16M	16M	16M	16M
Increment size, bytes	4M or 8M	8M	8M	8M
Cycle time, nanoseconds	—	—	—	—
BUFFER STORAGE				
Minimum capacity, bytes	Not available	Not available	16K	16K
Maximum capacity, bytes	—	—	16K	16K
Increment size	—	—	Not applicable	Not applicable
INPUT/OUTPUT CONTROL				
Number of channels:				
Byte multiplexer	0	0	0	0
Block multiplexer	1	2	2	12
Word	0	0	0	0
Other	0	0	0	0

*The 9375 Models 40 and 60 can be converted to the 9377 Model 90; the conversion requires a processor cage swap so that a second rack can be added.

Although the new version of ACF/VTAM will not be delivered until 1988, it is very important. Because ACF/VTAM Release 3 avoids host intervention in system-to-system communications, it reduces the complexities and performance degradations experienced when interconnecting systems, when sharing resources, when uploading and downloading files, and when passing data between programs.

ACF/VTAM Release 3 also reduces network management tasks. It provides the routines for automating network configuration management tasks, thus freeing the communications programmers and operating staff from the time-consuming tasks associated with configuring and reconfiguring networks. It also provides facilities for reducing the amount of communications programming needed to recover from a system crash or communications error.

The new NetView Release 2 and VM/DSNX, a new VM-based software product, reduce the expenses of managing a network by providing centralized system and network management. NetView Release 2 permits departmental and distributed 9370 systems to run virtually unattended, with almost all network and systems management being performed by a central operations staff. VM/DSNX manages the distribution of new software, software changes, files, and maintenance through the SNA network to distributed 9370 systems and other VM-based processors, further enhancing users' ability to run distributed VM-based systems unattended. Using these products reduces the staffing requirements needed to run the distributed system and the skill levels needed to maintain and operate a distributed processor.

registers and provides hardware for addition, subtraction, multiplication, and division, as well as for square root functions.

The 9377 Model 90—the top-of-the-line 9370 processor—provides 2.1 times the commercial throughput of the 9375 Model 60; in compute-intensive or engineering/scientific applications, the 9377 delivers 1.9 times the 9375 Model 60's throughput in short-precision floating-point operations and 2.0 times its throughput in long-precision floating-point functions.

Control storage on the 9375 Model 60 is incorporated as a microinstruction store containing a translation lookaside buffer (TLB) and a 16K-byte high-speed buffer storage that acts as a smaller and faster subset of processor storage. The 9377 Model 90 includes 8K bytes of microinstruction storage that holds complex and less frequently used microinstructions. Frequently used microinstructions are executed directly in hardware.

The 9370 processors incorporate 16 general-purpose registers.

Three types of addresses are recognized: absolute, real, and logical. The dynamic address translation facility, standard in all models, is the mechanism that translates the virtual storage addresses contained in instructions into real main storage addresses as each instruction is executed. All models can address a virtual storage space of 16,777,216 bytes.

Translation between the virtual and real addresses is accomplished by a hardware-implemented table-lookup procedure that accesses tables in main storage which are created and maintained by the operating system. The translation process is sped up by the TLB, a group of high-speed registers, which holds recently referenced virtual storage addresses and their real storage equivalents. The 9373 and 9375 translation lookaside buffers can hold addresses for 512K

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► VM-based networks can be built and maintained more timely with the NetView Network Definer. The Netview Network Definer reduces the effort and skills needed to build and maintain VM-based SNA networks—an important feature in the 9370's target VM environment.

With the enhancements made to the VSE operating system and ACF/VTAM, a 9370 running VSE can now function on the IBM Token-Ring LAN. Previously, only a 9370 running VM/IS or VM/SP could use the Token-Ring LAN.

By adding such products as ACF/VTAM Release 3 and IBM Token-Ring LAN support for the VSE operating system, IBM is better able to meet networking requirements at the departmental level of organizational processing. These functions reduce the complexities, expenses, efforts, and skills required for having departmental and distributed processors communicate with one another and with the host and provide for greater connectivity options at the departmental level. Furthermore, the addition to the SNA network of ACF/VTAM, NetView, VM/DSNX, and NetView Network Definer makes IBM's distributed processing products more competitive with other networking solutions such as Digital Equipment's DECnet, a decentralized (or peer-to-peer) network.

The addition of the X.25 protocol to the 9370 communications and networking architecture also extends distributed data processing functions. It permits the 9370 to communicate with those information systems using networks based on the International Standards Organization's Open Systems Interconnect (OSI) standards or the U.S. Department of Defense's (DOD's) networking recommendations (the DDN network).

The 9370's competitiveness and capabilities are furthered by new DASD subsystems and 3270-compatible workstations. Among the new peripheral devices, the most significant are the higher density DASD drives and higher performance DASD controllers. The 3990 Storage Controller increases overall system performance. It is 30 percent more powerful than the 3880 Storage Controller, the predecessor to the 3990. The high-density 3380 DASD increases the amount of on-line storage that the 9370 can support, thus allowing larger data bases and bigger work loads than before. The newest high-end 3880 DASD model offers approximately 50 percent more storage than the previous high-end 3380 DASD; i.e., the new high-end 3380 contains 7.6 gigabytes of storage whereas the former top-of-the-line 3380 contains 5 gigabytes of storage.

Furthermore, the new DASD controller and 3880 DASDs offer better price/performance than their predecessors. For example, the entry-level 3990 Storage Controller costs almost as much as the entry-level 3880 Storage Controller, the DASD controller it effectively replaces, but the 3990 provides 30 percent more processing power than the 3880. As another example, the 7.6G-byte 3380 DASD costs \$128,000, or \$16,842 per gigabyte; the previous high-end 3380 DASD, offering 5G bytes of storage, is priced at \$124,480, or \$24,896 per gigabyte.

► bytes of processor storage; the buffer on the 9377 can hold addresses for up to 128K bytes.

Classes of *interrupts* include I/O, external, program, supervisor call, machine check, and restart. Classes of interrupts are distinguished by the storage locations at which the old program status word (PSW) is stored and from which the new PSW is fetched.

SPECIAL FEATURES: A hardware floating-point accelerator in the 9377 executes add, subtract, multiply, divide, and square root long- and short-precision floating-point instructions. A High Accuracy Arithmetic (ACRITH) for solving problems in numerical analysis with verified accuracy and verified results is also standard. The ACRITH consists of 20 arithmetic instructions that supplement those in the System/370 floating-point instruction complement.

Each 9370 CPU includes a cable-attached Processor Console, which uses a specially configured IBM PC. The console initializes and monitors the system; analyzes machine checks; handles errors; supports manual operations; aids in problem determination; supports the system's automatic/secure power control feature, which allows automatic or remote system startup/shutdown under control of the operating system, and automatic restart after a power outage; and provides 3270 display emulation, which lets the console be attached to a Work Station Subsystem Controller or a 3274 Control Unit to serve as a user workstation.

Other standard features on the 9370 processors include automatic restart after power failures and time-of-day clock and calendar.

PHYSICAL SPECIFICATIONS: The physical dimensions and weights of the 9370 models are as follows:

	Height, inches (centi- meters)	Width, inches (centi- meters)	Depth, inches (centi- meters)	Weight, pounds (kilo- grams)
9373	14 (35.6)	19 (48.3)	28 (71.1)	132 (60)
9375	28 (71.1)	19 (48.3)	31 (78.2)	280 (127)
9377	28 (71.1)	19 (48.3)	31 (78.2)	268 (122)

The 9370 systems require the following operating environment:

	Temperature, degrees F (C)	Relative Humidity
9373	50 to 105 (10 to 40.6)	8 to 80 percent
9375	50 to 90 (10 to 32.2)	8 to 80 percent
9377	60 to 90 (15.6 to 32.2)	8 to 80 percent

The 9370 processors are housed in IBM's 9309 Rack Enclosure, which comes in Models 1 and 2; any of the processors can be mounted in either model. Model 1 stands 39.3 inches (1 m.) high; Model 2 is 62.9 inches (1.6 m.) tall.

The 9370 processors and the 9309 Rack Enclosure use single-phase power. All processor models can operate on 220-V power. The 9373 processor Model 20 can also operate on 120-V power; the 9309 Rack Enclosure Model 1 can be ordered with either power supply module.

► The logic of the 9377 processor is housed in an air-cooled thermal conduction module (TCM). Raised-floor construction and special electrical and plumbing facilities are not required for this processor. ►

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► COMPETITIVE POSITION

IBM positions its 9370 Information System against the MicroVAX and VAX 8000 systems from Digital Equipment, IBM's chief rival within the medium-scale marketplace. The 9370 Model 20 is positioned against the Digital Equipment MicroVAX II and the VAX 8250. The 9375 Model 40 is positioned against the Digital Equipment VAX 8250 and VAX 8350. The 9375 Model 60 goes up against the VAX 8350 and the VAX 8530. The 9377 Model 90 competes against both the 8530 and the 8550.

The 9370 remains functionally competitive with the VAX 8000s. For example, as previously stated, the new IBM communications and networking products enable IBM to present a distributed 9370 processing solution that is competitive with Digital Equipment's DECnet, the distributed processing solution for its VAX systems. With the addition of the new connectivity and network management functions, SNA will deliver the same network functionality as Digital Equipment's DECnet—i.e., peer-to-peer communications that reduces system interconnection complexities, connection costs, and network management complexities and expenses.

The products that enable SNA to support peer-to-peer communications across the entire network, however, will not be delivered for six months. These new SNA facilities, therefore, do not immediately solve IBM's networking problems. Even so, these new SNA products will encourage those customers looking for peer-to-peer distributed system solutions to consider the 9370 and IBM's SNA products as an alternative to DECnet.

In addition to the 9370's functional parity with the VAX 8000s, it is also competitive with the VAX systems in configurability and cost-effectiveness. For example, the entry-level 9370 Model 20 offers greater expansion capabilities and is less expensive than the MicroVAX II. The 9370 Model 20 supports up to 6.5G bytes of disk storage and 64 workstations, whereas the MicroVAX II only accommodates 2G bytes of disk storage and 48 workstations. A 9370 Model 20 with 8M bytes of memory, 1.6G bytes of DASD storage, cartridge tape unit, associated DASD and tape controllers, 24 workstations, one 410-line-per-minute (lpm) printer, associated workstation and printer controllers, and the VM/IS system control package costs \$151,755, or \$6,323 per user. A similarly configured MicroVAX II, with the MicroVMS system control package, costs \$181,360, or \$7,566 per user, \$1,243 more per user than the 9370 Model 20.

The high-end 9377 Model 90 is more cost effective than the VAX 8530. For example, the 9370 Model 90 featuring 16M bytes of memory, 5G bytes of DASD storage, a cartridge tape drive, a 1600 bpi tape subsystem, 128 display workstations, a 20-page-per-minute (ppm) laser printer, a 3,600-lpm printer, and the VM/IS system control package costs \$900,640, or \$7,036 per user. A similarly configured Digital Equipment VAX 8530, with the VAX/VMS system control packages, costs \$982,228, or \$7,674 per user.

► CONFIGURATION RULES

The 9309 Rack Model 1 can hold 19 Electronic Industries Association (EIA) standard RS-310-B units; one EIA unit is equal to 1.75 inches (4.4 cm.). Model 2 can accommodate 32 EIA units. The number of EIA units required by each rack-mountable 9370 device is shown in the following table.

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

The 9373 Processor has one card enclosure that holds the processor logic, storage, and I/O controller cards; the enclosure has seven slots for the I/O controller cards. The single I/O bus on the 9373 Processor can accommodate up to four I/O controllers. The maximum number of each controller supported is as follows:

- Up to two DASD/Subsystem Controllers.
- Up to two Work Station Subsystem Controllers.
- Up to two Communications Subsystem Controllers.
- One System/370 Block Multiplexer Channel.

The 9375 Processor employs two card enclosures. The basic enclosure holds the processor logic and storage cards and provides five slots for I/O controller cards; the expansion enclosure, positioned below the basic enclosure, has 12 slots for I/O controller cards.

The 9375 permits configuration of up to four I/O buses, to which 16 I/O controllers can be attached. The 9375 supports the following maximums for each controller:

- Up to four DASD/Tape Subsystem Controllers.
- Up to six Work Station Subsystem Controllers.
- Up to four Communications Subsystem Controllers.
- Up to two System/370 Block Multiplexer Channels.

The 9377 Processor 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. The 9377 Processor can have up to six I/O buses, to which a maximum of 16 I/O controllers can be attached. The number of each controller that can be supported is as follows:

- Up to 12 DASD/Tape Subsystem Controllers.
- Up to 12 Work Station Subsystem Controllers.
- Up to 12 Communications Subsystem Controllers.
- Up to 12 System/370 Block Multiplexer Channels.

I/O card units with either one or two internal buses are available for the 9377. A card unit with one internal I/O bus can hold 11 DASD/Tape Subsystem Controller, Work Station Subsystem Controller, or Communications Subsystem Controller cards. A unit with two internal buses can

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TABLE 2. MASS STORAGE

MODEL	9332 DASD	9335 DASD	3370 DASD	3375 DASD	3380 DASD
Cabinets per subsystem	1 to 4	1 to 4	16 to 32	16 to 32	8 to 16
Disk packs/HDAs per cabinet	1 fixed	1 fixed	1 HDA	1 HDA	1 or 2 HDAs
Capacity, bytes	368M	824M	729.8M	819.7M	1260M, 2520M, or 3786M per HDA
Tracks/segments per drive unit	—	—	—	—	—
Average seek time, msec.	23 to 25	18	19	19	12 to 17
Average access time, msec.	32.6 to 34.6	26.28	29.1	29.1	20.3 to 25.3
Average rotational delay, msec.	9.6	8.28	10.1	10.1	8.3
Data transfer rate	2.6MB per sec	3.0MB per sec	1.86MB per sec	1.86MB per sec	3.0MB per sec
Controller model	Integrated	Model A1 Device Controller	3880-1 or -4	3880-1 or -4	3880-3 or -23; 3990
Comments	Attaches to 9370 DASD/Tape Subsystem Controller.	Model A1 attaches to 9370 DASD/Tape Subsystem Controller.	Model A units include logic and power for up to three B units.	Model A1 includes logic and power for up to three B1 units or two B1 units and one D1 unit.	"A" and "C" models include logic and power for up to three "B" models. Not supported by the 9373 Model 20.

➤ Although the 9370 is a more competitive and highly functional product for office and departmental computing than previously available from IBM, we question how much this machine will assist IBM in recapturing the medium-scale market share it has ceded to Digital Equipment.

A major advantage for the VAX 8000 systems is that they are a proven product for departmental and distributed processing. The 9370 systems, on the other hand, are not proven in the field. Since the 9370 has been shipping for only a few months, it has not been on the market long enough to determine its effectiveness in departmental and distributed processing.

The Digital Equipment VAX 8000s have captured a substantial portion of the mid-range systems marketplace for departmental and distributed processing systems. Since the VAX 8000s are proven in either a Digital Equipment or IBM environment, IBM will have a difficult time replacing the VAX 8000s. Customers might not part with their VAXs just to acquire an IBM processor. Moreover, such a migration would be costly, since hardware, software, and communications investments are lost. Most sales will be to organizations having an IBM computer that have yet to invest in Digital Equipment VAX 8000s—the 9370 software compatibility with most IBM mainframes is a definite advantage in those environments.

In addition to competing against Digital Equipment within the medium-sized system marketplace, IBM is competing against itself. Sales of 9370 systems will be limited at both the low and high ends of the medium systems scale because, at the low end, IBM is using both the System/36 and the 9370 Model 20 to address small-scale business, office, and departmental computing. Customers neither requiring nor anticipating 9370 performance and functionality will purchase the less expensive System/36, thus reducing 9370 sales revenue.

At the high end, according to IBM's performance figures, the 9370 encroaches on the 4381's turf. The 9377 Model 90, the 4381 Model Group 11 (which serves as the entry-level 4381 at the present time), and the 4381 Model Group 21 (the entry-level 4381 which will replace the 4381 Model

➤ hold 10 cards, supporting all of the aforementioned controller types, plus the System/370 Block Multiplexer Channel.

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

- One dual-bus unit and four single-bus units.
- Three dual-bus units.
- Two single-bus units and two dual-bus units.

The 9375 Model 40 can be upgraded in the field to the 9375 Model 60 processor through a simple card exchange. Either 9375 model can be converted to the 9377 Model 90; the conversion requires a processor cage swap, because a second rack must be added.

INPUT/OUTPUT CONTROL

The 9373 processor includes one internal I/O bus; the system provides an estimated aggregate I/O capacity of up to 5.5M bytes per second. I/O slots for attachment of up to seven card features are provided inside the processor unit.

The two 9375 processor models have four I/O buses each. Each system provides an estimated aggregate I/O capacity of up to 22M bytes per second. Up to 17 card features can be configured in the available I/O slots in the processor unit.

The 9377 processor accommodates from two to six buses; depending on the configuration chosen, the number of available I/O card slots ranges from 10 to 54. The 9377 processor offers an estimated aggregate I/O capacity of up to 39M bytes per second.

All integrated I/O is compatible with the System/370 I/O structure of channel and control unit. To attach channel control units and their devices, a System/370 Block Multiplexer Channel is available. This channel supports devices with data rates of up to 1.5M bytes per second on all models, and up to 1.9M bytes and 3.0M bytes per second on the 9375 and 9377 processors.

The 9370 processors have an integrated I/O controller structure, consisting of the I/O processor (IOP) and I/O adapter (IOA). The IOP communicates with the CPU over the internal I/O bus; the IOA communicates with devices over the appropriate external I/O interface. The IOP and IOA may be combined on a single card, or they may exist on multiple cards. In multiple-card configurations, the IOP is one card and the IOAs are on one or more additional cards.

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TABLE 3. INPUT/OUTPUT UNITS

Magnetic Tape Units	Number of Tracks	Recording Density, Bits/Inch	Encoding	Tape Speed, Inches/Sec.	Transfer Rate, Bytes/Sec.
9347	9	1600	PE	25 or 100	40,000-160,000
1589	9	1600	PE	75	120,000
	9	6250	GCR	75	468,000
3420:					
Model 3	7	556/800	NRZI	75	41,700/60,000
	9	800	NRZI	75	60,000
	9	1600	PE	75	120,000
Model 5	7	556/800	NRZI	125	69,500/100,000
	9	800	NRZI	125	100,000
	9	1600	PE	125	200,000
Model 7	7	556/800	NRZI	200	111,200/160,000
	9	800	NRZI	200	160,000
	9	1600	PE	200	320,000
Model 4	9	1600	PE	75	120,000
	9	6250	GCR	75	470,000
Model 6	9	1600	PE	125	200,000
	9	6250	GCR	125	780,000
Model 8	9	1600	PE	200	320,000
	9	6250	GCR	200	1,250,000
3422	9	1600	PE	125	200,000
	9	6250	GCR	125	780,000
3430	9	1600	PE	50	80,000
	9	6250	GCR	50	312,500
3480	18	38,000 bytes/inch	—	79	3,000,000
Printers	Printing Speed	Print Positions	Horizontal Spacing, Chars./Inch	Vertical Spacing, Lines/Inch	Form Size, Inches
3262:					
Model 3	650 lpm	132	10	6 or 8	3.5 to 16 wide, 6 to 14 long
Model 13	325 lpm	132	10	6 or 8	3.5 to 16 wide, 6 to 14 long
3268 Models 2 & 2C	340 cps	132	10 or 16.7	3, 4, 6, or 8	16 wide, continuous
3287:					
Models 1 & 1C	80 cps	132	10	6 or 8	3 to 14 $\frac{1}{2}$ wide
Models 2 & 2C	120 cps	132	10	6 or 8	3 to 14 $\frac{1}{2}$ wide
3812	12 ppm	—	Variable	Variable	7 to 8.5 wide, 10.1 to 14 long
3820	22 ppm	—	Variable	Variable	Up to 8.5 wide, up to 14 long
4224	50 to 400 cps	—	10, 12, 15	6 or 8	3 to 15 wide
4234 Model 1	120 to 410 lpm	—	10, 15	3, 4, 6, or 8	Up to 16 wide, up to 14 long
4245:					
Models 12 & D12	1,200 lpm	132	10	6 or 8	3.5 to 22 wide, 3 to 24 long
Models 20 & D20	2,000 lpm	132	10	6 or 8	3.5 to 22 wide, 3 to 24 long
4248 Model 2	2,200 to 4,000 lpm	132 std.; 168 opt.	Variable	Variable	3.5 to 22 wide
4250	1.5 to 2.5 ppm average	—	Variable	Variable	Up to 12.99 wide
5210:					
Model G1	40 cps	—	10, 12, 15	3.4 to 8	Up to 15.4 wide
Model G2	60 cps	—	10, 12, 15	3.4 to 8	Up to 15.4 wide

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TABLE 4. TERMINALS

MODEL	3151	3161/3164	3178	3179 Model G	3191
DISPLAY PARAMETERS					
Max. chars./screen	1,920 to 3,300	1,920	1,920	2,560	1,920 or 2,560
Screen size (lines x chars.)	24 x 80 or 24 x 132	24 x 80	24 x 80	32 x 80	24 x 80 or 32 x 80
Symbol formation	9 x 14 or 9 x 15 dot matrix	8 x 16 dot matrix	7 x 14 dot matrix	720 x 384 pixels, APA	7 x 14 dot matrix
Character phosphor	Green or amber	Green or amber (3161); color (3164)	Green	Color	Green or amber
Total colors/no. simult. displayed	Not applicable	8 (3164 only)	Not applicable	8	Not applicable
KEYBOARD PARAMETERS					
Style	Typewriter	Typewriter	Typewriter, data entry	Typewriter, APL	Typewriter, data entry
Character/code set	128 ASCII	ASCII	94 EBCDIC	EBCDIC/APL	94 EBCDIC
Detachable	Yes	Yes	Yes	Yes	Yes
Program function keys	12 standard	24 standard	10 or 24	24 standard	24 standard
OTHER FEATURES					
Buffer capacity	—	1,920 char. (3161); 7,680 char. (3164)	—	—	—
Tilt/swivel	Optional	Standard	Standard	Standard	Standard
Graphics capability	Line drawing set	Line drawing set	No	Standard	No
TERMINAL INTERFACE	ASCII Subsystem Controller; Telecommunications Subsystem Controller; 3174 Control Unit	ASCII Subsystem Controller	Work Station Subsystem Controller; 3274 Control Unit	Work Station Subsystem Controller; 3274 Control Unit	Work Station Subsystem Controller; 3174 or 3274 Control Unit

➤ Group 11 in 1988) all function within the same performance range. Although the 9370 offers a better price/performance ratio than the 4381 Model Group 11 and outperforms the 4381 Model Group 21 in engineering/scientific computing and commercial processing, users will select the entry-level 4381s if they anticipate the need to expand use beyond the performance and functionality levels given by the 9377 Model 90. The entry-level 4381 models provide customers with entry points into IBM's high-performance computing realm. With the entry-level 4381s, customers are provided with a cost-effective migration path to higher performance systems within and beyond the 4381 family.

Furthermore, even though the 9370 Model 90 offers better price/performance than the entry-level 4381s, it does not provide a cost-effective migration path to higher performance computing. The move from a 9370 Model 90 to a 4381 requires a processor box swap, a more costly move than an upgrade for an entry-level 4381.

ADVANTAGES AND RESTRICTIONS

One of the most significant advantages of the 9370 is its communications and networking scheme. The 9370 delivers a much-improved communications architecture when compared to other IBM departmental systems, such as the S/36 and S/38. Ethernet, Token-Ring Network, and SNA deliver the openness required in departmental processing. The Ethernet and the Token-Ring LANs provide the connectivity solutions that permit IBM and non-IBM systems and workstations to communicate and share resources with one another.

Of particular importance within the 9370's communications scheme is its Ethernet connectivity. Ethernet LANs are one of the most popular schemes for interconnecting information systems and workstations, especially at the department level; cases in point are Digital Equipment

➤ The 9370 employs four principal types of I/O controllers:

- DASD/Tape Subsystem Controller.
- Work Station Subsystem Controller.
- System/370 Block Multiplexer Channel.
- Communications Subsystem Controller.

(The various types of Communications Subsystem Controllers are discussed in detail in the "Communications" subsection of this report. Information about the number of devices configurable on each controller is contained in the "Configuration Rules" subsection.)

The *DASD/Tape Subsystem Controller* attaches IBM's 9332 and 9335 Direct Access Storage Device (DASD) disk products and 9347 magnetic tape units to the 9370 processor. The controller employs the IBM Intelligent Peripheral Interface (IPI) Level 3 standard interface, which conforms to the American National Standards Institute (ANSI) standard for IPI Level 3.

The DASD/Tape Subsystem Controller combines the IOP and IOA functions on a single card. It is supported by the VM/SP, VSE/SP, and IX/370 operating environments.

The *Work Station Subsystem Controller* allows attachment of IBM 3270-type devices (such as PCs, display stations, and printers) and OEM devices for special-purpose applications, such as factory or laboratory automation, data acquisition, process control, and communications. Attachable 3270-type devices include the 3178, 3191, 3192, and 3278 Display Stations; 3179 and 3279 Color Display Stations; 5170 and 5371 3270-PCs; and 4224, 4234, 4245, and 4250 printers. Both the 3270-type and the OEM devices attach either directly or through 3299 Terminal Multiplexers.

OEM devices must be attached to the Work Station Subsystem Controller through an appropriate, customer-supplied OEM adapter; the adapter must perform control functions and protocol conversion between the Work Station Subsystem Controller and the appropriate industry standard. IBM's Serial OEM Interface (SOEMI), which supports Multibus and other devices, is an example of such an adapter.

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TABLE 4. TERMINALS (Continued)

MODEL	3192	3193	3194	3270 PC/G & PC/GX	3278	3290
DISPLAY PARAMETERS						
Max. chars./screen	1,920 to 3,564	3,840	1,920	3,920 or 4,000	960 to 3,564	9,920
Screen size (lines x chars.)	24 x 80 to 27 x 132	48 x 80	24 x 80	Up to 50 x 80	12 x 80 to 27 x 132	62 x 160
Symbol formation	—	11 x 24 dot matrix (total char- acter box)	—	720 x 512 or 1024 x 1024 pixels, APA White, color	7 x 9 or 7 x 8 dot matrix	5 x 8 dot matrix
Character phosphor	Green or color on black	White on black	Monochrome or color on dark 8	White, color	White	Amber gas plasma
Total colors/no. simult. displayed	7 or 8	Not applicable	8	8 or 16	Not applicable	Not applicable
KEYBOARD PARAMETERS						
Style	Typewriter, type- writer/APL 2	Typewriter	Typewriter	Typewriter, APL	Typewriter, data entry	Typewriter, data entry
Character/code set	94	EBCDIC	94 EBCDIC	—	94 EBCDIC	EBCDIC
Detachable	Yes	Yes	Yes	Yes	Yes	Yes
Program function keys	24 standard	24 standard	24 or 12	—	12 standard	24 standard
OTHER FEATURES						
Buffer capacity	—	—	30K bytes	3,270 char.	—	24K bytes
Tilt/swivel	Standard	Standard	Standard	Standard	No	Tilt standard
Graphics capability	Yes (Model G)	Images	No	Standard	No	No
TERMINAL INTERFACE						
	Work Station Subsystem Con- troller; 3174, 3274, or 3276 Control Unit	Work Station Subsystem Con- troller; 3174 or 3274 Control Unit	Work Station Subsystem Con- troller; 3174 or 3274 Control Unit	Work Station Subsystem Con- troller; 3174 Control Unit	Work Station Subsystem Con- troller; 3274 Control Unit	Work Station Subsystem Con- troller; 3274 Control Unit

➤ Corporation's Ethernet facilities for VAX minicomputers, MicroVAX, and VAX workstations and Data General's Ethernet facilities for Eclipse MV minicomputers.

The SNA networking facilities running on the 9370 permit the 9370 to serve as either a host or remote system within the SNA network. Permitting distributed IBM and non-IBM systems to gain access to MVS and VM resources is essential within the departmental and distributed processing environment, where such systems are frequently called upon to access applications, files, and data residing on MVS- and VM-based hosts.

A significant component within SNA is the LU6.2 and PU2.1 support facility for peer-to-peer communications. This facility reduces the complexities and performance degradations experienced when interconnecting systems, when sharing resources, when uploading and downloading files, and when passing data between programs. It also reduces the application development effort for writing distributed processing applications.

By employing this communications facility, distributed VM, VSE, and MVS systems can establish communications with each other without experiencing the complexities caused by host intervention. Furthermore, applications in VM, VSE, and MVS environments can establish communications with those LU6.2-based applications on IBM minicomputers, special-purpose processors, and microcomputers without incurring major interfacing difficulties.

Another advantage of the 9370 is its configurability. The 9370 delivers a flexible operating environment for commercial, office, engineering/scientific, and industrial computing. End users select the operating system that best suits application needs and task handling requirements. The VM/IS and VM/SP products are best suited for interactive

➤ The Work Station Subsystem Controller is supported by the VM/SP and VSE/SP operating environments. The SOEMI is supported by VM/SP and VSE/SP through the IBM/SOEMI Access Method software facility.

The Work Station Subsystem Controller comprises two cards; one contains the Work Station Processor, and the other the Work Station Adapter.

The *System/370 Block Multiplexer Channel (BMPX)* allows attachment of one to eight control units for both IBM and non-IBM DASD, tapes, displays, printers, and other devices. Attachable controllers include the 3880 Storage Control Unit (for IBM's 3370, 3375, and 3380 DASD), the 3990 Storage Control Unit (for the 3380 DASD), the 3430 Model A1 Magnetic Tape Subsystems, the 3800 Printing Subsystem, and the 5080 Graphic System.

The single-card BMPX allows several I/O devices to operate concurrently at high speeds. Devices attached to the BMPX that cannot employ block multiplexing (such as IBM's 3420 magnetic tape unit) act as if they were attached to a selector channel. The BMPX operates in datastreaming mode for attaching high-speed DASD like the 3380. Datastreaming permits a data rate of up to 3M bytes per second and cable lengths of up to 400 feet (122 meters) between the 9370 and the last control unit.

The System/370 BMPX allows the 9373 to attach devices with transfer rates of up to 1.5M bytes per second; the 9375 and 9377 can attach 1.5M-, 1.9M-, and 3M-byte-per-second devices.

The BMPX is supported by the VM/SP, VSE/SP, IX/370, and MVS/SP operating environments.

The *3044 Fiber Optic Extender Link* permits low- and medium-speed peripheral subsystem control units, switching units, and Channel-to-Channel Adapters to be positioned further "down the line" to reduce central processing complex floor space requirements and reduce peripheral connectivity costs. With this link extender, I/O equipment such as terminals and printers can be placed further away from the host system without employing the costly communications equipment needed for connectivity to the host. Employing fiber optic cable for peripheral subsystem con-

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▷ processing in departmental and workgroup environments. IX/370, based on the UNIX System V operating system developed and licensed by AT&T, is employed where UNIX System V functionality is required. VSE/SP is designed primarily for intensive batch and on-line transaction processing in either a centralized or distributed environment. MVS/SP handles the system control programming functions in a large user community.

Although the 9370 supports MVS/SP, there is no interface between MVS and the 9370's integrated adapters. Furthermore, the 9370 does not support MVS/XA, the MVS-based operating system designed for larger S/370-type systems; therefore, application portability between the 9370 and the large-scale S/370-based systems is limited.

Even though MVS/SP and MVS/XA are compatible, applications cannot be ported directly from one environment to another because of the differences between MVS/SP and MVS/XA. Applications being moved between the MVS/SP and MVS/XA environments must be modified to run in the designated environment, requiring additional application development expenditures.

When required, more than one operating system can run on the 9370. VM/SP contains the system programming controls that permit it to run IX/370, VSE/SP, MVS/SP, and VM/SP itself. Moreover, VM/SP also accommodates SVS/VSE and OS/VS1, the primary operating systems of the old 4361, thus providing 4361 installations with a migration path to the 9370. VM/SP runs the guest operating systems concurrently, so that users under each operating environment have continual access to applications and services within that domain.

The multiple operating system structure simplifies application system migration, preserves the life of existing applications, widens the application base, and increases operational capabilities. For example, an installation can run IX/370 as a guest under VM/SP to gain access to UNIX application development tools and applications; run VSE/SP under VM/SP to meet transaction processing requirements; and, at the same time, run VM/SP itself to gain access to business professional productivity tools and office automation facilities. As another example, an installation can run OS/VS1 from the 4361 system under VM/SP until the OS/VS1 applications have been converted to the formats needed for running under VM/SP.

IBM has reduced the level of data processing expertise needed to run a 9370 installation. VM and VSE are bundled into packages that simplify operating environment software installation. The VM/IS version of VM/SP, for instance, includes all the functions of VM/SP, but reportedly does not require anywhere near the 44 hours of system programmer time that VM/SP requires in its nonintegrated version.

Additionally, VM/IS and VSE/SP incorporate tools that simplify system operation and maintenance. Facilities are available for reducing the amount of time required to perform problem diagnosis and service routines.

▷ nectivity increases data throughput and improves communications channel reliability, availability, and integrity as compared to traditional peripheral subsystem connectivity cables and buses.

The 3044 Fiber Optic Extender Link consists of two units that are connected by up to 1.2 miles (2 km.) of fiber optic cable. The 3044 Model C01 attaches the processor channel to one end of the fiber optic cable. The 3044 Model D01 connects the other end of the cable to the remote I/O control unit.

The 3088 *Multisystems Channel Communications Unit* provides high-speed communications with 4300, 3080, and 3090 processors and other 9370 processors. The 3088, a stand-alone I/O controller, provides the capabilities for interconnecting up to eight processor channels. The 9370 can be up to 800 feet from the 3088. The interprocessor cable attaches to the System/370 Block Multiplexer Channel and the interface on the 3088. The 3088 is compatible with channel-to-channel adapters.

MASS STORAGE

Disk drives supported on the 9370 systems are listed in Table 2.

INPUT/OUTPUT UNITS

For magnetic tape drives and printers available for the 9370 systems, please refer to Table 3.

To aid in the management of complex peripheral configurations, IBM provides the 3814 *Switching Management System*. With the 3814, the 9370 can share channel-attached devices with other System/370-type processors. The peripheral device-sharing capabilities minimize the number of I/O devices required for peak demand and critical device backup, reduce the impact from device failures, and minimize the complexities of data processing operation control by providing greater security of configurations. For more details on the 3814, please refer to Report 70D9-503MK-101 in Volume 2 of this service.

TERMINALS

Terminals supported on the 9370 systems are summarized in Table 4.

COMMUNICATIONS

The 9370 employs four principal Communications Subsystems Controllers: Telecommunications Subsystem Controller, ASCII Subsystem Controller, IBM Token-Ring Subsystem Controller, and IEEE 802.3 Local Area Network Subsystem Controller. All four subsystems are based on the same communications processor card, plus one or more communications adapter cards and the appropriate microcode for the specific subsystem. As previously mentioned, the 9373 supports up to 2 of these controllers, the 9375 supports up to 4, and the 9377 accommodates up to 12.

The *Telecommunications Subsystem Controller* allows attachment of local communications lines to the 9370 or allows the 9370 to be attached to public networks. The controller permits attachment of two types of adapters: the Multi-Protocol Two-Line Adapter and the Asynchronous Four-Line Adapter. The adapter configuration options for this controller are as follows:

- One to three Four-Line Adapters.
- One to three Two-Line Adapters.
- A combination of up to three Two-Line and Four-Line Adapters.

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➤ Furthermore, VSE/SP and VM/IS packages offer system interfaces that simplify system administrator, system operator, and end-user interaction with the system. These interfaces feature consistent access to system functions, menu- and prompt-driven dialogs, system-guided operations, and on-line help and referencing facilities, all of which reduce the learning times and skill levels required to manage and use the system.

As an option, customers can off-load system control programming to a remote site, thus eliminating system operations concerns. The remote system programming site performs system and application start-ups and shutdowns, system operations, performance monitoring, problem diagnosis, and corrective fixes.

The IBM-supplied customer/product support services also reduce system management complexities. For a fee, IBM performs remote system programming for the VM/IS system; provides telephone consulting; provides remote on-line problem diagnosis and off-line analysis; applies microcode changes to the system from the remote site; and conducts preinstallation planning, installations, and postinstallation support.

All these ease-of-use facilities and centralized system management features are particularly important in the departmental processing environment, where lower overhead is a necessity.

Another 9370 advantage is its compatibility with System/370-based superminicomputers and mainframes. The 9370's hardware and software compatibility with the 4381, 3080, and 3090 systems makes it valuable as a departmental or distributed system. Because of the software compatibility between the 9370 and higher performance S/370-class machines, VM, MVS, VSE, and IX/370 applications can be moved to or down from the same environments on S/370-based systems.

Furthermore, the 9370 maintains hardware compatibility with the System/370-based systems. The System/370 Block Multiplexer Channel-attached peripheral storage subsystems, workstations, printers, and specialized I/O systems; the 3270-type terminals and printers; and 37XX communications processors employed on the 9370 models can be moved over to higher performance S/370-based models, thus preserving investments in peripheral subsystems and devices.

Although the 9370 is compatible with IBM's more powerful 4381 and 30XX systems, it still lacks full compatibility with the S/36 and S/38—very significant players in the mid-range system marketplace. There is no direct software compatibility between the 9370 and S/3X systems. The problem of top-to-bottom compatibility will not be solved until at least 1988, when IBM starts delivering products conforming to the company's Systems Application Architecture (SAA), which will permit applications conforming to a specific set of standards to run on any IBM system. It could take several years before fully functional, SAA-com-

➤ The Telecommunications Subsystem Controller supports the following types of line interfaces:

- EIA RS-232-C/CCITT V.24/V.28, supporting async, BSC, and SDLC protocols at line speeds from 75 bits per second (bps) to 19.2K bps.
- EIA RS-422-A/CCITT V.11, supporting async, BSC, BSC/SDLC, and SDLC protocols at line speeds from 75 bps to 64K bps.
- EIA RS-366/CCITT V.25, supporting async, BSC, and SDLC protocols at line speeds from 75 bps to 19.2K bps.
- CCITT V.35, supporting BSC and SDLC protocols at line speeds from 2.4K bps to 64K bps.
- CCITT X.21, supporting SDLC and HDLC/X.25 protocols at line speeds from 600 bps to 64K bps.

The maximum number of lines supported by one Telecommunications Subsystem Controller depends on the combination of protocols and line speeds selected and the number of I/O slots available. The controller is supported by the VM/SP and VSE/SP operating environments.

The *ASCII Subsystem Controller* supports up to 16 ASCII devices operating at 50 bps to 19.2K bps in full-duplex mode either on local lines without modems or on switched and leased communications lines with modems. The controller comprises a Communications Processor and up to four Asynchronous Four-Line Adapter cards. Terminals supported include the IBM 3151, 3161, and 3164, as well as ASCII terminals from Rolm, Digital Equipment, TeleVideo, and Tektronix.

Three modes of operation—ASCII support, ASCII/3270 conversion, and ASCII/3270 transparent mode—are available. In ASCII mode, all attached ASCII devices appear to software as native devices; this mode is supported by the Unix-based IX/370 operating system. In addition to IX/370, the ASCII Subsystem Controller is supported by the VM/SP and VSE/SP environments.

The ASCII Subsystem Controller's asynchronous adapter can be connected to a Rolm Computer Branch Exchange (CBX) through a Rolm DataCom Module (DCM) or Data Terminal Interface (DTI).

The *IBM Token-Ring Subsystem Controller* provides access to a 4M bps baseband IBM Token-Ring Network compatible with the IEEE 802.5 standard for interconnecting information processing equipment. The network uses the IBM cabling system, including Type 3 (telephone twisted pair) specified media, for physical interconnection; it employs a token-ring access protocol for network traffic control. The two-card Token-Ring Subsystem Controller comprises a Communications Processor and a Token-Ring Adapter. The adapter provides both a physical link and access control to the IBM Token-Ring Network; programming support must be equivalent to the International Standards Organization's (ISO's) Open Systems Interconnection (OSI) Layer 3 and above.

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

The *IEEE 802.3 Local Area Network (LAN) Subsystem Controller*—comprising a Communications Processor card and an IEEE 802.3 LAN Adapter card—is used for communicating with other 9370 Information Systems, other vendors' systems, and workstations using the IEEE 802.3 standard or the Ethernet LAN; it provides both a physical link

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▷ patible facilities become generally available, and even then, these overlay products will only help to bloat IBM's already heavy operating environments.

Even though the 9370 and S/3X operating environments are incompatible, the 9370 does provide more of a bridge between the S/3X machines and the S/370-class systems than did the 4361. S/3X users who want to move up to a S/370-class machine can now bring some of their peripherals with them, rather than having to start over with new storage devices and workstations in addition to new processors. For example, the 9332 and 9335 DASD devices and the 3178 display stations employed on the S/36 Model 5362 or 5360 can be carried over to the 9370 during a system migration. □

▶ and access control. This controller supports a network with a transmission speed of 10M bps using Carrier Sense Multiple Access with Collision Detection (CSMA/CD). Programming support for the LAN adapter must be equivalent to OSI Layer 3 and above. The LAN Subsystem Controller is supported by VM/SP and TCP/IP.

The 3737 *Remote Channel-to-Channel Unit* is a standalone control unit that allows System/370-type hosts to communicate over unlimited distances with each other via public or private T1 facilities at speeds up to 1.5M bits per second (bps). Communications between host systems is supported by the VTAM channel-to-channel program. The 3737 is transparent to the host, requiring no host modifications and allowing the hosts to communicate with each other as though they were channel-to-channel connected. The MVS, VSE, and VM operating systems view the 3737 as a (local) channel-to-channel adapter. The 3737 attaches to the 9370 and another System/370-type processor via a System/370-type block multiplexer channel.

The System/370 Block Multiplexer Channel permits attachment of a range of other IBM communications devices, including the 3174 *Subsystem Control Unit* and the 3274 *Control Unit*, both for terminal control; the 3299 *Terminal Multiplexer*; and the 3720 and 3725 *Communications Controllers*.

SOFTWARE

OPERATING SYSTEM: All 9370 systems run under IBM's VM/SP, VSE/SP, and IX/370 operating systems. The IX/370 is supported only under control of VM/SP. The MVS/SP operating system is supported only on the 9375 Model 60 and the 9377 Model 90; this support enables users to develop applications on a host system and transport them, without changes, to distributed workgroup locations.

VM/Integrated System (VM/IS) is IBM's preferred delivery vehicle for the interactive *VM/SP* operating environment in departments and end-user workgroups.

VM/IS comprises the following components:

- VM/SP, which manages 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 an interactive computing environment for general problem solving and program development. An editor and an interpretive language are also included.

VM/SP accommodates IBM guest operating systems, including VSE/SP, MVS/SP, VM/SP itself, and the IX/370, for purposes such as application testing and execution of applications restricted to specific environments.

- VM Batch Subsystem, which controls background execution of user processes.
- VM Directory Maintenance, which provides interactive facilities that enable the system administrator to manage the VM system directory.
- VM Interactive Productivity Facility (IPF), which provides a simplified interface to the VM system. This facility also includes an interface that allows the addition of user-written or IBM programs to the system.
- VM/IS Productivity Facility (VM/IS PF), which provides end-user menus containing task-oriented, introductory, and navigational dialogs leading to the functions of other programs in VM/IS. VM/IS PF uses the functions of underlying products like IPF without duplicating or changing them.
- Interactive System Productivity Facility (ISPF), a dialog manager that controls the flow of the end-user interface provided by VM/IS. Programmers can use ISPF to produce interactive applications with menu-driven dialogs and dialog functions.
- VM File Storage Facility, which allows users to share data files with other VM users, store and retrieve files, send them to other users, and perform other file management functions.
- VM Real-Time Monitor (RTM), which provides performance monitoring and statistical analysis presented in realtime on any VM/IS-supported monitor.
- VM Performance Monitor Analysis Program (VM MAP), which provides reports and graphics on the performance and use of a running VM system. VM MAP requires the general support routines contained in another integral product, PL/1 Transient Library.
- Document Composition Facility/Foreground Environment Feature (DCF/FEF), a facility for production of text documents. A document formatted by DCF can be printed, displayed, or used as input to other text documents.
- Graphical Data Display Manager (GDDM), a host system program for creating, showing, and storing pictures, including graphics, images, and numerics. GDDM drives displays, printers, plotters, and scanners. Another GDDM product included in VM/IS is GDDM/Graphics Presentation Function (GDDM/GPF), which provides methods for producing business and other charts.

Eight optional applications packages are available for VM/IS, providing 33 licensed programs. The packages are the following:

- Text Office Support (TXTO), a package that includes IBM's Professional Office System (PROFS), which provides facilities for mail handling; appointment scheduling; and document, memo, graphics, business forms, and report preparation. IBM's DisplayWrite/370 document processing facility is also included.
- Engineering/Scientific Problem Development Support (E/SPDS), which, among other facilities, includes VS Fortran language, debug, and utilities; High Accuracy Arithmetic Subroutine Library (ACRITH); and Elementary Math Library (EML).
- APL Language Support (ALS), which allows use of the APL2 language for the development of mathematical and statistical applications.

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- ▶ • **Problem-Solving Languages (PSL)**, which provides Basic and Pascal/VS for development of applications addressing business problems.
- **Data Base Query (DBQ)**, for the creation and management of relational data bases. This package includes IBM's Structured Query Language/Data System (SQL/DS) and Database Edit Facility (DBEDIT).
- **Intelligent Workstation Support (IWS)**, which provides support for IBM's PC. This product allows PC users to take advantage of VM/SP facilities and to transfer files between the PC and the VM host. This product requires that the user obtain additional PC programs, such as PC/VM Bond, for the individual PCs.
- **Networking Support (NTWK)**, which permits information to be sent between sites and allows logging on to remote systems. This package includes the VM Pass-Through Facility (PVM).
- **Communication Controller Support (COM)**, including the Advanced Communications Function/System Support Program (ACF/SSP) and IBM 3725 Emulation Package (EP3725) for support of the IBM 3725 Communications Controller (and of the older 3705).

VM/SP System Offering is a VM package structured for installation and customization on larger 9370 systems. It consists of VM/SP and a set of optional feature program products. With only a few exceptions, all products supported by VM/IS are supported by VM/SP System Offering. However, VM/SP System Offering requires a higher level of data processing expertise than VM/IS.

Additional products available through VM/SP System Offering include the following:

- Application development systems such as Application Prototype Environment (APE), Cross System Product/Application Development (CSP/AD), CSP/Application Execution (CSP/AE), CSP/Query (CSP/Q), Interactive Instructional Presentation System (IIPS), and Development Management System/Conversational Monitor System (DMS/CMS).
- OS PL/1 and VS Cobol II compilers, debuggers, and libraries.
- GDDM-Interactive Map Definition (GDDM-IMD), a tool for graphics processing.
- VM Backup Management System (VMBACKUP-MS) and VM Tape Management System (VMTAPE-MS) system control support packages.
- Contextual File Search/370 (CFSearch/370) data/file management tool.
- Printer support packages including the Font Library Service Facility (FLSF), Overlay Generation Language (OGL), Page Printer Formatting Aids/VM (PPFA/VM), Printer Services Access Facility (PSAF), and Printer Services Facility.
- Info Center/1 (IC/1) information management system.
- Document Composition Facility, a text processing package.

VSE/SP is a pregenerated, load-and-go operating system most desirable for departments and end-user workgroups with intensive batch and transaction processing requirements. It is IBM's primary production system for intermediate systems and the operating system base for distributed processing nodes.

It replaces IBM's Small Systems Executive/VSE (SSX/VSE) as the VSE entry system for data centers and distributed environments.

VSE/SP includes task-oriented menus, including those to identify and correct on-line transaction failures; intelligent workstation support for IBM PCs and 3270 PCs; virtual address extension, providing up to three virtual address spaces for up to 40M bytes of virtual storage; and system start-up and remote operation control, allowing unattended operation of departmental systems.

The *VSE/SP* product incorporates the following components:

- **VSE/Advanced Functions (VSE/AF)**, for basic system control.
- **ACF/VTAM and Basic Telecommunications Access Method-Extended Support (BTAM-ES)**, for workstation and network control. They support attachment of local and remote workstations and processors; VTAM also supports channel-to-channel attachment.
- **VSE/Interactive Computing Control Facility (VSE/ICCF) and Customer Information Control System (CICS/DOS/VS)** for interactive system control and transaction processing, respectively.
- **VSE/Priority Output Writers, Execution Processors, and Input Readers (VSE/Power)** for spooling, networking, and remote job entry control.
- **VSE/VSAM and VSE/VSAM Space Management Feature**, for data management; they control data storage and access to DASD and also manage DASD space.
- **Three utilities: VSE/VSAM Backup and Restore Feature, VSE/Fastcopy, and Data Interfile Transfer, Testing, and Operations Utility (Ditto).**

Optional products for *VSE/SP* are available in the following areas:

- **Business professional applications**, including Distributed Office Support System (DISOSS), DisplayWrite/370 (DW/370), Personal Services/370 (PS/370), and Decision Support/VSE (DS/VSE).
- **Application development**, including DOS/VS Cobol, DOS PL/1, DOS/VS RPG II, and Cross System Product/Application Development (CSP/AD).
- **Data base management and query**, including the hierarchical DBMS product Data Language/One DOS/VS (DL/1 DOS/VS), the relational SQL/DS, Query Management Facility/VSE (QMF/VSE), and DOS/VS Sort/Merge II.
- **Systems networking and distributed data processing**, including Distributed Systems Executive (DSX), ACF/NCP, and Network Communications Control Facility (NCCF).

IX/370 is IBM's implementation of AT&T's Unix System V. It is a multiuser, multitasking system that runs as a guest under VM/SP. *IX/370* includes the Bourne Shell command language and provides virtual addressing, a hierarchical file system, and extended file and logical record locking. The block size of *IX/370* files is 4096 bytes.

Another feature is multiple *IX/370* system support, which allows several *IX/370* subsystems to coreside on the same processor. The subsystems operate independently of one another.

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► **IX/370** provides the full set of UNIX programmer-productivity tools, such as the Source Code Control System (SCCS) and symbolic debugger. A full set of UNIX text processing tools is also provided. For message and file transfer, the mail and UNIX-to-UNIX copy (uucp) facilities are provided. Interactive Systems Corporation's INmail and INnet programs are provided as electronic mail facilities for communications among computers in a network.

The local/remote file transfer support facilities of IX/370 allow users to send files to and receive files from other users in a Remote Spooling Communications Subsystem (RSCS) network. In particular, these facilities allow IX/370 users to receive files sent by an IBM Conversational Monitor System (CMS) user, an MVS/Time Sharing Option (MVS/TSO) user, or any other IX/370 user. Similarly, an IX/370 user can send files to any other user accessible through the RSCS network.

MVS/SP is used only on the 9375 Model 60 and the 9377 Model 90, primarily where operating system compatibility with a central computer is required for transporting program packages between the host and distributed systems. *MVS/SP* does not support fixed-block architecture DASD, such as the 9332 and 9335 nor does it support any of the 9370's integrated I/O controllers. All I/O devices must be attached through standard System/370 Block Multiplexer Channels and control units.

PROGRAMMING LANGUAGES: Languages available for the VM, VSE, and MVS operating environments include VS Fortran, PL/1, Cobol, and RPG II. Available for the VM and MVS environments only are APL2, Pascal/VS, and Basic. Lisp/VM is available for VM only.

DATA BASE MANAGEMENT: *Structured Query Language/Data System (SQL/DS)*, designed for use with VM/SP and VSE systems, is a relational DBMS with integrated query and report writing facilities. It is broadly compatible with IBM's DB2 product in MVS environments. In the VM environment, SQL/DS provides remote relational access support, allowing users on one CPU to access an SQL/DS data base on another locally or remotely connected CPU. For VSE, SQL/DS provides an extract facility that enables users of IBM's DL/1 DOS VS to select portions of DL/1 DOS/VS data and copy them into SQL/DS tables.

Data Language/1 (DL/1) (also called DL/1 DOS/VS) is intended for the VSE environment, for applications with complex processing requirements and highly structured, fixed data relationships; it complements the relational SQL/DS product. An adjunct product, Query. DL/1, provides a simplified facility for making queries against DL/1 data bases.

Database 2 (DB2), for the MVS/SP environment, is intended for applications with dynamic requirements and data structures. Multiple users can concurrently access and change data within the same DB2 table; data remains consistent not only within the data base, but also as it is perceived by each user. This product uses SQL for programming in either high-level language or interactive mode; the same syntax is used to define and control the system.

Information Management System/VS Data Base Facility (IMS/VS-DB) is a full-function data base management system used to create an environment for complex applications like transaction processing; it runs under MVS operating systems. It is most often combined with either IMS/VS-DC or CICS/VS (see the "Data Communications" subsection below) to achieve a complete data base/data communications system. IMS/VS-DB executes as an application and interfaces between user application programs and data bases.

DATA COMMUNICATIONS: IBM offers a wide range of communications products for the VM, VSE, and MVS environments. Key products are described in the following paragraphs; those provided as integral or optional facilities for specific operating systems are mentioned in the "Operating System" subsection above.

The 9370 participates in IBM's *Systems Network Architecture (SNA)*. The base for major communications subsystems in the VM, VSE, and MVS environments is ACF/VTAM. Together with ACF/Network Control Program (ACF/NCP), when applicable, it provides an operating system for the network. The functions of the network operating system are analogous to those of a host operating system for resource sharing and logical handling of user requests.

ACF/VTAM supports concurrent execution of multiple telecommunications applications and controls the sharing of telecommunications resources among the programs in one or more systems. It supports logically direct transmission of data between application programs and terminals in session and supports data transfer between two application programs residing in the same system or in distributed systems.

ACF/VTAM, working in conjunction with ACF/NCP, supports peer-to-peer communications among SNA nodes; that is, programs residing on distributed systems can communicate with one another without host application assistance.

Advanced Program-to-Program Communications (APPC) is provided by the VTAM Application Program Interface (API). The API allows S/370-type applications using LU6.2 sessions to communicate over an SNA network with APPC applications running on the following: S/370-architecture mainframes and intermediate-sized processors; IBM System/36, System/38, and Series/1 minicomputers; IBM System/88 fault-tolerant/on-line transaction processors; the IBM RT PC workstation; the IBM PC and PS/2 microcomputers; and other manufacturers' systems which support LU6.2 communications.

ACF/NCP resides in the IBM 372X Communication Controller and provides physical management of the communications network. It controls attached lines and terminals, performs error recovery, and routes data through the network. It communicates with the host through ACF/VTAM or, in the case of a remote 372X, through another ACF/NCP.

The *Non-SNA Interconnection* network program allows the connection of BSC-oriented remote job entry (RJE) workstations to be connected to a 37XX communications processor. The *Network Terminal Option* allows non-SNA terminals to access ACF/VTAM-based applications.

The *X.25 NCP Packet Switching Interface (X.25 NPSI)* allows ACF/NCP users to communicate over packet switched data networks that have interfaces complying with CCITT Recommendation X.25 (1980 and 1984.) This product allows SNA host processors to communicate with either SNA or non-SNA equipment over such networks.

The *Distributed Systems Executive (DSX)*, a network program for VSE- and MVS-based host systems, helps the central site plan, schedule, and track the distribution of data and software among the nodes in an SNA network. It provides centralized support and control for resource distribution between the host and selected SNA nodes, maintains control over the maintenance of software at the remote site, allows the scheduled distribution of node software, distributes data between the host and nodes, initiates processing at the nodes and host, and provides wider security coverage.

The *VSE/Distributed Systems Node Executive (DSNX)*, a network program for VSE-based systems, provides support

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► for the central site management of a network of distributed systems. VSE/DSNX is installed at the remote site to receive and to implement software and data objects received from the VSE- or MVS-based host which is running DSX.

Like VSE/DSNX, VM/DSNX provides support for the central site management of a network of distributed systems. VM/DSNX is installed at the remote site to receive and to implement software and data objects. It also provides limited function for distributing objects from the VM-based central site to distributed VM-based systems.

NetView, a product for VM, MVS, and VSE environments, is a network management program that provides a cohesive set of SNA host network management services. Fully compatible with IBM's SNA network management architecture, NetView performs the network management functions of NCCP, Network Logical Data Manager (NLDM), and Network Problem Determination Application (NPDA) and performs functions of VTAM Node Control Application (VNCA) and Network Management Productivity Facility (NMPPF).

NetView contains the following components:

- **Command facility.** This component provides command, messaging, and other capabilities for executing network management functions. The facility supports single-domain, multiple-domain, or interconnected SNA networks that allow system operations to be centralized at a single location or distributed at different points.
- **Session monitor.** This component gathers information on session activities for performance evaluation, system tuning, and system accounting.
- **Hardware monitor.** This component collects and displays alerts, events, and statistical data to assist in identifying failing resources in the network, determine probable cause, and recommend action for specific problems related to alerts and events.
- **Status monitor.** This component allows the operator to view the status of all domain resources.
- **On-line help facility.** This component provides operator information without requiring the use of the operation reference library.
- **Help Desk Facility.** This component is an on-line guide that provides problem diagnosis and network operation techniques.
- **Network Log and Data Set Browse.** This facility stores network messages and permits the operator to review the messages. Through user specification, messages being flagged by an "important message indicator" may be color coded or highlighted to designate severity, type, or source.

The *NCCF*, which operates as an application program under ACF/VTAM, provides the network operator with functions for controlling a communications network. It also provides services for IBM or user-written network management programs.

The *NLDM* and the *NPDA* are NCCF applications which collect session-related information that is useful for identifying and isolating network problems.

The *Network Performance Monitor (NPM)* aids network support personnel in managing the performance and growth of VTAM-based networks. The *Network Design and Analysis (NETDA)* is an interactive program product designed to assist customers in the definition, performance analysis, and optimization of SNA networks.

The *Routing Table Generator (RTG)* assists users in defining networks and routing tables. The *NetView Network Definer*, a NetView application, assists users in building and maintaining definition tables for VM-based SNA networks. The *Teleprocessing Network Simulator (TPNS)* tests on-line application programs, communications access methods, control programs, subsystems, and networks.

VM/Conversational Monitor System (VM/CMS), in conjunction with the VM operating system, provides an interactive computing system; it can also be used as a base for interactive applications. It provides full time sharing in either a distributed system or a centralized environment with a dedicated processor, or in conjunction with other operating systems.

The *Customer Information Control System (CICS)* is a general-purpose data communications monitor for terminal-oriented transaction processing applications in VSE and MVS environments. It interfaces among user-written application programs, transaction processing access methods (such as ACF/VTAM), and data base managers (such as DB2 in MVS). The user can generate a CICS/VS system configuration applicable to specific needs and define the environment in which the system is to execute.

IMS/VS-Data Communications (IMS/VS-DC) is a data communications management system that supports multiple terminal-oriented applications using a common data base in the MVS environment. Among other features, it provides support for SNA and SDLC terminals and allows simplified migration to SNA. IMS/VS-DC is generally used in conjunction with IMS/VS-DB (see the "Data Base Management System" subsection above).

UTILITIES: Utility and special functions for the 9370 systems are handled both through intrinsic operating system capabilities and through specialized software products supplied with the operating systems. Those adjunct facilities are listed in the "Operating System" subsection above.

OTHER SOFTWARE: *Professional Office System (PROFS)*, for the VM/SP environment, provides distribution services, such as document transfer; library services, such as storage and retrieval of notes, documents, and statistics; personal services, such as calendaring and appointment scheduling; final-form and revisable-form document interchange with DISOSS users; and an integrated interface to DisplayWrite/370 as an additional document preparation facility.

Distributed Office Support System (DISOSS) runs under MVS or VSE in IBM's CICS environment. It allows users to exchange text, data, and images through electronic mail and central filing. A DISOSS-PROFS bridge supports the exchange of both final-form and revisable-form documents with VM-based systems. DISOSS provides distribution and library services, personal services, and an Application Program Interface (API) that interfaces DISOSS and user-written CICS applications. Together with DISOSS, *Personal Services/370 (PS/370)* provides office system functions on a 3270, 3270-PC, 3270-PC AT, or 3270-PC AT/G or /GX display terminal. Operating as a CICS/VS application, PS/370 supports DisplayWrite/370.

DisplayWrite/370, operating in the MVS and VSE environments, provides a full-screen text editor/formatter supporting the 3270 Information Display System and the 3270-PC display terminal.

A range of proprietary commercial, engineering/scientific, and technical applications is available for the VSE, VM, and MVS operating environments. The 9370 supports any System/370 applications program, provided that it is not time dependent; does not require the presence of system

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► facilities (such as storage capacity, I/O equipment, or optional features) when the facilities are not included in the configuration; and does not require the absence of system facilities when the facilities are included in the configuration. (For example, the program must not depend on interruptions caused by invalid operation codes.)

With the announcement of the 9370, IBM began selling the *SolutionPac* series of software offerings. SolutionPacs are predefined software packages comprising predetermined combinations of the following elements:

- Integrated, pregenerated system and application software.
- Snap-on application software for standard operating environments.
- Customized or fixed pricing for the following services:
 - Application integration and customization services.
 - Design, installation, and education services.
 - Maintenance services, including a single point of contact for the total offering.
- Application competency center support.
- Customer support telephone service.

PRICING AND SUPPORT

POLICY: The 9370 systems are available for sale or monthly rental. During the first six months following installation, 50 percent of the monthly rental charges may be applied as a credit toward the purchase of the machine, not to exceed 50 percent of the purchase price applicable at the time of purchase. Volume purchasing is available under the Volume Procurement Amendment (VPA) to Agreement for Purchase of IBM Machines. Term leases and installment payment plans are available through IBM Credit Corporation.

Discounts are available for purchasers aggregating required quantities of System/36, System/38, 9370, and 4300 processors.

A 25 percent educational allowance is available to qualifying institutions in accordance with IBM's Educational Allowance Amendment. The educational allowance may not be added to any other discount or allowance.

VM, VSE, and cross-system licensed software products are subject either to a monthly license charge or to a onetime charge. The onetime charge varies according to the processor group to which the target machine belongs. IBM has defined four processor groups—10, 20, 30, and 40—for 370-based machines; 9373 Model 20 and 9375 Model 40 belong to Processor Group 10, while 9375 Model 60 and 9377 Model 90 belong to Processor Group 20. Graduated group-to-group and version-to-version upgrade charges also apply. Volume discounts are available for onetime-charge products, starting with a quantity of three.

SUPPORT: The 9370 systems are covered by a one-year warranty and are eligible for IBM On-Site Repair. Service is provided by IBM's National Service Division.

The 9370 processors are designated customer setup (CSU) equipment. Processors and rack-mountable devices or features ordered with the IBM 9309 Rack Enclosure are installed in the rack enclosure at the factory. The customer is responsible for determining system configuration requirements, unpacking the processor or the rack assembly, positioning the processor or the rack enclosure in the prescribed

location, setting up stabilizing hardware, routing power and signal cables, and performing a device operational checkout.

Step-by-step instructions lead the customer through setup of the processor console and rack-mounted units, as well as through connection to external units and communications facilities. Some system elements, such as System/370 channel-attached I/O devices, require installation by IBM service personnel.

IBM 9370 systems are in IBM's maintenance plan group D. The minimum period of maintenance service is nine consecutive hours between 7 a.m. and 6 p.m., Monday through Friday. Charges for maintenance coverage outside this period are based upon percentages of the minimum monthly maintenance charge (MMC) added to the MMC.

IBM also has a Corporate Service Amendment to the IBM Maintenance Agreement providing discounts on service for qualifying systems and network customers.

For users without a maintenance contract or requiring maintenance beyond contracted hours, the 9370 comes under IBM Hourly Service Rate Classification 2. The per-call charge during regular hours is \$158 per hour; outside regular hours, the charge is \$180 per hour.

IBM's Customer Assistance Group can be contacted to help determine and resolve system problems. This group provides step-by-step guidance through a problem determination activity requiring trained personnel to interpret results.

The SDLC communications adapter in the 9370 processor console allows attachment of an external modem to provide data link communications with a remote IBM service system. Remote IBM service personnel can perform on-line diagnosis of the system; logout data stored on the processor console can be transferred and saved at the remote IBM support site for later off-line analysis. IBM support personnel can also apply microcode corrections to the system from the remote site.

EDUCATION: IBM offers a range of technically and conceptually oriented training programs covering a variety of subjects, from large-system operating environments to information systems use and management. Educational methods include classroom instruction, self-study, program offerings (computer-based training products running on the 9370 and other systems), and technical update videotapes. Courses are usually given at IBM Education Centers nationwide; some are held at IBM branch offices and, by special arrangement, at user sites.

IBM offers a range of systems, applications, and operations courses for the VSE/SP, MVS, and VM environments; courses on communications systems, data base management systems, and distributed processing, among other subjects, are also offered.

TYPICAL CONFIGURATIONS: The following are small, medium, and large 9370 system configurations. More detailed pricing of hardware components and available software is included in the price list that follows.

9373 Model 20:

9373 Model 20 CPU with 4MB of main memory	\$ 31,000
4MB of additional memory	10,000
9309 Rack Model 2	3,000
Two DASD/Tape Subsystem Controllers	6,000
9335 A1 Device Function Controller	8,500
9335 B1 824MB DASD fixed disk drive	21,250
9347 1600 bpi streaming tape drive	7,900

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▶ Work Station Subsystem Controller	4,200
Three 3299 terminal multiplexers	2,385
Eight 3179 Model G color display stations	22,360
16 3191 Model A10 monochrome display stations	20,720
4234 Model 1 410-lpm dot band printer	8,800
VM/IS Base Release 5	28,200
TOTAL PURCHASE PRICE:	\$174,315
9375 Model 40:	
9375 Model 40 CPU with 8MB of main memory	\$ 65,000
8MB of additional memory	20,000
Two 9309 Rack Model 2s	6,000
Two DASD/Tape Subsystem Controllers	6,000
9335 A1 Device Function Controller	8,500
Three 9335 B1 824MB DASD fixed disk drives	63,750
9347 1600 bpi streaming tape drive	7,900
Two Work Station Subsystem Controllers	8,400
Six 3299 terminal multiplexers	4,770
16 3179 Model G color display stations	44,720
16 3191 Model A10 monochrome display stations	20,720
16 3270 PC Model 5371	96,800
4245 Model D20 2,000-lpm band printer	35,000

VM/IS Base Release 5	28,200
TOTAL PURCHASE PRICE:	\$415,760
9377 Model 90:	
9377 Model 90 CPU with 8MB of main memory	\$ 190,000
8MB of additional memory	20,000
Two 9309 Rack Model 2s	6,000
I/O card unit adapter (#5000)	4,200
Two card units (#5010)	15,400
System/370 Block Multiplexer Channel	6,000
3880 Model 3 storage controller	60,270
3380 Model AE4 5.04GB DASD fixed disk drive	122,480
3480 Model A22 tape control unit	65,430
3480 Model B22 cartridge tape drive	43,120
Four Work Station Subsystem Controllers	16,800
16 3299 terminal multiplexers	12,720
48 3179 Model G color display stations	134,160
48 3191 Model A10 monochrome display stations	62,160
32 3270 PC Model 5371	193,600
3820 20-ppm laser printer	28,350
4248 Model 1 3,600-lpm band printer	75,000
VM/IS Base Release 5	28,200
TOTAL PURCHASE PRICE:	\$1,083,890

EQUIPMENT PRICES

		Purchase Price (\$)	Monthly Maint. (\$)	Monthly Rental Charge* (\$)	Monthly 2-Year Lease Charge* (\$)
PROCESSORS					
9373-020	Processor with 4MB of main memory	31,000	225.00	3,100	NA
9375-040	Processor with 8MB of main memory	65,000	280.00	6,500	NA
9375-060	Processor with 8MB of main memory	93,000	350.00	9,300	NA
9377-090	Processor with 8MB of main memory	190,000	550.00	19,000	NA
PROCESSOR OPTIONS					
9309	Rack Enclosure:				
	Model 1; 1.0 Meter	2,500	4.00	250	NA
	Model 2; 1.6 Meter	3,000	4.00	300	NA
	120-V Power Supply for Model 1	NC	NC	NC	NC
4000	Automated Power Controls	800	NA	80	NA
5000	I/O Card Unit Adapter	4,200	NA	420	NA
5010	I/O Card Unit	7,700	NA	770	NA
5020	I/O Card Unit	11,300	NA	1,130	NA
6010	DASD/Tape Subsystem Controller	3,000	NA	300	NA
6001	Channel Power Control	1,600	NA	160	NA
6003	System/370 Block Multiplexer Channel	6,000	NA	600	NA
6020	Work Station Subsystem Controller	4,200	NA	420	NA
MEMORY					
4002	4MB Memory Addition for 9373 Processor	10,000	NA	1,000	NA
4008	8MB Memory Addition for 9373 or 9375 Processor	20,000	NA	2,000	NA
4108	8MB Memory Addition for 9377 Processor	20,000	NA	2,000	NA

*Rental/lease prices include equipment maintenance.

**Annual maintenance fee.

***Four-year lease.

NA—Not applicable.

NC—No charge.

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		Purchase Price (\$)	Monthly Maint. (\$)	Monthly Rental Charge* (\$)	Monthly 2-Year Lease Charge* (\$)
COMMUNICATIONS EQUIPMENT					
6030	Communications Processor	2,400	NA	240	NA
6031	Multi-Protocol Adapter	1,200	NA	120	NA
6032	Asynchronous Adapter	825	NA	83	NA
6034	IBM Token-Ring Adapter	1,950	NA	195	NA
6035	IEEE 802.3 Adapter	2,700	NA	270	NA
3299	Terminal Multiplexer	795	NA	NA	NA
3720	Communications Controller:				
	Model 1; Local Base	36,500	175.00	2,865	NA
	Model 2; Remote Base	26,000	142.00	2,040	NA
	Model 11; Local Base and TR	42,500	178.00	3,335	NA
	Model 12	33,000	146.00	2,510	NA
3721	Expansion Unit				
	Model 1; One Scanner	16,000	NA	1,255	NA
	Model 2; Two Scanners	22,500	NA	1,765	NA
3275	Communication Controller:				
	Model 1	75,000	232.00	4,420	NA
	Model 2	60,500	208.00	3,330	NA
3726	Communication Control Console	32,000	43.00	1,880	—
3227	Operator Console	2,390	28.00	215	—
3737	Remote Channel-to-Channel Unit	72,000	635.00	NA	NA
3044	Fiber-Optic Channel Extender Link	8,500	27.00	NA	NA
MASS STORAGE					
3370	Direct Access Storage:				
	Model A2; 729.8MB; contains logic and power for up to three Model B2 units	35,480	134.00	2,190	NA
	Model B2; connects to a 3370 Model A2	26,600	101.00	1,640	NA
	8150 String Switch for 3370 A1 and A2	3,830	1.50	199	169
3375	Direct Access Storage; 819.7MB per drive:				
	Model A1; contains logic and power for up to three Model B1 units	24,730	144.00	1,851	1,575
	Model B1; connects to a 3375 Model A1	18,700	109.00	1,486	1,265
	Model D1; provides dual controller function in a 3375 string; requires one Model A1 and two Model B1s	23,590	133.00	1,763	1,500
	4951—Model D1 Attachment for Model A1	2,590	6.00	112	95
	4952—Model D1 Attachment for Model B1	NC	NC	NC	NC
	8150—String Switch Feature for 3375 A1	3,795	1.50	181	154
3380	Direct Access Storage:				
	Model AD4; 2.52GB drive; attaches to 3880-3, 3880-23, or 3990 storage directors	82,000	295.00	5,105	NA
	Model AE4; 5.04GB Extended Capability drive; attaches to 3880-3, 3880-23, or 3990 storage directors	113,000	295.00	7,590	NA
	Model BD4; 2.52GB drive; can be attached to AD4, AE4, BE4, or another BD4	59,000	215.00	3,715	NA
	Model BE4; 5.04GB Extended Capability drive; can be attached to AD4, AE4, BD4, or another BE4	90,000	215.00	6,190	NA
	Model AJ4; 2.52GB Enhanced Subsystem drive; can be attached to 3990 storage director	82,000	225.00	4,325	NA
	Model AK4; 7.56GB Enhanced Subsystem drive; can be attached to 3990 storage director	128,000	225.00	6,625	NA
	Model BJ4; 2.52GB Enhanced Subsystem drive; can be attached to AJ4 or AK4 drive	59,000	165.00	3,115	NA
	Model BK4; 7.56GB Enhanced Subsystem drive; can be attached to AJ4 or AK4 drive	105,000	165.00	5,415	NA
	Model CJ2; 1.26GB Channel-Attached drive	70,000	230.00	3,730	NA
3880	Storage Control; includes two storage directors:				
	Model 1; each storage director can attach up to four 3370 A1/A2 or 3375 A1 or D1 in any combination	51,000	176.00	4,124	3,510
	Model 3; provides two storage directors for 3380 storage	51,000	176.00	1,370	1,165
	Model 4; provides one storage director which can attach up to four 3370 or 3375 Model A1s	30,000	82.50	2,370	NA
	Model D23; includes two cache storage directors for 3380; 8 megabytes	110,000	575.00	2,940	NA
	Model E23; same as D23, but with 16 megabytes	146,000	600.00	3,900	NA
	Model G23; same as D23, but with 32 megabytes	218,000	650.00	5,825	NA
	Model H23; same as D23, but with 48 megabytes	290,000	700.00	7,750	NA
	Model J23; same as D23, but with 64 megabytes	362,000	750.00	9,675	NA

*Rental/lease prices include equipment maintenance.

**Annual maintenance fee.

***Four-year lease.

NA—Not applicable.

NC—No charge.

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		Purchase Price (\$)	Monthly Maint. (\$)	Monthly Rental Charge* (\$)	Monthly 2-Year Lease Charge* (\$)
MASS STORAGE (Continued)					
	3005—3380 AJ4/AK4 support for 3880 Model 3	5,000	NA	NA	NA
	3010—3380 AK4 support for 3880 Model 23	5,000	NA	NA	NA
	6140—4.5MB/sec support for 3880 Model 23	3,000	NA	80	NA
	6148—Remote Switch Attachment	NC	NC	NC	NC
	6149—Remote Switch Attachment, additional	NC	NC	NC	NC
	6150—Remote Switch Attachment for Eight-Channel Switch	NC	NC	NC	NC
	6550—Speed Matching Buffer for 3380	8,250	40.00	220	187
	6560—Speed Matching Buffer	9,710	40.00	260	221
	8160—Two-Channel Switch	3,850	5.00	241	NA
	8170—Two-Channel Switch Pair	5,290	11.00	140	119
	8171—Two-Channel Switch Pair, additional	14,120	38.50	380	323
	8172—Eight-Channel Switch	19,420	53.50	520	443
3990	Storage Control:				
	Model 1; one storage cluster with two storage directors	60,000	185.00	3,185	NA
	Model 2; two storage clusters with four storage directors	110,000	370.00	5,870	NA
	Model G3; two storage clusters with four storage directors and 32MB cache	200,000	800.00	10,800	NA
	Model J3; same as Model G3, but with 64MB cache	312,000	875.00	16,475	NA
	Model L3; same as Model G3, but with 128MB cache	536,000	1,025.00	27,825	NA
	Model Q3; same as Model G3, but with 256MB cache	984,000	1,325.00	50,525	NA
	8172—Four-Channel Switch, Additional	18,000	40.00	940	NA
	6149—Remote Switch Attachment	NC	NC	NC	NC
	6150—Remote Switch Attachment, Additional	NC	NC	NC	NC
	7149—Local Remote Switch Attachment	NC	NC	NC	NC
	7150—Local Remote Switch Attachment, Additional	NC	NC	NC	NC
9332	400MB Rack Mounted DASD	14,000	27.00	1,400	NA
9335	DASD	21,250	50.00	2,125	NA
MAGNETIC TAPE EQUIPMENT					
1589	Magnetic Tape Units:				
	Model C1; Tape Control and one Tape Unit; fits in 1.0-m rack enclosure	26,500	NA	NA	NA
	Model D1; single Tape Unit	20,200	NA	NA	NA
	Model C2; Tape Control and one Tape Unit; fits in 1.6-m rack enclosure	27,000	NA	NA	NA
	Model E2; Tape Control and two Tape Units	44,000	NA	NA	NA
3420	Magnetic Tape Units:				
	Model 3; 120,000 bytes/sec at 1600 bpi; 75 ips	13,120	248.00	768	645
	Model 4; 470,000 bytes/sec at 6250 bpi; 75 ips	16,870	248.00	1,075	903
	Model 5; 200,000 bytes/sec at 1600 bpi; 125 ips	17,600	272.00	1,035	869
	Model 6; 780,000 bytes/sec at 6250 bpi; 125 ips	19,710	272.00	1,235	1,037
	Model 7; 320,000 bytes/sec at 1600 bpi; 200 ips	19,710	326.00	1,225	1,029
	Model 8; 1250 bytes/sec at 6250 bpi; 200 ips	21,860	401.00	1,465	1,231
	6420—6250 bpi Density Feature (for 3420 Models 4, 6, and 8)	1,760	74.00	103	87
	6425—6250/1600 bpi Density Feature (for 3420 Models 4, 6, and 8)	2,425	99.00	151	127
	6631—Single Density Feature (for Models 3, 5, and 7)	3,155	74.00	177	149
	3550—Dual Density Feature (for Models 3, 5, and 7)	4,075	124.00	231	194
	6407—7-Track Feature (for Models 3, 5, and 7)	3,155	107.00	177	149
3422	Magnetic Tape Unit:				
	A1 Drive and Control Unit	40,480	440.00	2,460	NA
	B1 Magnetic Tape Unit	19,690	181.00	1,165	NA
	3020—Data Streaming Feature	1,730	35.00	122	NA
	3005—Two-Channel Switch	3,575	4.00	183	NA
	3010—Two Control Unit Switch (Communicator), primary	8,085	20.00	425	NA
	3015—Same as 3010, but secondary	5,775	20.00	310	NA
3430	Magnetic Tape Subsystem:				
	Model A1; Tape Unit and Control	33,400	251.00	2,575	NA
	Model B1; Tape Unit only	16,900	176.00	1,365	NA
	4991—Multiple Drive Attachment	600	5.00	46	NA
3480	Magnetic Tape Subsystem:				
	Model A22 Control Unit	65,430	423.00	4,605	NA
	Model B22 Magnetic Tape Unit	43,120	264.00	3,015	NA

*Rental/lease prices include equipment maintenance.

**Annual maintenance fee.

***Four-year lease.

NA—Not applicable.

NC—No charge.

IBM 9370 Information System

		Purchase Price (\$)	Monthly Maint. (\$)	Monthly Rental Charge*	Monthly 2-Year Lease Charge*
MAGNETIC TAPE EQUIPMENT (Continued)					
	1511—First Channel Attachment	5,785	21.00	357	NA
	1512—Second Channel Attachment	5,785	21.00	357	NA
	1513—Third Channel Attachment	5,785	21.00	357	NA
3803	Tape Controller:				
	Model 1; for 3420 Models 3, 5, 7	22,740	158.00	1,335	1,121
	Model 2; for 3420 Models 3 through 8 drives	30,300	218.00	1,945	1,634
	5310—9-Track NRZI Feature (permits connection of 800 bpi drives to 3803-2)	3,385	2.00	186	156
	6320—7-Track NRZI Feature (permits connection of 800 bpi drives to 3803-2; 5310 is prerequisite)	1,665	2.00	92	77
	Multiple Tape Control Switches (for switching up to sixteen 3420 tape drives among up to four 3803 control units):				
	1792—For 2 Tape Controls	6,740	15.00	388	326
	1793—For 3 Tape Controls	8,600	25.00	504	423
	1794—For 4 Tape Controls	10,110	25.00	590	496
	6148—Remote Switch Attachment	1,000	NA	55	46
	8100—Two-Channel Switch	5,060	6.50	288	242
9347	Magnetic Tape Unit	7,900	78.00	790	NA
	6010—DASD/Tape Controller	3,000	NA	300	NA
PRINTERS					
3262	Line Printer:				
	Model 1; 650 lpm	15,040	202.50	806	686
	Model 3; 650 lpm (3274)	15,040	202.50	806	686
	Model 11; 325 lpm	12,620	148.00	592	504
	Model 13; 325 lpm (3274)	12,620	148.00	592	504
3268	Printer:				
	Model 2	7,500	76.00	498	424
	Model 2C	8,990	102.00	677	NA
3287	Serial Printer:				
	Model 1; 80 cps	4,830	41.00	348	296
	Model 2; 120 cps	5,150	52.00	426	362
	Model 1C; 4 colors; 80 cps	5,210	46.00	431	367
	Model 2C; 4 colors; 120 cps	5,530	57.00	506	431
	1120—APL/Text	165	0.50	6	5
	3610—Extended Character Set Adapter	429	3.00	25	22
	3880—Extended Print Buffer	198	0.50	7	6
	4110—Friction Feed Paper Handling	151	0.50	6	5
	8330—3271/3272 Attachment for Models 1 and 2	860	2.50	60	51
	8331—3274/3276 Attachment for Models 1 and 2	165	0.50	6	5
	8700—Variable-Width Forms Tractor	151	0.50	6	5
3812	Nonimpact Page Printer, Model 1	8,235	126.00	NA	NA
	3060—Bisync Communication Feature for VM attachment	250	NA	NA	NA
3820	Laser Page Printer:				
	Model 1	28,350	310.00	1,845	NA
	3005—Pattern Storage Memory; 256KB	1,050	10.00	67	NA
	3010—Pattern Storage Memory; 512KB	1,700	20.00	112	NA
	3020—Pattern Storage Memory; 1024KB	3,000	40.00	202	NA
	3025—Pattern Storage Memory; 2048KB	6,000	80.00	404	NA
	3030—Pattern Storage Memory; 3072KB	9,000	120.00	607	NA
	3035—Control Storage Memory; 128KB	750	10.00	50	NA
	3055—System/370 Channel Interface Attachment	2,600	40.00	180	NA
4224	Printer:				
	Model 1C2	6,700	50.00	NA	NA
	Model 1E2	6,500	45.00	NA	NA
	Model 1O1	4,200	30.00	NA	NA
	Model 1O2	6,000	40.00	NA	NA
	2C2—400 cps Max. Expanded Storage and Color	6,700	50.00	NA	NA

*Rental/lease prices include equipment maintenance.
 **Annual maintenance fee.
 ***Four-year lease.
 NA—Not applicable.
 NC—No charge.

IBM 9370 Information System

		Purchase Price (\$)	Monthly Maint. (\$)	Monthly Rental Charge* (\$)	Monthly 2-Year Lease Charge* (\$)
PRINTERS (Continued)					
	2E2—400 cps Max. Expanded Storage	6,500	45.00	NA	NA
	201—200 cps Maximum	4,200	30.00	NA	NA
	202—400 cps Maximum	6,000	40.00	NA	NA
	3C2—400 cps Color Printer	6,700	50.00	NA	NA
	301—200 cps Printer	4,200	30.00	NA	NA
	302—400 cps Printer	6,000	40.00	NA	NA
4234	Dot Band Printer: Model 1	8,800	85.00	NA	NA
4245	Band Printer: Model 12; 1,200 lpm	31,000	250.00	2,050	NA
	Model D12; 1,200 lpm	31,000	250.00	2,050	NA
	Model 20; 2,000 lpm	35,000	400.00	2,340	NA
	Model D20; 2,000 lpm	35,000	400.00	2,340	NA
4248	Printer, Model 2; 2,200/3,200/4,000 lpm; 132 print positions	75,000	800.00	6,205	NA
	3751—Additional 36 Print Positions (plant installation)	10,000	110.00	615	NA
	3753—Additional 36 Print Positions (field installation)	15,000	110.00	615	NA
4250	Nonimpact Printer, Model 1; 600 by 600 dots per square inch	21,000	190.00	1,520	NA
5210	Printer: Model G1	5,420	65.00	NA	NA
	Model G2	5,835	71.00	NA	NA
WORKSTATIONS/TERMINALS					
3151	ASCII Monochrome Display Station: Model 160; 84-key keyboard, green display	399	**27.00	NA	NA
	Model 360; 102-key keyboard, green display	525	**27.00	NA	NA
	Model 460; 102-key keyboard, amber-gold display	525	**27.00	NA	NA
3161	Monochrome Display Station: Model 11; includes keyboard and RS-232-C interface	695	**45.00	NA	NA
	Model 12; includes keyboard and RS-232-C/RS-422-A interface	774	**40.00	NA	NA
	Model 21; includes keyboard and RS-232-C interface	695	**45.00	NA	NA
	Model 22; includes keyboard and RS-232-C/RS-422-A interface	774	**40.00	NA	NA
3164	Color Display Station: Model 11; includes RS-232-C interface	1,295	**85.00	NA	NA
	Model 12; includes RS-232-C/RS-422-A interface	1,374	**85.00	NA	NA
3178	Monochrome Display Station: Model C10; 75-key keyboard	1,040	NA	NA	NA
	Model C20, C30, and C40; 87-key keyboard	1,095	NA	NA	NA
3179	Color Display Station: Model 1; 122-key typewriter keyboard	2,095	**92.00	NA	NA
	Model G1; graphics terminal; 122-key typewriter keyboard	2,795	NA	NA	NA
	Model G2; graphics terminal; 122-key typewriter/APL keyboard	2,795	NA	NA	NA
3191	Monochrome Display Station: Model A; 102- or 122-key keyboard, green display	1,295	40.00	NA	NA
	Model B; 102-, 104-, or 122-key keyboard, amber-gold display	1,295	40.00	NA	NA
	Model D; 102-, 104-, or 122-key keyboard, green display	1,425	**55.00	NA	NA
	Model E; 102-, 104-, or 122-key keyboard, amber-gold display	1,425	**55.00	NA	NA
	Model L; 102-, 104-, or 122-key keyboard, green display, selector light pen	1,795	**145.00	NA	NA
3192	Color Display Station: Model C; 102-, 104-, or 122-key keyboard	1,895	85.00	NA	NA
	Model D; 102-, 104-, or 122-key keyboard	1,795	60.00	NA	NA
	Model G; 102-, 104-, or 122-key typewriter or typewriter/APL keyboard	2,795	110.00	NA	NA
	Model F; 102-, 104-, or 122-key keyboard	2,095	**85.00	NA	NA
	Model L; 102-, 104-, or 122-key keyboard, selector light pen	2,295	**175.00	NA	NA
3193	Monochrome Display Station: Model 10; 122-key keyboard	2,495	75.00	NA	NA
	Model 20; 102-key keyboard	2,495	75.00	NA	NA

*Rental/lease prices include equipment maintenance.

**Annual maintenance fee.

***Four-year lease.

NA—Not applicable.

NC—No charge.

IBM 9370 Information System

WORKSTATIONS/TERMINALS (Continued)		Purchase Price (\$)	Monthly Maint. (\$)	Monthly Rental Charge* (\$)	Monthly 2-Year Lease Charge* (\$)
3194	Display Station:				
	Model C; 102-, 104-, or 122-key keyboard, color display	2,495	**125.00	NA	NA
	Model D; 102-, 104-, or 122-key keyboard, monochrome display	2,195	**125.00	NA	NA
	Model H; 102- or 122-key keyboard, color display	2,895	NA	NA	NA
5371	System Unit, 3270-PC:				
	System Unit, Model 12	3,520	NA	NA	NA
	System Unit, Model 14	3,730	NA	NA	NA
	System Unit, Model 16	4,430	NA	NA	NA
	1003—64KB Memory Module Kit	100	NA	NA	NA
	1013—Memory Expansion Option, 64/256KB	265	NA	NA	NA
	2500—Fixed Disk, 10MB	1,195	NA	NA	NA
	2501—Fixed Disk Adapter	495	NA	NA	NA
	3810—Dual-sided Diskette Drive	425	NA	NA	NA
	4900—Mono Display and Printer Adapter	250	NA	NA	NA
	5370—Standard Keyboard	295	NA	NA	NA
3278	Monochrome Display Station:				
	Model 2	1,572	10.00	119	102
	Model 3	1,716	10.50	146	124
	Model 4	1,804	11.50	149	127
	Model 5	2,060	13.00	175	149
3290	Information Panel:				
	Model 220	6,500	**288.00	NA	NA
	Model 230	6,500	**288.00	NA	NA
	Model T30	9,300	**360.00	NA	NA
	3210—Display Panel	3,600	NA	202	NA
	4730—Data/Typewriter Keyboard	440	NA	26	NA
	4731—APL Typewriter Keyboard	440	NA	26	NA
	4830—Numeric Keypad	250	NA	13	NA
	4831—Program Function Keypad	250	NA	13	NA

SYSTEM MANAGEMENT

3814	Switching Management System:				
	Model A1 Controller (4 x 4)	47,480	159.00	2,630	***2,105
	Model A2 Controller (4 x 8)	60,420	207.00	3,350	***2,680
	Model A3 Controller (8 x 4)	64,740	203.00	3,595	***2,875
	Model A4 Controller (two 4 x 4s)	69,570	223.00	3,875	***3,095
	Model B1 Remote Unit (4 x 4)	39,710	107.00	2,205	***1,765
	Model B2 Remote Unit (4 x 8)	52,660	157.00	2,920	***2,335
	Model B3 Remote Unit (8 x 4)	56,970	151.00	3,165	***2,530
	Model B4 Remote Unit (two 4 x 4s)	61,800	171.00	3,435	***2,745
	Model C1 Expansion Unit (4 x 4)	37,980	104.00	2,105	***1,680
	Model C2 Expansion Unit (4 x 8)	50,930	152.00	2,820	***2,255
	Model C3 Expansion Unit (8 x 4)	55,240	147.00	3,065	***2,450
	Model C4 Expansion Unit (two 4 x 4s)	60,070	168.00	3,340	***2,670

*Rental/lease prices include equipment maintenance.

**Annual maintenance fee.

***Four-year lease.

NA—Not applicable.

NC—No charge.

SOFTWARE PRICES

		Initial Basic License Charge (\$)	Monthly Basic License Charge (\$)	Graduated Onetime Charge (\$)	Licensed Program Support Charge (\$)
Onetime charges are based on the processor group to which the system belongs. The 9373 Model 20 and the 9375 Model 40 belong to Processor Group 10. The 9375 Model 60 and the 9377 Model 90 belong to Processor Group 20.					
5664 167	VM/SP Release 3 through 5 and up				
	Group 10	NA	500	7,740	69
	Group 20	NA	500	13,540	69
5664 204	NetView Release 2 for VM/SP				
	Group 10	NA	940	9,020	90
	Group 20	NA	940	15,790	90

NA—Not applicable.

IBM 9370 Information System

		Initial Basic License Charge (\$)	Monthly Basic License Charge (\$)	Graduated Onetime Charge (\$)	Licensed Program Support Charge (\$)
5664 280	ACF/VTAM Version 3 Release 1.1 for VM/SP Group 10	3,535	1,175	11,235	247
	Group 20	3,535	1,175	19,660	247
5664 283	VM/IS Productivity Facility Group 10	NA	107	855	16
	Group 20	NA	107	1,500	16
5664 301	VM/IS Base Release 5 Group 10	NA	2,381	28,200	NA
	Group 20	NA	2,381	49,365	NA
5664 301	VM/IS Real Time Monitor Group 10	NA	50	400	NA
	Group 20	NA	50	700	NA
5664 301	VM/IS Performance Reporting Feature (VMMAP) Group 10	NA	270	1,600	NA
	Group 20	NA	270	2,800	NA
5664 301	VM/IS General Language Support Routines (PL/1) Group 10	NA	37	440	NA
	Group 20	NA	37	775	NA
5664 301	VM/IS Shared User Files Feature (FSF) Group 10	NA	44	440	NA
	Group 20	NA	44	770	NA
5664 301	VM/IS Background Execution Feature (Batch) Group 10	NA	150	1,800	NA
	Group 20	NA	150	3,150	NA
5664 301	VM/IS Graphics Support Feature (GDMM/PGF) Group 10	NA	413	4,955	NA
	Group 20	NA	413	8,670	NA
5664 301	VM/IS Text Formatting Feature (DCF/FEF) Group 10	NA	417	4,990	NA
	Group 20	NA	417	8,735	NA
5664 309	PROFS Version 2 Group 10	NA	995	12,800	NA
	Group 20	NA	995	22,400	NA
5664 370	DisplayWrite/370 Version 1 for VM/SP Group 10	NA	665	5,600	42
	Group 20	NA	665	9,800	42
5664 385	NetView Network Definer Group 10	—	—	2,240	—
	Group 20	—	—	3,920	—
5666 273	VSE/Power Version 2 Group 10	498	166	1,550	33
	Group 20	498	166	2,710	33
5666 280	ACF/VTAM Version 2 for VSE Group 10	849	284	3,690	59
	Group 20	849	284	6,455	59
5666 316	VSE/SP Version 2 Release 1.6 Group 10	NA	2,160	23,110	433
	Group 20	NA	2,160	40,440	433
5666 338	DisplayWrite/370 for VSE Group 10	NA	285	2,400	42
	Group 20	NA	285	4,200	42
5668 805	VS Fortran Library Version 2 Release 2 Group 10	NA	200	2,400	NA
	Group 20	NA	200	4,200	NA
5668 806	VS Fortran Compiler/Library/IAD Version 2 Release 2 Group 10	NA	750	9,000	NA
	Group 20	NA	750	15,750	NA
5668 899	APL2 Group 10	4,170	695	5,600	37
	Group 20	4,170	695	9,800	37
5668 903	VS Fortran Interactive Debug (IAD) Group 10	1,920	320	4,475	26
	Group 20	1,920	320	7,835	26
5668 940	VS Cobol II Library Group 10	2,550	425	5,945	53
	Group 20	2,550	425	10,410	53
5668 958	VS Cobol Compiler/Library Group 10	6,420	1,070	14,975	53
	Group 20	6,420	1,070	26,210	53
5668 996	Basic for VM/SP Group 10	1,125	375	2,800	38
	Group 20	1,125	375	4,900	38
5684 009	VM/DSNX Group 10	—	240	2,880	—
	Group 20	—	240	2,880	—

NA—Not applicable.

IBM 9370 Information System

		Initial Basic License Charge (\$)	Monthly Basic License Charge (\$)	Graduated Onetime Charge (\$)	Licensed Program Support Charge (\$)
5736 LM4	PL/1 Resident Library for VM/SP, VSE	—	240	5,040	—
	Group 10	NA	58	695	7
	Group 20	NA	58	1,215	7
5736 LM5	PL/1 Transient Library for VM/SP, VSE				
	Group 10	NA	34	405	7
	Group 20	NA	34	710	7
5736 PL1	PL/1 Optimizing Compiler for VM/SP, VSE				
	Group 10	NA	251	3,010	39
	Group 20	NA	251	5,270	39
5736 PL3	PL/1 Compiler and Library for VM/SP, VSE				
	Group 10	NA	344	4,125	53
	Group 20	NA	344	7,220	53
5746 AM2	VSE/VSAM				
	Group 10	NA	82	695	24
	Group 20	NA	82	1,215	24
5746 AM2	VSE/VSAM Backup Restore				
	Group 10	NA	33	175	7
	Group 20	NA	33	305	7
5746 AM2	VSE/VSAM Space Management				
	Group 10	NA	40	285	NA
	Group 20	NA	40	495	NA
5746 AM4	VSE/Fast Copy				
	Group 10	NA	NA	200	5
	Group 20	NA	NA	345	5
5746 RC5	BTAM VSE				
	Group 10	NA	44	525	7
	Group 20	NA	44	920	7
5746 XX3	CICS/DOS/VS for VSE				
	Group 10	NA	686	8,230	149
	Group 20	NA	686	14,405	149
5748 FO3	VS Fortran Compiler and Library				
	Group 10	747	249	3,235	18
	Group 20	747	249	5,660	18
5748 LM3	VS Fortran Library				
	Group 10	219	73	945	7
	Group 20	219	73	1,660	7
5748 XXJ	SQL/DS				
	Group 10	NA	464	5,565	144
	Group 20	NA	464	9,740	144
5667-126	IX/370				
	4506 For maximum of 16 concurrently signed-on terminal users (CSTU)	NA	NA	10,000	495
	4507 For maximum of 32 CSTU; features are cumulative, so maximum license charge=\$20,000	NA	NA	10,000	495
	4508 For maximum of 64 CSTU; features are cumulative, so maximum license charge=\$40,000	NA	NA	20,000	NA
	4509 For maximum of 65+ CSTU; features are cumulative, so maximum license charge=\$75,000	NA	NA	35,000	NA

NA—Not applicable. ■