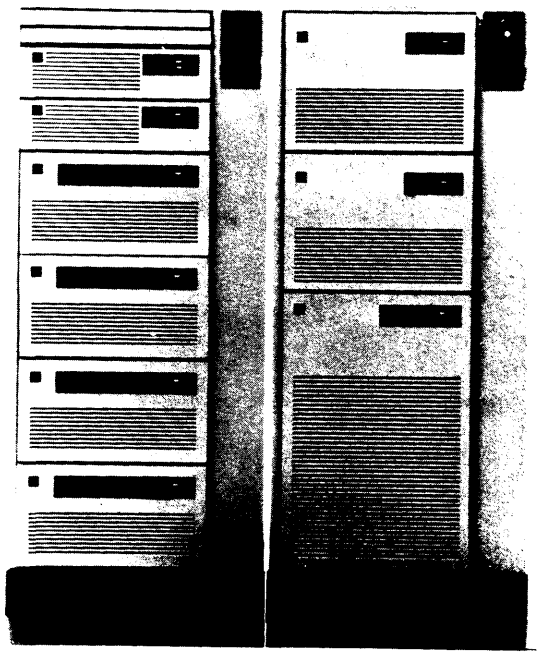
IBM 9370 Information System

MANAGEMENT SUMMARY

Greek and Roman drama employed a convention called the *deus ex machina*, in which a god was lowered to the stage by a cranelike device to solve the problem around which the action centered. The Latin phrase has been adopted into English, and can well be used to describe the role of the 9370 in IBM's product strategy. IBM is counting on this system to provide office- and department-level compatibility with its System/370-based mainframe line and deliver the kind of top-to-bottom, entry-level-to-mainframe application portability that has enabled Digital Equipment Corporation to seriously cut into IBM's share of the medium-scale systems market.

No one can deny that IBM desperately needs this machine to provide a viable—and credible—office-level entry point into the System/370 architecture. The System/36—hitherto IBM's strategic departmental system—is incompatible with the company's line of 370-based mainframes. The PC 370 XT and AT, which run System/370 software, on the other hand, only provide subsets of the System/370 architecture, so those systems do not qualify as true entry points into the System/370 family.

For a couple of years prior to the 9370 announcement, IBM had been marketing the 4361 as an entry-level 370 engine for work group and departmental computing in engineering/scientific environments. That machine was obviously ➢



IBM's 9377 Model 90—the top-of-the line machine in the 9370 Information System family—rivals lower-end IBM 4381 systems in processing power. The 9377 Model 90 allows configuration of up to 16 3MB-per-second System/370 Block Multiplexer Channels for attachment of high-performance disk drives and other peripherals.

The 9370 represents IBM's first migration of the full System/370 mainframe architecture down to the medium-system level. Designed for use as a departmental system in both engineering/scientific and commercial applications, the office-installable 9370 is primarily intended to run in IBM's VM/SP operating environment. It also supports the VSE/SP, MVS/SP, and Unix-based IX/370 operating systems.

MODELS: 9373 Model 20, 9375 Model 40 and Model 60, and 9377 Model 90.
CONFIGURATION: From 4MB to 16MB of main memory, 368MB to 5160GB of disk storage, and up to 384 workstations.
COMPETITION: Digital Equipment MicroVAX II 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, NY 10504. Contact your local IBM representative.

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

DATA FORMATS

BASIC UNIT: An 8-bit byte. Each byte can represent 1 alphanumeric character, 2 BCD digits, or 8 binary bits. Two consecutive bytes form a "halfword" of 16 bits, while 4 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; 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; 2 words, consisting of 56-bit fraction and 7-bit hexadecimal exponent, in "long" format; or 4 words, in "extended precision" format.

INSTRUCTIONS: 2, 4, or 6 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 operations, packing, and unpacking. In addition, a group of "privileged instructions," usable only by the operating system, handles input/output and various hardware control functions. ➢

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undesirable for those purposes, however, for it had a footprint and environmental requirements that made it unsuitable for placement in an office. A fully configured 9375 Model 60, on the other hand—including a system printer and processor console—takes up only 14 percent of the space and requires only 45 percent of the power and 60 percent of the air-conditioning of a similarly configured 4361 Model Group 3.

Consequently, IBM waffled about the status of the 4361 for a few months after the 9370 announcement, and recently announced the withdrawal from marketing of its onetime departmental solution, effective at the end of May 1987—no doubt heaving a sigh of relief as it saw the 4361 sink slowly into the sunset.

Although the 9370 provides a solution to IBM's mid-range problems, some problems, paradoxically, are themselves inherent in this solution, for it causes competition among the company's midrange product lines.

COMPETITIVE POSITION

One cannot truthfully say that the 9370 represents a case of "too little, too late," for it is indisputably a highly functional product that will do much to provide IBM with a more unified computing environment than was previously available. Still, one must question how much this machine will do to assist IBM in recapturing the medium-scale market share it has effectively ceded to Digital Equipment.

IBM has recently accelerated the anticipated delivery dates for the 9370, announcing July availability for the 9373 Model 20 and 9375 Model 60, and October delivery for 9375 Model 40 and 9377 Model 90. Still, those dates fall within the original third and fourth quarter 1987 time frames originally announced for the systems, so they don't represent a significant acceleration. The significance of the schedule change diminishes further when one considers that Digital has been shipping competing models of the VAX 8000 family (Models 8200 through 8550) for over a year, and is already well into the second generation of VAXBI-based VAX 8000 systems.

Thus, even if IBM delivers 25,000-plus units by the end of 1988, as some analysts have predicted, the company will undoubtedly still be playing catchup with Digital.

With the 9370, IBM is also selling against itself at both the low and high ends of the medium systems scale. For example, even the the low-end 9373 Model 20 is more powerful and configurable than the high-end System/36 machines, raising the question of why anyone would buy the System/36 if they get more power and System/370 functionality and compatibility into the bargain. IBM claims that the 9370 will be purchased by those anticipating the need for 370 compatibility, while those with more limited computing objectives will purchase the System/36. That argument has its limits, however; we can assume that anyone anticipating the need for more than 7MB of memory and 1.4GB of disk storage—the current limits of the System/36—will be interested in the 9370, particularly

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

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

MAIN MEMORY

STORAGE TYPE: Information unavailable from the vendor.

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

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 7-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 for the VM/SP operating system (ECPS:VM), as well as assists for the Unix-based IX/370 operating system (IXA). The 9375 Model 60 and the 9377 Model 90 processors support ECPS:MVS, for the 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 inches (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 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

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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	—	—	—	—
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	Not available	Not available	16KB	16KB
Maximum capacity	—	—	16KB	16KB
Increment size	—	—	Not applicable	Not applicable
INPUT/OUTPUT CONTROL				
Number of channels:				
Byte multiplexer	0	0	0	0
Block multiplexer	1	2	2	16
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.*

where downloading of complex applications and auxiliary storage service to intelligent workstations necessitates greater memory and disk capacities.

According to performance figures provided by IBM, the 9370 encroaches on the 4381's turf; the 9377 Model 90, for instance, consistently outperforms the 4381 Model Group 11. In full-precision (64-bit) floating-point performance, determined by the LINPACK measurement, for example, the 9377 delivers 0.78 MFLOPS—double the 0.39 attained by the 4381-11 (and not too far from the 0.95 MFLOPS delivered by 4381-12). Similarly, in the RAMP-C test to determine commercial interactive performance, the 9377 processes 425 transactions per minute, compared to only 308 TPM for the 4381-11. Why, then, should a user pay $215,000 for a 4381-11 CPU with 8MB of memory when a comparable 9370 facility costs only $190,000?

It is also highly likely that the 9370 will be further enhanced, with high-end models eventually replacing the 4381 altogether. Those who anticipate riding the wave of the future will be more likely to buy the lower priced 9370—whether high end or low end—instead of the 4381, and wait until new models fill in the gaps that still exist in power and expandability between the two supermini lines. Clearly, the 9370 is IBM's stategic medium-range system, despite the manufacturer's protestations to the contrary.

ADVANTAGES AND RESTRICTIONS

Software, or lack thereof, is the biggest problem facing IBM's 9370. Because the 9370 is intended primarily for IBM's VM environment, there is a pronounced lack of readily available software on the market. Most of IBM's 3080 and 3090 mainframes operate principally under

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 16KB high-speed buffer storage that acts as a smaller and faster subset of processor storage. The 9377 Model 90 includes 8KB 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 512KB of processor storage; the buffer on the 9377 can hold addresses for up to 128KB.

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.

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MVS/XA, which is not supported on any of the 9370 models (although 9735 Model 60 and 9377 Model 90 support MVS/SP); they run VM, if at all, as a secondary system in one of their multiple machines. The delivery of the 9370 will undoubtedly spur the development of VM applications by third parties, but until those products can be delivered, 9370 users will have to do a lot of their own software development.

Still, the 9370 does provide a midrange-to-mainframe (and vice versa) migration path for applications, thus making it valuable as a departmental machine. It's not an inordinately difficult task to migrate VM, MVS, and VSE applications up to or down from the same environments on 370-based mainframes or superminis.

However, as just about everyone knows, there is no direct software compatibility between the 9370 and IBM's less strategic minis—the System/36 and System/38—or with the PC and Personal System/2 line. (The two latter groups can attach to the 9370 as workstations, however.) The problem of top-to-bottom compatibility will not begin to be solved until at least 1988, when IBM starts delivering products conforming to the company's recently announced 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-compatible facilities become generally available, and, even then, these overlay products will only help to further bloat IBM's already software heavy operating environments.

Before leaving the subject of software, it is worth noting, to the vendor's credit, that IBM is plugging load-and-go versions of both the VM/SP and VSE/SP operating systems to simplify customer installation. The VM/IS (Integrated System) 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 non-integrated version. Moreover, VM/IS runs on any System/370 machine, so a 9370 user who eventually migrates up to a larger 370 machine need only pay the difference in onetime software charges between the 9370 and the more powerful system.

On the hardware side, IBM has done much to simplify the I/O architecture of the 9370 by integrating modular controllers. That approach makes the 9370 look more like the non-IBM systems it competes against, and reduces emphasis on the byzantine byte and block multiplexer channel structures that characterized the old 4361 and the 4381. The Work Station Subsystem Controller also helps to open up the 9370, permitting attachment of third-party devices (e.g., for Multibus and VMEbus) through the Serial OEM Interface (SOEMI). If appearance is reality, as philosphers frequently contend, then the 9370 is really more of a mini than any of its predecessors.

The 9370 provides more of a bridge between the System/3X machines and the System/370 grouping than the 4361 did. It permits attachment of the 9332 and 9335 disk

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	Width, inches	Depth, inches	Weight, pounds
9373	14 (35.6 cm)	19 (48.3 cm)	28 (71.1 cm)	132 (60 kg)
9375	28 (71.1 cm)	19 (48.3 cm)	31 (78.2 cm)	280 (127 kg)
9377	28 (71.1 cm)	19 (48.3 cm)	31 (78.2 cm)	268 (122 kg)

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.

CONFIGURATION RULES

The 9309 Rack Model 1 can hold 19 EIA (Electronic Industries Association) 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.

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drives employed by the System/36, and also allows configuration, through the System/370 Block Multiplexer Channel, of the 33XX DASD used by System/370-based mainframes. Thus, even though the operating environments of those two groups are incompatible, System/3X users who want to move up to the System/370 class can now bring some of their peripherals with them, rather than start all over with new storage devices in addition to new processors.

It must be noted that attachment of the 33XX DASD poses a problem for those who wish to use the 9370 in an office environment. The high-performance—and, necessarily, high-powered storage devices—require a classic closed-room environment.

The 9370 delivers more flexibility in communications than other IBM departmental offerings. Its support for Ethernet, as well as for the IBM Token-Ring Network and SNA, provides it with a generic, as well as a proprietary, network interface; such openness is important in the departmental environment, where many workstations, particularly those geared to technical computing, support the Ethernet standard.

The 9370 has one drawback in the SNA environment, however; the LU6.2 facility for peer-to-peer communication does not support the VM operating system, the primary operating environment for this machine. That lack of LU6.2 functionality is primarily a short-run drawback, because competitors like Digital are currently providing LU6.2 products; thus, IBM is a step behind the competition in a product it patented. However, LU6.2 support for VM will probably come; moreover, true peer-to-peer communications, particularly desirable in multivendor networks, is not immediately realizable in those environments because of file-format incompatibilities. Thus, Digital or other systems purchased to interface to IBM mainframes on a peer-to-peer basis probably won't have a significant advantage over the 9370 for long. □

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 16 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 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 5.5MB 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 22MB 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

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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	2 HDAs
Capacity	368MB	824MB	571.3MB or 729.8MB	819.7MB	1260MB or 2520MB per HDA
Tracks/segments per drive unit	—	—	—	—	—
Average seek time, msec.	23 to 25	18	19	19	15 to 17
Average access time, msec.	32.6 to 34.6	26.28	29.1	29.1	23.3 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, -2, or -4	3880-1, -2, or -4	3880-2, -3, -13, or -23
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.	Model AD4 and AE4 include logic and power for up to three BD4 or BE4 units. Not supported by the 9373 Model 20.

offers an estimated aggregate I/O capacity of up to 39MB 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 1.5MB per second on all models, and up to 1.9MB and 3.0MB per second on the 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.

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. This 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, 3180, 3191, 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.

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 3430 Model A1 Magnetic Tape 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) will act as if they were attached to a selector channel. The BMPX can operate in data streaming mode for attaching high-speed DASD like the 3380. Data streaming permits a data rate of up to 3MB 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 1.5MB per second; the 9375 and 9377 can attach 1.5MB-, 1.9MB-, and 3MB-per-second devices.

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

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.

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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 or 160,000
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 14⅞ wide
Models 2 & 2C	120 cps	132	10	6 or 8	3 to 14⅞ 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	1200 lpm	132	10	6 or 8	3.5 to 22 wide, 3 to 24 long
Models 20 & D20	2000 lpm	132	10	6 or 8	3.5 to 22 wide, 3 to 24 long
4248 Model 2	2200 to 4000 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	3101	3161/3164	3178	3179 Model G	3191	3192 Models C & D
DISPLAY PARAMETERS						
Max. chars./screen	1,920	1,920	1,920	2,560	1,920	1,920 to 3,564
Screen size (lines x chars.)	24 x 80	24 x 80	24 x 80	32 x 80	24 x 80	24 x 80 to 27 x 132
Symbol formation	7 x 14 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	Green or amber (3161); color (3164)	Green	Color	Green or amber	Color (Model C); green (Model D)
Total colors/no. simult. displayed	Not applicable	8 (3164 only)	Not applicable	8	Not applicable	7 (Model C)
KEYBOARD PARAMETERS						
Style	Typewriter	Typewriter	Typewriter, data entry	Typewriter, APL	Typewriter, data entry	Typewriter or enhanced typewriter
Character/code set	ASCII	ASCII	94 EBCDIC	EBCDIC/APL	94 EBCDIC	94
Detachable	Yes	Yes	Yes	Yes	Yes	Yes
Program function keys	8 standard	24 standard	10 or 24	24 standard	24 standard	24 standard
OTHER FEATURES						
Buffer capacity	—	1,920 char. (3161); 7,680 char. (3164)	—	—	—	—
Tilt/swivel	Standard	Standard	Standard	Standard	Standard	Standard
Graphics capability	No	Line drawing set	No	Standard	No	No
TERMINAL INTERFACE	ASCII Subsystem Controller	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	Work Station Subsystem Controller; 3174, 3274, or 3276 Control Unit

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 two of these controllers, the 9375 supports up to four, 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.

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 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.

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

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TABLE 4. TERMINALS (Continued)

MODEL	3192 Model G	3193 Models 1 & 2	3194	3270 PC/G & PC/GX	3278 Models 2, 3, 4, & 5	3290 Models 220, 230, & T30
DISPLAY PARAMETERS						
Max. chars./screen	1,920 or 2,560	3,840	1,920	3,920 or 4,000	960 to 3,564	9,920
Screen size (lines x chars.)	24 or 32 x 80	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 character box)	—	720 x 512 or 1024 x 1024 pixels, APA	7 x 9 or 7 x 8 dot matrix	5 x 8 dot matrix
Character phosphor	Color on black	White on black	Color on dark	White, color	White	Amber gas plasma
Total colors/no. simult. displayed	8	Not applicable	—	8 or 16	Not applicable	Not applicable
KEYBOARD PARAMETERS						
Style	Typewriter, typewriter/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	—	Images	No	Standard	No	No
TERMINAL INTERFACE	Work Station Subsystem Controller; 3174 or 3274 Control Unit	Work Station Subsystem Controller; 3174 or 3274 Control Unit	Work Station Subsystem Controller; 3174 or 3274 Control Unit	Work Station Subsystem Controller; 3174 Control Unit	Work Station Subsystem Controller; 3274 Control Unit	Work Station Subsystem Controller; 3274 Control Unit

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 (OSI) 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 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 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 Virtual Machine/System Product (VM/SP), Virtual Storage Extended/System Package (VSE/SP), and Interactive Executive for System/370 (IX/370) operating systems. The Unix-based IX/370 is supported only under control of VM/SP. The Multiple Virtual Storage/System Product (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 work group locations.

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

VM/IS comprises the following components:

- VM/SP. This function, for basic system control and data management, 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 Unix-based 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), providing a simplified interface to the VM system. This facility also includes an interface that allows addition of user-written or IBM programs to the system.

- VM/IS Productivity Facility (VM/IS PF). This product provides end-user menus containing task-oriented, introductory, and navigational dialogues 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 dialogue manager, this product controls the flow of the end-user interface provided by VM/IS. Programmers can use ISPF to produce interactive applications with menu-driven dialogues and dialogue functions.

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- 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), providing performance monitoring and statistical analysis presented in real time on any VM/IS-supported monitor.

- VM Performance Monitor Analysis Program (VM MAP), providing reports and graphics on 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 28 licensed programs. The packages are the following:

- Text Office Support (TXTO). This package 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 development of mathematical and statistical applications.

- Problem-Solving Languages (PSL), which provides Basic and Pascal/VS for development of applications addressing business problems.

- Data Base Query (DBQ), for creation and management of relational data bases. This packages 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 onto 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 Advanced Communications Function/Network Control Program (ACF/NCP), ACF/SSP, VSE/Virtual Storage Access Method (VSE/VSAM), and ACF/Virtual Telecommunications Access Method (ACF/VTAM).

VSE/SP is a pregenerated, load-and-go operating system most desirable for departments and end-user work groups 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 40MB of virtual storage; and system startup 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).

The 9370 systems support other System/370 system software, including the SQL/DS relational data base management sytem and PROFS (Professional Office Systems) for office automation. For communications, the 9370 supports IBM Systems Network Architecture (SNA) products for teleprocessing, networking, and communications systems.

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).

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- 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 co-reside on the same processor. The subsystems operate independently of one another.

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 uucp (Unix-to-Unix copy) 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; neither 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 "Communications" subsystem 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/Virtual Telecommunications Access Method (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 hosts. It supports logically direct transmission of data between application programs and terminals in session, and allows sessions and supports data transfer between two application programs residing in the same host or in different hosts. ACF/VTAM also permits interconnection of independent SNA networks.

ACF/Network Control Program (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 *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.

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

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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 termninal. 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 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 one-time 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 9 consecutive hours between 7 a.m. and 6 p.m., Monday through Friday.

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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 offline 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 CONFIGURATONS: 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
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
TOTAL PURCHASE PRICE:	$146,115

9375 Model 40:

9375 Model 40 CPU with 8MB of main memory	$ 65,000
8MB of additional memory	20,000
Two 9309 Racks Model 2	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 2000-lpm band printer	35,000
TOTAL PURCHASE PRICE:	$387,560

9377 Model 90

9377 Model 90 CPU with 8MB of main memory	$ 190,000
8MB of additional memory	20,000
Two 9309 Rack Model 2	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 3600-lpm band printer	75,000
TOTAL PURCHASE PRICE:	$1,055,690

IBM 9370 Information System

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	3,100	NA
9375-040	Processor with 8MB of main memory	65,000	280	6,500	NA
9375-060	Processor with 8MB of main memory	93,000	350	9,300	NA
9377-090	Processor with 8MB of main memory	190,000	550	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
	120V 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
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	2,605	**2,090	
	Model 2; Remote Base	26,000	1,855	**1,705	NA
	Model 11; Local Base and TR	42,500	3,305	**2,135	
	Model 12	33,000	2,285	**1,750	NA
3721	Expansion Unit				
	Model 1; One Scanner	16,00	NA	1,145	NA
	Model 2; Two Scanners	22,500	NA	1,605	NA
3275	Communication Controller:				
	Model 1	75,000	**2,795	4,020	NA
	Model 2	60,500	**2,495	3,030	NA
3726	Communication Control Console	32,000	42.00	1,710	524
3227	Operator Console	2,390	27.00	196	336
MASS STORAGE					
3370	Direct Access Storage:				
	Model A1; Single Disk Drive; 571.3MB	35,480	173.00	1,851	1,575
	Model B1; Add-on Single Disk Drive for attachment to Model A1	26,600	129.00	1,387	1,180
	Model A12; 729.8MB; contains logic and power for up to three Model B2 units	35,480	139.00	2,405	NA
	Model B12; connects to a 3370 Model A2	26,600	105.00	1,800	NA
	8150 String Switch for 3370 A1 and A2	3,830	1.50	181	154
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	102	87
	4952—Model D1 Attachment for Model B1	NC	NC	NC	NC
	8150—String Switch Feature for 3375 A1	3,795	1.50	181	154

**Rental/lease prices include equipment maintenance.*
***Annual maintenance fee.*
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)					
3380	Direct Access Storage; 2.52 billion bytes per unit:				
	Model AD4; 2.52GB Extended Capability drive; attaches to 3880 Model 3 or 23 storage directors	88,780	295.00	5,105	NA
	Model AE4; 5.04GB Extended Capability drive; attaches to 3880 Model 3 or 23 storage directors	124,480	295.00	7,590	NA
	Model BD4; 2.52GB Extended Capability drive; can be attached to AD4, AE4, BE4, or another BD4	64,440	215.00	3,715	NA
	Model BE4; 5.04GB Extended Capability drive; can be attached to AD4, AE4, BD4, or another BE4	98,140	215.00	6,190	NA
3880	Storage Control; includes two storage directors:				
	Model 1; each storage director can attach up to four 3350 A2/A2F, 3370 A1, or 3375 A1 or D1 in any combination	60,270	176.00	4,124	3,510
	Model 2; provides one storage director for 3350, A2/A2F, 3370 A1, or 3375 storage and one for 3380 storage	60,270	176.00	4,124	3,510
	Model 3; provides two storage directors for 3380 storage	60,270	176.00	4,124	3,510
	Model 4; provides one storage director which can attach up to four 3375 Model A1s	30,000	82.50	2,370	NA
	Model E21; same as D21, but with 16 megabytes	165,400	600.00	11,300	NA
	Model G21; same as D21, but with 32 megabytes	237,400	650.00	15,970	NA
	Model H21; same as D21, but with 48 megabytes	309,400	700.00	20,640	NA
	Model J21; same as D21, but with 64 megabytes	381,400	750.00	25,310	NA
	Model D23; includes two cache storage directors for 3380; 8 megabytes	129,400	575.00	8,965	NA
	Model E23; same as D23, but 16 megabytes	165,400	600.00	11,300	NA
	Model G23; same as D23, but with 32 megabytes	237,400	650.00	15,970	NA
	Model H23; same as D23, but with 48 megabytes	309,400	700.00	20,640	NA
	Model J23; same as D23, but with 64 megabytes	381,400	750.00	25,310	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	9,705	40.00	597	508
	6560—Speed Matching Buffer	11,420	40.00	518	441
	8160—Two-Channel Switch	3,850	5.00	241	NA
	8170—Two-Channel Switch Pair	6,225	11.00	421	358
	8171—Two-Channel Switch Pair, additional	16,610	38.50	1,136	967
	8172—Eight-Channel Switch	22,850	53.50	1,563	1,330
9332	400MB Rack Mounted DASD	14,000	27.00	1400	NA
9335	DASD	21,250	50.00	2,125	NA
MAGNETIC TAPE EQUIPMENT					
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	68.00	95	80
	6425—6250/1600 bpi Density Feature (for 3420 Models 4, 6, and 8)	2,425	90.00	138	116
	6631—Single Density Feature (for Models 3, 5, and 7)	3,155	67.50	162	136
	3550—Dual Density Feature (for Models 3, 5, and 7)	4,075	113.00	211	177
	6407—7-Track Feature (for Models 3, 5, and 7)	3,155	98.00	162	136
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	32.00	111	NA
	3005—Two-Channel Switch	3,575	4.00	167	NA
	3010—Two Control Unit Switch (Communicator), primary	8,085	19.00	387	NA
	3015—Same as 3010, but secondary	5,775	19.00	282	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	42	NA

**Rental/lease prices include equipment maintenance.*
***Annual maintenance fee.*
NA—Not applicable.

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		Purchase Price ($)	Monthly Maint. ($)	Monthly Rental Charge* ($)	Monthly 2-Year Lease Charge ($)*
Magnetic Tape Equipment (Continued)					
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
	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	170	143
	6320—7-Track NRZI Feature (permits connection of 800-bpi drives to 3803-2; 5310 is prerequisite)	1,665	2.00	85	71
	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	14.00	354	297
	1793—For 3 Tape Controls	8,600	23.00	459	385
	1794—For 4 Tape Controls	10,110	23.00	537	451
	6148—Remote Switch Attachment	1,000	NA	51	43
	8100—Two-Channel Switch	5,060	6.50	262	220
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	NA	NA
	3610—Extended Character Set Adapter	429	3.00	NA	NA
	3880—Extended Print Buffer	198	0.50	NA	NA
	4110—Friction Feed Paper Handling	151	0.50	NA	NA
	8330—3271/3272 Attachment for Models 1 and 2	860	2.50	NA	NA
	8331—3274/3276 Attachment for Models 1 and 2	165	0.50	NA	NA
	8700—Variable-Width Forms Tractor	151	0.50	NA	NA
3812	Nonimpact Page Printer, Model 1	8235	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	61	NA
	3010—Pattern Storage Memory; 512KB	1,700	20.00	102	NA
	3020—Pattern Storage Memory; 1024KB	3,000	40.00	184	NA
	3025—Pattern Storage Memory; 2048KB	6,000	80.00	368	NA
	3030—Pattern Storage Memory; 3072KB	9,000	120.00	552	NA
	3035—Control Storage Memory; 128KB	750	10.00	46	NA
	3055—System/370 Channel Interface Attachment	2,600	40.00	164	NA
4224	Printer:				
	Model 1C2	6,700	50.00	NA	NA
	Model 1E2	6,500	45.00	NA	NA
	Model 101	4,200	30.00	NA	NA
	Model 102	6,000	40.00	NA	NA

**Rental/lease prices include equipment maintenance.*
***Annual maintenance fee.*
NA—Not applicable.

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		Purchase Price ($)	Monthly Maint. ($)	Monthly Rental Charge* ($)	Monthly 2-Year Lease Charge ($)*
Printers (Continued)					
	2C2—400 cps Max. Expanded Storage and Color	6,700	50.00	NA	NA
	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; 1200 lpm	31,000	250.00	2,050	NA
	Model D12; 1200 lpm	31,000	250.00	2,050	NA
	Model 20; 2000 lpm	35,000	400.00	2,340	NA
	Model D20; 2000 lpm	35,000	400.00	2,340	NA
4248	Printer, Model 2; 2200/3200/4000 lpm; 132 print positions	75,000	800	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	63.00	NA	NA
	Model G2	5,835	69.00	NA	NA
WORKSTATIONS/TERMINALS					
3101	Monochrome Display Terminal:				
	Model 13	1,430	**198	NA	NA
	Model 23	1,650	**209	NA	NA
3161	Monochrome Display Station:				
	Model 11; includes keyboard and RS-232-C inferface	695	**45	NA	NA
	Model 12; includes keyboard and RS-232-C/RS-422-A inferface	774	**40	NA	NA
	Model 210; includes keyboard and RS-232-C interface	695	**45	NA	NA
	Model 220; includes keyboard and RS-232-C/RS-422-A interface	774	**40	NA	NA
3164	Color Display Station:				
	Model 11; includes RS-232-C interface	1,295	**85	NA	NA
	Model 12; includes RS-232-C/RS-422-A interface	1,374	**85	NA	NA
3178	Monochrome Display Station:				
	Model C10; 75-key keyboard	1,040	NA	NA	NA
	Model C20; 87-key keyboard	1,095	NA	NA	NA
	Model C30; 87-key keyboard	1,095	NA	NA	NA
	Model C40	1,095	NA	NA	NA
3179	Color Graphics Display Station:				
	Model G1	2,795	NA	NA	NA
	Model G2	2,795	NA	NA	NA
3191	Monochrome Display Station:				
	Model A10; 122-Key Keyboard, Green Display	1,295	NA	NA	NA
	Model A20; 102-Key Keyboard, Green Display	1,295	NA	NA	NA
	Model A30; 104-Key Keyboard, Green Display	1,295	NA	NA	NA
	Model B10; 122-Key Keyboard, Amber-Gold Display	1,295	NA	NA	NA
	Model B20; 102-Key Keyboard, Amber-Gold Display	1,295	NA	NA	NA
	Model B30; 104-Key Keyboard, Amber-Gold Display	1,295	NA	NA	NA
3192	Color Display Station:				
	Model C10; 122-Key Keyboard	1,895			
	Model C20; 102-Key Keyboard	1,895	NA	NA	NA
	Model C30; 104-Key Keyboard	1,895	NA	NA	NA
	Model D10; 122-Key Keyboard	1,795	NA	NA	NA
	Model D20; 102-Key Keyboard	1,795	NA	NA	NA
	Model D30; 104-Key Keyboard	1,795	NA	NA	NA
	Model G10; 122-key Keyboard	2,795	NA	NA	NA

**Rental/lease prices include equipment maintenance.*
***Annual maintenance fee.*
NA—Not applicable.

IBM 9370 Information System

		Purchase Price ($)	Monthly Maint. ($)	Monthly Rental Charge* ($)	Monthly 2-Year Lease Charge ($)*
Workstations/Terminals (Continued)					
	Model G20; 122-Key Typewriter or APL2 Keyboard	2,795	NA	NA	NA
	Model G30; 104-Key Keyboard	2,795	NA	NA	NA
	Model G40; 104-Key Typewriter or APL2 Keyboard	2,795	NA	NA	NA
3193	Monochrome Display Station:				
	Model 1; 122-Key Keyboard	2,495	NA	NA	NA
	Model 2; 102-Key Keyboard	2,495	NA	NA	NA
3194	Color Display Station:				
	Model H20; 102-Key Keyboard	2,895	NA	NA	NA
	Model H50; 122-Key Keyboard	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	109	93
	Model 3	1,716	10.50	133	113
	Model 4	1,804	11.50	136	116
	Model 5	2,060	13.00	160	136
3290	Information Panel:				
	Model 220	6500	**288	NA	NA
	Model 230	6500	**288	NA	NA
	Model T30	9300	**360	NA	NA
	3210—Display Panel	3600	NA	184	NA
	4370—Data/Typewriter Keyboard	440	NA	24	NA
	4731—APL Typewriter Keyboard	440	NA	24	NA
	4830—Numeric Keypad	250	NA	12	NA
	4831—Program Function Keypad	250	NA	12	NA

**Rental/lease prices include equipment maintenance.*
***Annual maintenance fee.*
NA—Not applicable.

SOFTWARE PRICES

		Initial Charge		Monthly Charge		
		Basic License Charge ($)	DSLO License Charge ($)	Basic License Charge ($)	DSLO Charge ($)	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					
	Group 10	7,740	5,805	500	375	69.00
	Group 20	13,540	10,155	500	375	69.00
	Upgrade—Group 10 to Group 20	5,800	4,350			
5664 280	ACF/VTAM V3 (VM/SP)					
	Group 10	11,235	19,660	1,175	880	247
	Group 20	19,60	14,725	1,175	880	247
	Upgrade—Group 10 to Group 20	8,425	6,310			
5664 283	VM/IS PF	1,140	1,025	107	NA	16.00
	Group 20	2,000	1,800	107	NA	16.00
	Upgrade—Group 10 to Group 20	860	775			
5664 301	VM/IS					
	Group 10	26,840	22,250	2,000	NA	NA
	Group 20	46,985	38,950	2,000	NA	NA
	Upgrade—Group 10 to Group 20	20,145	16,700			
5664 301	System Base					
	Group 10	13,575	10,345	851	NA	NA
	Group 20	23,765	18,105	851	NA	NA

**The figure to the right of the slash is a Monthly Multiple Licensed Support Charge.*
NA—Not applicable.

IBM 9370 Information System

Software Prices (Continued)		Initial Charge		Monthly Charge		
		Basic License Charge ($)	DSLO License Charge ($)	Basic License Charge ($)	DSLO Charge ($)	Licensed Program Support Charge ($)
	Upgrade—Group 10 to Group 20	10, 190	7,760			
	Real Time Monitor					
	Group 10	400	400	50.00	NA	NA
	Group 20	700	700	50.00	NA	NA
	Upgrade—Group 10 to Group 20	300	300			
	VMMAP					
	Group 10	1,600	1,600	270	NA	NA
	Group 20	2,800	2,800	270	NA	NA
	Upgrade—Group 10 to Group 20	1,200	1,200			
	PL/1					NA
	Group 10	440	320	37.00	NA	NA
	Group 20	775	565	37.00	NA	
	Upgrade—Group 10 to Group 20	335	245			
	FSF					
	Group 10	440	440	44.00	NA	NA
	Group 20	770	770	44.00	NA	NA
	Upgrade—Group 10 to Group 20	330	330			
	Batch					
	Group 10	440	440	44.00	NA	NA
	Group 20	770	770	44.00	NA	NA
	Upgrade—Group 10 to Group 20	330	330			
	GDDM/PGF					
	Group 10	4,955	3,715	320	NA	NA
	Group 20	8,670	6,505	320	NA	NA
	Upgrade—Group 10 to Group 20	3,715	2,790			
	DCF/FEF					
	Group 10	4,990	4,990	384	NA	NA
	Group 20	8,735	8,735	384	NA	NA
	Upgrade—Group 10 to Group 20	3,745	3,745			
5664 309	PROFS V2					
	Group 10	12,800	9,600	995	225	NA
	Group 20	22,400	16,800	995	225	NA
	Upgrade—Group 10 to Group 20	9,600	7,200			
	Over 100 CSTU UPG					
	Group 10	0	0	200	150	NA
	Group 20	400	300	200	150	NA
	Upgrade—Group 10 to Group 20	400	300			
5664 370	DW/370 (VM/SP)					
	Group 10	5,600	4,200	665	500	42.00
	Group 20	9,800	7,350	665	500	42.00
	Upgrade—Group 10 to Group 20	4,200	3,150			
5666 316	VSE/SP Version 2					
	Group 10	23,110	20,800	455	410	66.00
	Group 20	40.440	36,410	455	410	66.00
	Upgrade—Group 10 to Group 20	17,330	15,610			
5666 338	DW 370 (VSE/CICS)					
	Group 10	2,400	1,800	535	400	71.00
	Group 20	4,200	3,150	535	400	71.00
	Upgrade—Group 10 to Group 20	1,800	1,350			
5668 805	VS Fortran Library Version 2					
	Group 10	2,400	1,800	200	150	NA
	Group 20	4,200	3,150	200	150	NA
	Upgrade—Group 10 to Group 20	1,800	1,350			
5668 806	VS Fortran Compiler/Library/IAD Version 2					
	Group 10	9,000	6,755	750	563	NA
	Group 20	15,750	11,820	750	563	NA
	Upgrade—Group 10 to Group 20	6,750	5,065			
5668 813	MVS					
	Group 10	6,800	6,120	NA	NA	NA
	Group 20	11,900	10,710	NA	NA	NA
	Upgrade—Group 10 to Group 20	5,100	4,590			
5668 814	MVS					
	Group 10	5,200	4,680	NA	NA	NA
	Group 20	9,100	8,190	NA	NA	NA
	Upgrade—Group 10 to Goup 20	3,900	3,510			
5668 899	APL2					
	Group 10	5,600	5,040	695	521	37.00
	Group 20	9,800	8,820	695	521	37.00
	Upgrade—Group 10 to Group 20	4,200	3,780			

**The figure to the right of the slash is a Monthly Multiple Licensed Support Charge.*
NA—Not applicable.

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Software Prices (Continued)		Initial Charge		Monthly Charge		
		Basic License Charge ($)	DSLO License Charge ($)	Basic License Charge ($)	DSLO Charge ($)	Licensed Program Support Charge ($)
5668 903	VS Fortran IAD					
	Group 10	4,475	3,345	320	240	26.00
	Group 20	7,835	5,855	320	240	26.00
	Upgrade—Group 10 to Group 20	3,360	2,510			
5668 918	CICS/OS/VS					
	Group 10	5,100	3,820	584	408	15.00
	Group 20	8,925	6,690	584	408	15.00
	Update—Group 10 to Group 20	3,825	2,870			
5668 940	VS Cobol II Library					
	Group 10	5,945	4,450	425	318	53.00
	Group 20	10, 410	7,790	426	318	53.00
	Upgrade—Group 10 to Group 20	4,465	3,340			
5668 958	VS Cobol Compiler/Library					
	Group 10	14,975	11,225	1,070	802	53.00
	Group 20	26,210	19,645	1,070	802	53.00
	Upgrade—Group 10 to Group 20	11,235	8,420			
5668 996	Basic (VM/SP)					
	Group 10	2,800	2,520	375	281	38.00
	Group 20	4,900	4,410	375	281	38.00
	Upgrade—Group 10 to Group 20	2,100	1,890			
5736 LM4	DOS PL/1 Resident Library					
	Group 10	695	515	58.00	43.00	7.00
	Group 20	1,215	900	58.00	43.00	7.00
	Upgrade—Group 10 to Group 20	520	385			
5736 LM5	DOS PL/1 Transient Library					
	Group 10	405	300	34.00	25.00	7.00
	Group 20	710	525	34.00	25.00	7.00
	Upgrade—Group 10 to Group 20	305	225			
5736 PL1	DOS PL/1 Optimizing Compiler					
	Group 10	3,010	2,255	251	188	39.00
	Group 20	5,720	3,945	251	188	39.00
	Upgrade—Group 10 to Group 20	2,260	1,690			
5736 PL3	DOS PL/1 Compiler and Library					
	Group 10	4,125	3,095	344	258	53.00
	Group 20	7,220	5,415	344	258	53.00
	Upgrade—Group 10 to Group 20	3,095	2,320			
5748 FO3	VS Fortran Compiler and Library					
	Group 10	3,235	2,415	247	186	18.00
	Group 20	5,660	4,230	247	186	18.00
	Upgrade—Group 10 to Group 20	2,425	1,815			
5748 LM3	VS Fortran Library					
	Group 10	945	700	73.00	54.00	7.00
	Group 20	2,370	1,755	73.00	54.00	7.00
	Upgrade—Group 10 to Group 20	715	525			
5748 XXJ	SQL/DS					
	Group 10	5,565	4,160	464	347	144.00
	Group 20	9,740	7,285	464	347	144.00
	Upgrade—Group 10 to Group 20	4,175	3,125			
5799 BWH	VSE/SP V2	4,990	4,495	502	452	433
	Group 10	4,990	4,495	502	452	433
	Group 20	8,740	7,865	502	452	433
	Upgrade—Group 10 to Group 20	3,753	3,370			
	CICS/DOS					
	Group 10	8,230	7,400	686	617	NA
	Group 20	14,405	12,955	686	617	NA
	Upgrade—Group 10 to Group 20	6,175	5,555			
	ACF/VTAM Version 2					
	Group 10	3,690	3,325	284	256	NA
	Group 20	6,455	5,820	284	256	NA
	Upgrade—Group 10 to Group 20	2,765	2,495			
	VSE/ICCF Version 2					
	Group 10	2,235	2,010	214	192	NA
	Group 20	3,915	3,525	214	192	NA
	Upgrade—Group 10 to Group 20	1,680	1,515			
	VSE/Power Version 2					
	Group 10	1,550	1,395	166	149	NA
	Group 20	2,710	2,440	166	149	NA
	Upgrade—Group 10 to Group 20	1,160	1,045			
	VSE/VSAM					
	Group 10	695	625	33.00	30.00	NA
	Group 20	1,215	1,095	33.00	30.00	NA

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NA—Not applicable.

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		Initial Charge		Monthly Charge		
		Basic License Charge ($)	DSLO License Charge ($)	Basic License Charge ($)	DSLO Charge ($)	Licensed Program Support Charge ($)
Software Prices (Continued)						
	Upgrade—Group 10 to Group 20	520	470			
	VSE/VSAM Space					
	Group 10	285	255	44.00	40.00	NA
	Group 20	495	445	44.00	40.00	NA
	Upgrade—Group 10 to Group 20	210	190			
	Ditto V1					
	Group 10	535	480	82.00	74.00	NA
	Group 20	9351	840	82.00	74.00	NA
	Upgrade—Group 10 to Group 20	400	360			
	BTAM (VSE)					
	Group 10	525	480	44.00	40.00	NA
	Group 20	920	840	44.00	40.00	NA
	Upgrade—Group 10 to Group 20	395	360			
	VSE/Fast Copy					
	Group 10	180	23.00	21.00	NA	
	200					
	Group 20	345	310	23.00	21.00	NA
	Upgrade—Group 10 to Group 20	145	130			
	VSE/VSAM Backup Restore					
	Group 10	175	155	33.00	30.00	NA
	Group 20	305	275	33.00	30.00	NA
	Upgrade—Group 10 to Group 20	130	120			
5667-126	IX/370					
	4506 For maximum of 16 concurrently signed-on terminal users (CSTU)	10,000	NA	NA	NA	*495/792
	4507 For maximum of 32 CSTU; features are cumulative, so maximum license charge=$20,000	10,000	NA	NA	NA	*495/792
	4508 For maximum of 64 CSTU; features are cumulative, so maximum license charge=$40,000	20,000	NA	NA	NA	*495/792
	4509 For maximum of 65+ CSTU; features are cumulative, so maximum license charge=$75,000	35,000	NA	NA	NA	*495/792

**The figure to the right of the slash is a Monthly Multiple Licensed Support Charge.*
NA—Not applicable. ■

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		Initial Charge		Monthly Charge		
		Basic License Charge ($)	DSLO License Charge ($)	Basic License Charge ($)	DSLO Charge ($)	Licensed Program Support Charge ($)
	FSF					
	Group 10	440	440	44	NA	NA
	Group 20	770	770	44	NA	NA
	Upgrade—Group 10 to Group 20	330	330	NA	NA	NA
	Batch					
	Group 10	440	440	44	NA	NA
	Group 20	770	770	44	NA	NA
	Upgrade—Group 10 to Group 20	330	330	NA	NA	NA
	GDDM/PGF					
	Group 10	4,955	3,715	320	NA	NA
	Group 20	8,670	6,505	320	NA	NA
	Upgrade—Group 10 to Group 20	3,715	2,790	NA	NA	NA
	DCF/FEF					
	Group 10	4,990	4,990	384	NA	NA
	Group 20	8,735	8,735	384	NA	NA
	Upgrade—Group 10 to Group 20	3,745	3,745	NA	NA	NA
5664-309	PROFS V2					
	Group 10	12,800	9,600	995	225	NA
	Group 20	22,400	16,800	995	225	NA
	Upgrade—Group 10 to Group 20	9,600	7,200	NA	NA	NA
	Over 100 currently signed-on terminal users upgrade					
	Group 10	NC	NC	200	150	NA
	Group 20	400	300	200	150	NA
	Upgrade—Group 10 to Group 20	400	300	NA	NA	NA
5664-370	DW/370 (VM/SP)					
	Group 10	5,600	4,200	665	500	42
	Group 20	9,800	7,350	665	500	42
	Upgrade—Group 10 to Group 20	4,200	3,150	NA	NA	NA
5666-316	VSE/SP Version 3					
	Group 10	29,315	NA	NA	NA	NA
	Group 20	51,305	NA	NA	NA	NA
	Upgrade—Group 10 to Group 20	17,330	15,610	NA	NA	NA
5666-338	DW 370 (VSE/CICS)					
	Group 10	2,400	1,800	535	400	71
	Group 20	4,200	3,150	535	400	71
	Upgrade—Group 10 to Group 20	1,800	1,350	NA	NA	NA
5668-805	VS FORTRAN LIBRARY Version 2					
	Group 10	2,400	1,800	200	150	NA
	Group 20	4,200	3,150	200	150	NA
	Upgrade—Group 10 to Group 20	1,800	1,350	NA	NA	NA
5668-806	VS FORT COMP/LIB/IAD Version 2					
	Group 10	9,000	6,755	750	563	NA
	Group 20	15,750	11,820	750	563	NA
	Upgrade—Group 10 to Group 20	6,750	5,065	NA	NA	NA
5668-813	MVS					
	Group 10	6,800	6,120	NA	NA	NA
	Group 20	11,900	10,710	NA	NA	NA
	Upgrade—Group 10 to Group 20	5,100	4,590	NA	NA	NA
5668-814	MVS					
	Group 10	5,200	4,680	NA	NA	NA
	Group 20	9,100	8,190	NA	NA	NA
	Upgrade—Group 10 to Group 20	3,900	3,510	NA	NA	NA
5668-899	APL2					
	Group 10	5,600	5,040	695	521	37
	Group 20	9,800	8,820	695	521	37
	Upgrade—Group 10 to Group 20	4,200	3,780	NA	NA	NA
5668-903	VS FORTRAN IAD					
	Group 10	4,475	3,345	320	240	26
	Group 20	7,835	5,855	320	240	26
	Upgrade—Group 10 to Group 20	3,360	2,510	NA	NA	NA
5668-918	CICS/OS/VS					
	Group 10	5,100	3,820	584	408	15
	Group 20	8,925	6,690	584	408	15
	Update—Group 10 to Group 20	3,825	2,870	NA	NA	NA
5668-940	VS COBOL II LIB					
	Group 10	5,945	4,450	425	318	53
	Group 20	10,410	7,790	426	318	53
	Upgrade—Group 10 to Group 20	4,465	3,340	NA	NA	NA
5668-958	VS COBOL COMP/LIB					
	Group 10	14,975	11,225	1,070	802	53
	Group 20	26,210	19,645	1,070	802	53
	Upgrade—Group 10 to Group 20	11,235	8,420	NA	NA	NA

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NA—Not applicable.

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		Initial Charge		Monthly Charge		
		Basic License Charge ($)	DSLO License Charge ($)	Basic License Charge ($)	DSLO Charge ($)	Licensed Program Support Charge ($)
5668-996	BASIC (VM/SP)					
	Group 10	2,800	2,520	375	281	38
	Group 20	4,900	4,410	375	281	38
	Upgrade—Group 10 to Group 20	2,100	1,890	NA	NA	NA
5736-LM4	DOS PL/1 RES LIB					
	Group 10	695	515	58	43	7
	Group 20	1,215	900	58	43	7
	Upgrade—Group 10 to 20	520	385	NA	NA	NA
5736-LM5	DOS PL/1 TRAN LIB					
	Group 10	405	300	34	25	7
	Group 20	710	525	34	25	7
	Upgrade—Group 10 to Group 20	305	225	NA	NA	NA
5736-PL1	DOS PL/1 OPT COMP					
	Group 10	3,010	2,255	251	188	39
	Group 20	5,720	3,945	251	188	39
	Upgrade—Group 10 to Group 20	2,260	1,690	NA	NA	NA
5736-PL3	DOS PL/1 COMP & LIB					
	Group 10	4,125	3,095	344	258	53
	Group 20	7,220	5,415	344	258	53
	Upgrade—Group 10 to Group 20	3,095	2,320	NA	NA	NA
5748-FO3	VS FORTRAN COMP, LIB					
	Group 10	3,235	2,415	247	186	18
	Group 20	5,660	4,230	247	186	18
	Upgrade—Group 10 to Group 20	2,425	1,815	NA	NA	NA
5748-LM3	VS FORTRAN LIB					
	Group 10	945	700	73	54	7
	Group 20	2,370	1,755	73	54	7
	Upgrade—Group 10 to Group 20	715	525	NA	NA	NA
5748-XXJ	SQL/DS					
	Group 10	5,565	4,160	464	347	144
	Group 20	9,740	7,285	464	347	144
	Upgrade—Group 10 to Group 20	4,175	3,125	NA	NA	NA
5799-BWH	VSE/SP V2					
	Group 10	4,990	4,495	502	452	433
	Group 20	8,740	7,865	502	452	433
	Upgrade—Group 10 to Group 20	3,753	3,370	NA	NA	NA
	CICS/DOS					
	Group 10	8,230	7,400	686	617	NA
	Group 20	14,405	12,955	686	617	NA
	Upgrade—Group 10 to Group 20	6,175	5,555	NA	NA	NA
	ACF/VTAM Version 2					
	Group 10	3,690	3,325	284	256	NA
	Group 20	6,455	5,820	284	256	NA
	Upgrade—Group 10 to Group 20	2,765	2,495	NA	NA	NA
	VSE/ICCF Version 2					
	Group 10	2,235	2,010	214	192	NA
	Group 20	3,915	3,525	214	192	NA
	Upgrade—Group 10 to Group 20	1,680	1,515	NA	NA	NA
	VSE/POWER Version 2					
	Group 10	1,550	1,395	166	149	NA
	Group 20	2,710	2,440	166	149	NA
	Upgrade—Group 10 to Group 20	1,160	1,045	NA	NA	NA
	VSE/VSAM					
	Group 10	695	625	33	30	NA
	Group 20	1,215	1,095	33	30	NA
	Upgrade—Group 10 to Group 20	520	470	NA	NA	NA
	VSE/VSAM SPACE					
	Group 10	285	255	44	40	NA
	Group 20	495	445	44	40	NA
	Upgrade—Group 10 to Group 20	210	190	NA	NA	NA
	DITTO V1					
	Group 10	535	480	82	74	NA
	Group 20	9,351	840	82	74	NA
	Upgrade—Group 10 to Group 20	400	360	NA	NA	NA
	BTAM (VSE)					
	Group 10	525	480	44	40	NA
	Group 20	920	840	44	40	NA
	Upgrade—Group 10 to Group 20	395	360	NA	NA	NA
	VSE/Fast Copy					
	Group 10	200	180	23	21	NA
	Group 20	345	310	23	21	NA
	Upgrade—Group 10 to Group 20	145	130	NA	NA	NA

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NA—Not applicable.

IBM ES/9370 Information System

		Initial Charge		Monthly Charge		
		Basic License Charge ($)	DSLO License Charge ($)	Basic License Charge ($)	DSLO Charge ($)	Licensed Program Support Charge ($)
	VSE/VSAM BACKUP RESTORE					
	Group 10	175	155	33	30	NA
	Group 20	305	275	33	30	NA
	Upgrade—Group 10 to Group 20	130	120	NA	NA	NA
5667-126	IX/370					
	4506 for maximum of 16 concurrently signed-on terminal users (CSTU)	10,000	NA	NA	NA	*495/792
	4507 for maximum of 32 CSTU; features are cumulative, so maximum license charge=$20,000	10,000	NA	NA	NA	*495/792
	4508 for maximum of 64 CSTU; features are cumulative, so maximum license charge=$40,000	20,000	NA	NA	NA	*495/792
	4509 for maximum of 65+ CSTU; features are cumulative, so maximum license charge=$75,000	35,000	NA	NA	NA	*495/792

**The figure to the right of the slash is a Monthly Multiple Licensed Support Charge.*
NA—Not applicable. ■

IBM ES/9370 Information System

Product Enhancement

In another overhaul of the ES/9370 line, IBM Corporation introduced a new low-end 9370 model, enhanced the Model 50, and discontinued the Models 20 and 40. Additionally, the Model 60 will only be available on a limited basis. The Models 20 and 40 will be withdrawn from marketing effective July 7, 1989.

IBM further announced improvements involving 9370 communications, system availability, and system management capabilities. Additionally, IBM enhanced the DPPX/370 operating system, one of several operating systems that run on the 9370. The new, more powerful entry-level model together with DPPX/370 improvements are partly directed towards IBM 8100 users. The company has been encouraging 8100 users to migrate to IBM 370 architecture using DPPX/370 as a migration tool.

The Model 25, a new entry-level model, replaces the Model 20, the previous entry-level machine. The Model 25 represents a 150 percent increase in relative performance compared to the previous Model 20, IBM said. Performance gains depend on workload mix. The company also expanded I/O attachment capability and aggregate data rate. Model 25 users will be charged for software at Processor Group 10 rates. The Model 25 sells for $26,250 and carries a $231 minimum monthly maintenance charge. The monthly rental charge is $3,650.

The Model 25 can be configured with 4, 8, or 16 megabytes of main memory. The machine contains two internal I/O buses and can accommodate 9 to 39 card slots, if the I/O Expansion Unit (feature 5030) is included in the configuration. Users can attach up to two System/370 channels, up to four Direct Access Storage Device (DASD)/tape attachments, up to 12 Workstation Subsystem Controllers, and up to 15 Communication Processors. The machine also provides support for ACRITH instructions.

The enhanced Model 50 provides up to 26 percent greater processor performance than the previous Model 50 version. Installed Model 50 machines will be upgraded to enhanced Model 50 performance at no charge. Model 50 purchase price remains unchanged.

The Model 50 features 8 and 16 megabytes of main memory, two to four I/O buses, and expanded I/O bus and I/O slot capabilities. Eight I/O slots, split across two buses, are standard. I/O Card Units and I/O Expansion Units permit the number of I/O slots to be expanded to a maximum of 100.

Users can attach up to four System/370 channels, up to eight DASD/tape attachments, up to 12 Workstation Subsystem Controllers, and up to 15 Communication Processors. The Model 50 also supports ACRITH instructions.

IBM announced the following upgrades and purchase prices:

- 9373-25 to 9373-30, $14,000
- 9373-25 to enhanced 9375-50, $30,000
- 9373-25 to 9377-80, $120,000
- 9373-25 to 9377-90, $180,000

An upgrade of a Model 20 or 30 to an enhanced Model 50 became available in May. All other upgrades will become available on August 25.

At the software level, IBM enhanced the DPPX/370 operating system. DPPX/370 Release 2 includes a new CICS command-level interface, Cobol II Debug Facility, and other Cobol II enhancements. Additionally, it features a new Personal Services/DPPX and DisplayWrite/DPPX, enhanced communications support, serviceability, and network management.

At the communications level, IBM announced the Workstation Subsystem Controller (feature 6120), a single card that provides the same functions and performance as the previous I/O Processor (feature 6020) and the I/O Adapter (feature 6021), composed of two cards. These last two features were withdrawn. The enhanced ASCII Subsystem Controller (feature 6130 and 6033) comes with additional functions that

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Product Enhancement

▻ became available in May. These include the Extended Data Stream support for ASCII terminals and printers and the Token-Ring 16/4M bps Adapter feature (feature 6134) for the IBM Token-Ring Subsystem.

In the system availability area, IBM announced improvements for Problem Analysis, Secondary Load Source, and Shared Power Controller. The Secondary Load Source improvement lets users back up the primary 9370 system IML data to a secondary DASD. The backup would be used should the primary load source fail.

The new 9370 Shared Power Controller feature (feature 9402) allows multiple power paths between attached systems and an IBM 9309 Model 2 Rack Enclosure. The enclosure contains IBM 9332 DASD devices or other devices capable of a shared interface. The feature permits up to eight systems to power up an IBM 9309-2 rack containing shared devices.

The Dual Copy feature automatically provides a duplicate copy of a 9332/9335 DASD volume. The Dual Copy feature will be available during the fourth quarter as a nonstandard RPQ. All other features became available in May. □