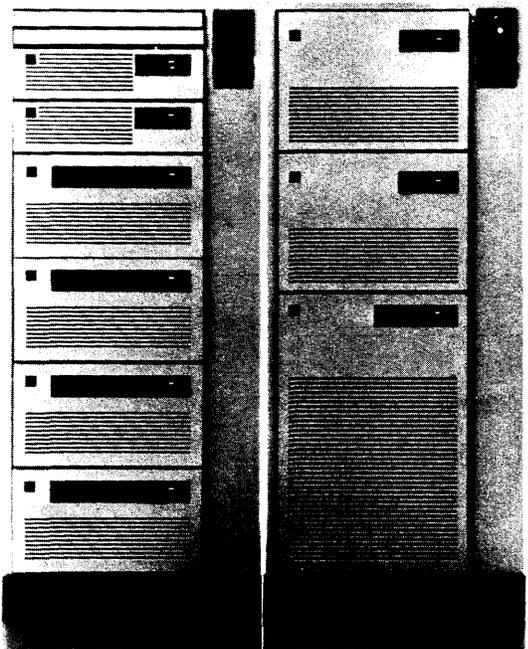# IBM 9370 Information System

PRODUCT DESCRIPTION

The 9370 Information System is a family of four office-installable superminicomputers employing the System/370 architecture found in the 4300 and 30XX systems. The four models are the entry-level 9373 Model 20, the intermediate 9375 Models 40 and 60, and the high-end 9377 Model 90. Intended primarily for work group and departmental computing in both engineering/scientific and commercial environments, these systems can be used as standalone engines or as nodes in networks of mainframes, mid-level processors, personal computers, and workstations.

All four of the systems support up to 16MB of main memory, based on 1M-bit chips. They are contained in rack enclosures that take up only 6.4 square feet of floor space. According to IBM, a fully configured 9375 Model 60—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.

Using the 368MB 9332 and 824MB 9335MB DASD (Direct Access Storage Device) disk drives employed on IBM's mid-range System/36 and System/38, the 9373, 9375, and 9377 processors can, respectively, support up to 6.5GB, 13.1GB, and 39.5GB of auxiliary storage. The three

IBM's 9377 Model 90 is the high-end computer in the 9370 Information System family. This system features IBM's first air-cooled Thermal Conduction Module (TCM), and, according to the vendor, takes up little more space than two filing cabinets.

BASIC SPECIFICATIONS

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.

PROCESSORS: The 9370 processors offer the full IBM System/370 instruction set, 16 general-purpose registers, and the virtual memory capability associated with the System/370 architecture. All four support the performance enhancements of Extended Control Program Support (ECPS:VM) and assists for the Unix-based IX/370 operating system (IXA). The 9375 Model 60 and the 9377 Model 90 processors support ECPS:MVS. Each processor includes a hardware floating-point accelerator.

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 (191 mm by 203 mm by 16 or 27 mm) and are enclosed in protective casings. Memory utilizes 1M-bit chips.

The entry-level 9373 Model 20 is available with 4MB, 8MB, and 16MB main memory options.

The two models (40 and 60) of the 9375 processor are the intermediate systems in the 9370 family. According to IBM, the 9375 Model 40 offers the same commercial processing power as the 9373 processor; the 9375 Model 40 offers additional configurability and, reportedly, heightened performance (up to 1.4 times that of the 9373). According to IBM, the system throughput of the 9375 Model 60 has been measured at 2.4 times that of the Model 40 in a commercial environment, and at 2.0 to 2.7 times that of the smaller 9375.

In the 9375, 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 9375 Model 40 can be upgraded in the field to the 9375 Model 60 processor through a simple card exchange. Either 9375 ▶

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processor groups also permit attachment, respectively, of 64, 192, and 384 3270-compatible workstations, printers, and other devices.

The 9370 systems run under IBM's VM/SP, VSE/SP, and IX/370 operating systems. (The Unix-based IX/370 runs as a guest under VM/SP.) The 9375 Model 60 and 9377 Model 90 also run under MVS/SP, an operating system whose previous entry point in the 370 scheme was the 4381 grouping. The 9370 machines run a full complement of System/370 software, including applications programs, the PROFS (Professional Office Systems) office automation package, the SQL/DS relational data base management system, and Systems Network Architecture (SNA) communications products.

The 9370 systems also support connection to IBM's Token-Ring local area network and to the Ethernet LAN.

RELATIONSHIP TO CURRENT PRODUCT LINE:
The 9370 Information System is a de facto replacement for the 4361. Although an IBM official said at the announcement that IBM "expect[s] to continue to ship some of the [4361] product," primarily to customers already committed to it, he admitted that "over time, the [9370] set of products will replace" it.

That replacement is highly significant, for the introduction of the 9370 as the entry point into the System/370 architecture brings the full functionality of that technology into the office for the first time. The 4361, while touted by IBM as a departmental system, has a footprint and environmental requirements that make it unsuitable for placement in an office. 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.

The 9370, in short, constitutes a more powerful and, compared to the 4361, more accessible addition to IBM's "general-purpose, mid-range solution" systems—a group heretofore anchored by the System/36 and System/38. The 9370 permits the downward migration into the departmental environment of applications from IBM's larger 4381 supermini and 30XX mainframe systems. Moreover, its support for various networking schemes—Token-Ring, Ethernet, and SNA—suit it to perform both as a peer in local networks and as an intermediary system between desktop workstations and mainframes.

Because the 9370 uses peripherals available for both the System/3X machines and the System/370 grouping (the latter through the System/370 Block Multiplexer Channel), it provides far more of a migration path between IBM's minicomputer and mainframe families than the 4361 did. Even if, as is well known, 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.

model can be converted to the 9377 Model 90; the conversion requires a processor cage swap, because a second rack must be added.

Each 9375 model supports 8MB or 16MB of main storage.

The 9377 Model 90—the top-of-the-line 9370 processor—supports 8MB or 16MB of main memory. It reportedly provides 2.1 times the commercial throughput of the 9375 Model 60; in compute-intensive or engineering/scientific applications, the 9377 reportedly 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.

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.

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 facility (ACRITH) for solving problems in numerical analysis with verified accuracy and verified results is also standard. As mentioned previously, IBM 9370 card features, except memory, are attached through an I/O card unit separate from the processor.

Each 9370 CPU includes a Processor Console, which uses a specially configured IBM PC. Other standard features on the 9370 processors include automatic restart after power failures and time-of-day clock and calendar.

INPUT/OUTPUT CONTROL: The 9370 processors have an integrated I/O controller structure. To describe the scheme, IBM uses the terms "device", "adapter", and "I/O processor". A device is attached to an adapter that communicates to an I/O processor. The I/O processor provides the means to handle I/O commands from the processor and to pass data to processor memory.

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 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.

DISK AND TAPE SUPPORT: The 9370 uses the 368MB 9332 and the 824MB 9335 DASD (Direct Access Storage Device) fixed disk drives used on IBM's System/36 and System/38. (The drives have physical capacities of 400.6MB and 855.8MB, respectively; because the 9370 processor reserves some of the disk for system use, 368MB and 824MB are the drives' respective usable capacities.)

The 9370 systems also support the 9347 streaming tape drive, which mounts in the system's 9309 Rack Enclosure. The 9347 autoloads reels of industry-standard, ½-inch magnetic tape and records or reads data at 1600 bpi at a data rate of either 40KB or 160KB per second.

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▷ It is also 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 negative side, the 9370 overlaps both lower and higher systems in processing power. For example, an IBM official stated that the 9373 Model 20 is more powerful than the 5362 processor of the System/36 family—which raises the question of why anyone would buy the System/36 if he or she could get more power and System/370 functionality to boot. Similarly, the 9377 Model 90 is said to overlap the 4381 Model Group 11; again, why should someone pay $215,000 for a 4381-11 CPU with 8MB of memory when a comparable 9370 facility costs only $190,000? Of course, the System/36 has extensive office facilities. And, to be fair, IBM has said that it expects prospective computer buyers who anticipate no future need for System/370 features to stick with the System/3X family. And the 4381 is, admittedly, more expandable than the 9370. Still, the overlap between the 9370 and the other mid-range and large systems could create some dissonance in customers' minds.

COMPETITIVE POSITION: While it is a highly significant addition to IBM's mid-range product line, the 9370 is something of a "me-too" product, necessitated by recent actions on the part of Digital Equipment Corporation and Data General, IBM's two biggest competitors in the medium-systems area. Those two vendors have recently concentrated on migrating their flagship VAX and Eclipse MV architectures down to the office and department levels. IBM has had to follow suit, especially in light of the criticism it has taken from other vendors and from the trade press concerning the incompatibility of its various operating environments and the lack of networking facilities comparable to those offered by its two principal rivals.

Thus, the addition of IBM Token-Ring and Ethernet facilities to the standby SNA products brings IBM into greater parity with Digital and DG; however, it merely fills a gap in System/370 departmental functionality that has been a prime target for critics. The establishment of graduated software charges based on processor power is also a reactive move, competitively speaking; DG and Digital have offered such schemes for quite some time.

Although the 9370 is compatible with IBM's more powerful 4381 and 30XX mainframes, it still lacks full compatibilty with the System/36 and System/38—very significant players in the mid-range office market. Thus, IBM's mid-range and large systems, taken as a whole, still do not display the top-to-bottom compatibility exhibited by those

▷ The disk and tape devices are controlled by the single-card DASD/Tape Subsystem Controller, which uses the standard IBM IPI-3 interface. Up to two of these controllers can be configured on the 9373, up to four can be placed on the 9375, and up to 12 can be accommodated by the 9377.

The minimum 9332/9335 DASD support available on each system is 368MB. The maximums are 6.5GB on the 9373 Model 20, 13.1GB on the two 9375 models, and 39.5GB on the 9377 Model 90.

Other System/370 disk and tape devices can be attached to the 9370 through the System/370 Block Multiplexer Channel.

WORKSTATION SUPPORT: The primary support device for workstations on the 9370 is the Workstation Subsystem Controller, which permits attachment of up to 32 IBM 3270 displays, printers, and personal computers. The 9373 can support up to two of these controllers; the 9375 accommodates up to six, and the 9377 permits configuration of up to 12.

The Workstation Subsystem Controller also supports IBM's Serial OEM Interface (SOEMI), which permits attachment of OEM subsystems and devices, including the widely used Multibus interface.

IBM does not provide specific ranges for the number of simultaneously active users supported on each model of the 9370, claiming that such a figure varies with the system's work load and actual user activity levels. The company does state that the 9373 can support 20 continuously active users; 100 such users can be supported by the 9377. Assuming that some users are only sporadically active, IBM says, the 9373 can support over 50 users and the 9377 over 200.

COMMUNICATIONS: The 9370 employs four principal communications control devices—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. 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 supports the following types of 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.

According to IBM, 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 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. 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 ▶

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▷ of DG and Digital Equipment. The third- and fourth-quarter 1987 delivery dates for the 9370 also will not help IBM to gain ground on its rivals immediately; unless the company accelerates delivery of the systems, the competitive impact of the 9370 may be significantly diminished.

As far as individual models go, the 9373 Model 20 competes against Digital Equipment's MicroVAX II and VAX 8200, and against Data General's Eclipse MV/4000 DC. The 9375 Model 40 goes up against DG's Eclipse MV/7800; it also competes with Digital's VAX 8200, and with the VAX 8300 as well in computation-intensive applications. The 9375 Model 60 competes with Digital's VAX 8500 and DG's Eclipse MV/8000 II. The top-of-the-line 9377 Model 90 rivals DG's MV/10000 SX and Digital's VAX 8550. □

▶ software as native devices; this mode is supported by the Unix-based IX/370 operating system.

The IBM Token-Ring Subsystem Controller provides access to a 4M-bps 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 specified telephone media, for physical interconnection; it employs a token-ring access protocol for network traffic control.

The IEEE 802.3 Local Area Network Subsystem Controller is used for communicating with other 9370 Information Systems, other vendors' systems, and workstations using he IEEE 802.3 standard or the Ethernet local area network. This controller supports a network with a transmission speed of 10M bps using Carrier Sense Multiple Access with Collision Detection (CSMA/CD).

The 9370 can also communicate with a Rolm CBX through a communications processor with an asynchronous adapter connected to a Rolm DataCom Module (DCM) or Data Terminal Interface (DTI).

SOFTWARE: All 9370 systems run under IBM's VM/System Product (VM/SP), VSE/System Package (VSE/SP), and IX/370 operating systems. The Unix-based IX/370 is supported only under control of VM/SP. The MVS/SP operating system is supported only on the 9375 Model 60 and the 9377 Model 90; according to IBM, this support enables users to develop applications on a host system and transport them, without changes, to distributed work group locations.

IBM defines VM/Integrated System (VM/IS) as the preferred delivery vehicle for the interactive VM/SP in departmental and end-user work group environments. VM/IS offers all the functions of VM/SP and provides eight optional applications packages for functions such as text/office support, intelligent workstation (PC) support, engineering/scientific program development, data base queries, APL language support, support for Basic and Pascal problem-solving languages, networking support, and support for IBM's 3705 and 3725 communications controllers. Those eight packages provide 28 licensed programs.

Similarly, IBM states that the pregenerated, load-and-go version of VSE/SP is most desirable for departments and end-user work groups with intensive batch and transaction processing requirements.

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.

According to IBM, 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.)

OPERATING ENVIRONMENT: The 9373 stands 14 inches (35.6 cm) high, 19 inches (48.3 cm) wide, and 28 inches (71.1 cm) deep; it weighs 130 pounds (60 kg). The two 9375 models and the 9377 are 28 inches high, 19 inches wide, and 31 inches (78.2 cm) deep. The 9375s each weigh 280 pounds (127 kg); the 9377 weighs 268 pounds (122 kg).

IBM states that when the system is mounted in the company's 9309 Rack Enclosure, temperature and humidity requirements, as well as noise levels, are compatible with normal office environments. The 9370 processors and the 9309 Rack Enclosure use single-phase power. The 9373 processor Model 20 operates on either 120 V or 220 V power; the 9309 Rack Enclosure Model 1 can be ordered with either power supply module.

PRICING: 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.

Although IBM has provided a price list for the 9370 and associated options (appearing at the end of this report), the list does not give detailed pricing for all available processor models. However, the company has stated the following price ranges for the processor models:

- 9373 Model 20 (4MB, 8MB, 16MB of memory), $31,000 to $51,000.

- 9375 Model 40 (8MB to 16MB of memory), $65,000 to $85,000.

- 9375 Model 60 (8MB to 16MB of memory), $93,000 to $113,000.

- 9377 Model 90 (8MB to 16MB of memory), $190,000 to $210,000.

A typical 9373 Model 20 configuration is purchase-priced at $95,430, and includes a CPU with 4MB of main memory; DASD/Tape Controller; 9332-400 368MB fixed disk drive; 9347 streaming tape drive; Workstation Subsystem Controller; 12 3179 color workstations; and a 3268 Model 2C 340-cps matrix printer.

VM, VSE, and cross-system licensed software products are subject either to a monthly license charge or to a onetime charge. The onetime charge varies according to the processor group to which the target machine belongs; the processors are grouped according to individual performance. 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. ▶

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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.

EQUIPMENT PRICES

		Purch. Price ($)	Monthly Rental ($)	Min. Maint. ($)
9370 PROCESSORS				
9373-020	Processor with 4MB of main memory	31,000	3,100	225
9375-040	Processor with 8MB of main memory	65,000	6,500	280
9375-060	Processor with 8MB of main memory	93,000	9,300	350
9377-090	Processor with 8MB of main memory	190,000	19,000	550
OPTIONS				
4000	Automated Power Controls	800	80	NA
4002	4MB Memory Addition for 9373 Processor	10,000	1,000	NA
4008	8MB Memory Addition for 9373 or 9375 Processors	20,000	2,000	NA
4108	8MB Memory Addition for 9377 Processor	20,000	2,000	NA
5000	I/O Card Unit Adapter	4,200	420	NA
5010	I/O Card Unit	7,700	770	NA
5020	I/O Card Unit	11,300	1,130	NA
6001	Channel Power Control	1,600	160	NA
6003	System/370 Block Multiplexer Channel	6,000	600	NA
6010	DASD/Tape Controller	3,000	300	NA
6020	Workstation Controller	4,200	420	NA
6030	Communications Processor	2,400	240	NA
6031	Multi-Protocol Adapter	1,200	120	NA
6032	Asynchronous Adapter	825	83	NA
6034	IBM Token-Ring Adapter	1,950	195	NA
6035	IEEE 802.3 Adapter	2,700	270	NA

NA—Not applicable.

SOFTWARE PRICES

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.

		Onetime Charge ($)	Monthly License Charge ($)
5664-167	VM/SP Release 5		
	Processor Group 10	7,740	500
	Processor Group 20	13,540	500
5664-301	VM/Integrated System (VM/IS) Release 4 BASE (VM/IS BASE)		
	Processor Group 10	26,840	2,275
	Processor Group 20	46,985	2,275
5664-283	IBM VM/IS Productivity Facility Release 4		
	Processor Group 10	1,140	107
	Processor Group 20	2,000	107
5664-318	Virtual Machine/Interactive Productivity Facility Version 2		
	Processor Group 10	900	75
	Processor Group 20	1,575	75
5748-RC1	VM/Pass-Through Facility (PVM) Release 3		
	Processor Group 10	1,710	185
	Processor Group 20	3,000	185
5666-345	VSE/System Package Version 3 Release		
	Processor Group 10	29,315	2,608
	Processor Group 20	51,305	2,608
5666-273	VSE/POWER Version 2 Release 3		
	Processor Group 10	1,550	166
	Processor Group 20	2,710	166
5666-316	VSE/SP Version 2 Release 1.6		
	Processor Group 10	23,110	2,160
	Processor Group 20	40,440	2,160
5666-361	IBM Decision and Information Support Productivity Facility/VSE (DISPF/VSE)		
	Processor Group 10	2,640	220
	Processor Group 20	4,620	220
5668-722	Data Interfile Transfer, Testing, and Operations Utility for VSE and VM Version 2 Release 1		
	Processor Group 10	980	82
	Processor Group 20	1,720	82